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History and Status of the California Red-legged Frog (*Rana draytonii*) in the Sierra Nevada, California, USA

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***Abstract.*—The status of the California Red-legged Frog (*Rana draytonii*), a Federally listed Threatened species, has long been uncertain in the Sierra Nevada range in eastern California, USA. We examined museum collections and historical records, and conducted 213 field surveys at 151 sites over 21 years to evaluate the status of this frog in the Sierra Nevada. We documented only 20 Sierra Nevada localities and one Cascades Mountains locality where *R. draytonii* occurred between 1916 and 1975, extending from Tehama County southeast about 405 km to Madera County. The elevation range of most of the historical localities was 200–900 m (about 40 km from lower to upper elevation), but three apparently extirpated populations that may have originated from deliberate translocations occurred at 1,500–1,536 m elevation in Yosemite National Park. We surveyed directly or within 5 km of 20 of the 21 historical Sierra Nevada/Cascades *R. draytonii* localities and found that at least one of these historical populations persists today, in large numbers. We also discovered or confirmed six new Sierra Nevada *R. draytonii* populations and individual frogs at three additional new sites, for a total of seven recent populations and three recent single-specimen occurrences extending from Butte County southeast about 275 km to Mariposa County. Historically, *R. draytonii* in the Sierra Nevada probably bred in stream pools, which tend to be small with limited forage and thus may have constrained the historical size and number of Sierra Nevada *R. draytonii* populations. Since the 1850's, manmade ponds sometimes capable of supporting large *R. draytonii* populations have supplemented stream pool breeding habitat. Excluding the southernmost and Yosemite historical localities, the current range of Sierra Nevada *R. draytonii* differs little from the historical range, and further surveys may reveal additional surviving Sierra Nevada *R. draytonii* populations. Sierra Nevada *R. draytonii* are threatened primarily by habitat modification and loss related to human population increase.**

Key Words.—Bullfrog; California Red-legged Frog; historical records; mining; *Rana draytonii*; Sacramento-San Joaquin Valley; Sierra Nevada; status

Introduction

The California Red-legged Frog (*Rana draytonii*) is the largest native ranid in the western United States. Adult females may reach 14 cm snout-urostyle length (SUL), about 3 cm longer than the maximum SUL reported for any other native western ranid (Stebbins 2003). In the western US, only the American Bullfrog (*Lithobates catesbeianus*, hereafter referred to as Bullfrogs), an exotic species established in California during the 1870's (Jennings and Hayes 1985), grows larger (to almost 20 cm SUL). *Rana draytonii* populations have been recorded from an estimated 20% of the California land area, from central Mendocino County and western Tehama County south in the California Coast Range to northern Baja California, Mexico, and in the Sierra Nevada/Cascade Ranges from Shasta County south to Madera County (Jennings and Hayes 1994; Grismer 2002; Shaffer et al. 2004). They are largely absent from the California Central Valley, which separates the Sierra Nevada from the Coast Range (Storer 1925; Jennings and Hayes 1994).

Before 1960, *R. draytonii* populations were densely distributed throughout the California Coast Range, and the species was also widespread in the coastal southern California foothills (Jennings and Hayes 1994). By 1970, habitat loss and perhaps other factors associated with accelerating human population growth had eliminated all but a handful of populations in southern California, and had caused local declines and extirpations from Monterey to Ventura Counties (Jennings and Hayes 1994; US Fish and Wildlife Service 2002). In the coastal mountains north of Point Conception, *R. draytonii* remains relatively widespread, but it is common only in the San Francisco Bay Area (US Fish and Wildlife Service 2002).

Rana draytonii has long been known to occur in the lower elevations of the western slopes of the Sierra Nevada and Cascade ranges of eastern and northernmost California, but very little information is available regarding specific occurrences, population sizes, or habitat preferences in the Sierra Nevada. Indeed, Wright and Wright's (1949) brief account of finding these frogs at an Amador County tailings pond in 1942 seems to be the only published historical firsthand observation of Sierra Nevada *R. draytonii*. This dearth of information has contributed to the widespread notion that *R. draytonii* is rapidly approaching extirpation in the Sierra Nevada (Moyle 1973; Hayes and Jennings 1986; US Fish and Wildlife Service 1996, 2002; Fellers 2005). The scarcity and presumed decline of *R. draytonii* in the Sierra Nevada and its near-extirpation in southern California, as well as continuing human population growth and related habitat loss over large regions of central California, led the United States Fish and Wildlife Service (USFWS; 1996) to list *R. draytonii* as a threatened species.

Since 1990, we have conducted extensive field surveys to locate *R. draytonii* in the Sierra Nevada. Our studies (e.g., Drost and Fellers 1996) have identified new populations, and we have also documented a surviving Sierra Nevada *R. draytonii* population that previously had been reported as extirpated (Jennings and Hayes 1994; US Fish and Wildlife Service 2002). We have also evaluated *R. draytonii* museum records to document the species' historical Sierra Nevada distribution, and to elucidate any temporal or distributional patterns. Additionally, we have identified likely historical Sierra Nevada *R. draytonii* breeding habitat and we have found that manmade habitat capable of supporting large populations has supplemented historical breeding habitat, which probably supported only very small, localized populations.

In this paper, we review historical information on Sierra Nevada populations of *R. draytonii*, identify recent populations of the species in the area, compare natural and manmade breeding habitat, evaluate the conservation status of *R. draytonii* in the Sierra Nevada, and offer recommendations to protect existing populations. We also suggest guidelines and habitat targets for further Sierra Nevada population surveys.

Methods

Study area.—The Sierra Nevada extends along most of the eastern portion of California, from the Feather River south to the Kern River. The western edge of the Sierra Nevada ranges down to about 150 meters (m) elevation where the Sierra Nevada foothills transition into the Central Valley grassland (Heady 1977). Our study focuses on the Sierra Nevada foothills, which we define as the western slope of the Sierra Nevada from 150 to 1,550 m elevation. United States Geological Survey (USGS) and US Forest Service (USFS) maps indicate that most of the Sierra Nevada territory within that elevation range is privately owned, and most of the Sierra Nevada above 1,550 m elevation is within National Forests and National Parks. The California Central Valley comprises the lower reaches of the Sacramento Valley (in the north) and the San Joaquin Valley (south). We treat *R. draytonii* records below 150 m elevation as Central Valley records. The Cascade Mountains extend from British Columbia, Canada south to where they meet the northern edge of the Sierra Nevada in Butte and Plumas Counties. We have included the single Cascades Mountains museum record in our study (Fig. 1).

Natural history.—Adult *R. draytonii* breed along the margins and shallow parts of sunlit pools. These pools may be natural or manmade ponds, wide slow sections of streams, or even small, spring-fed puddles, typically without centrarchid fish (Hayes and Jennings 1988). Breeding sites may hold water only seasonally, but sufficient water must persist into the summer for tadpoles to reach a size for metamorphosis (S. Barry, unpubl. data). *Rana draytonii* typically breed from mid-December through early April, earlier than other ranids within its range (Storer 1925; Stebbins 1951). During the summer, adult frogs frequently move from breeding areas to quiet, shaded pools along streams where they use undercut banks, dense thickets, or root masses for shelter (Bulger et al. 2003; Fellers and Kleeman 2007). Some frogs

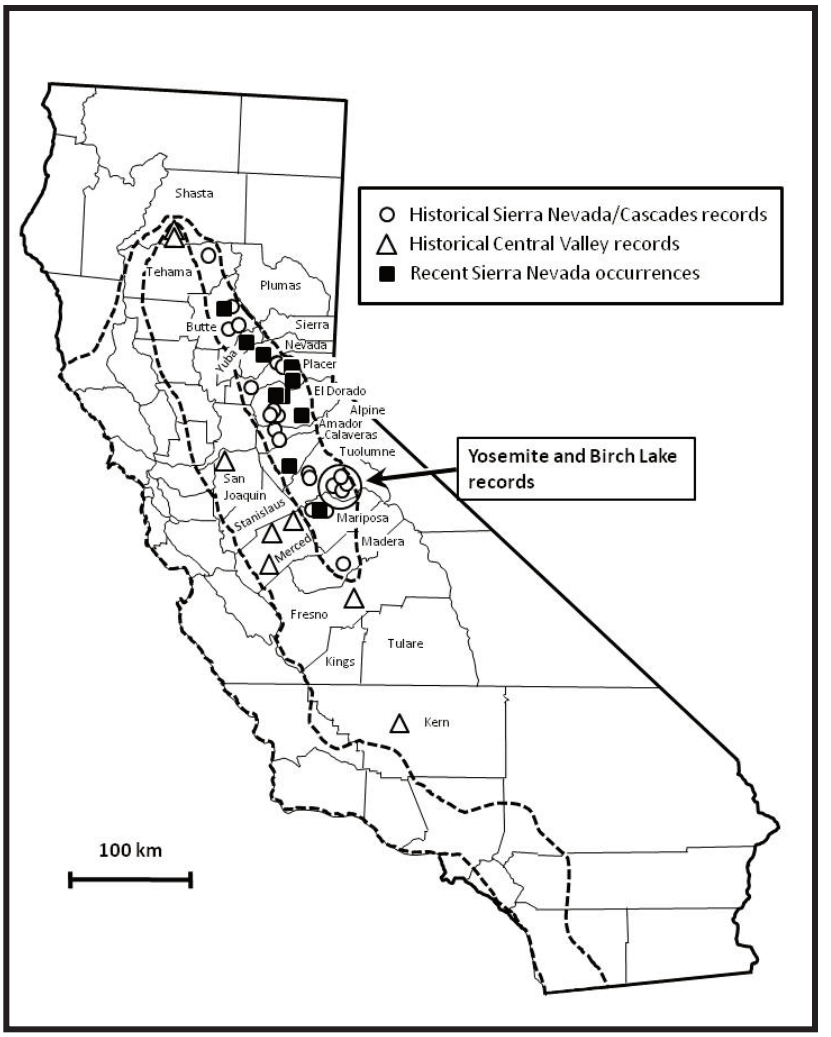

Figure 1. Historical (1916–1975) and recent (1992 and later) records of *Rana draytonii* in the Sierra Nevada and Cascade Mountains of California, USA and historical records from the Central Valley. The "Upper Lake" record from Yosemite (Table 1) is not indicated. Dashed line represents the USA range of *R. draytonii* excluding Central Valley records (modified from Jennings and Hayes 1994). Details for each record are provided in Tables 1, 2, & 6.

spend most of the year in non-breeding habitats. Other adult frogs remain in breeding pools all year (Fellers and Kleeman 2007; S. Barry, unpubl. data).

Museum records, literature, and field surveys.—We compiled museum records for specimens examined by Jennings and Hayes (1994), searched online museum databases for additional records (Herpnet. 2013. Global Network of Herpetological Specimen Data. Available from http://www.herpnet.org, [Accessed most recently on 26 January 2013]), and examined specimens or photographs for records not reviewed by Jennings and Hayes. We accepted photographs of living frogs as valid records if they included localities and dates, and if we could distinguish *R. draytonii* from potentially syntopic anurans such as Foothill Yellow-legged Frogs (*R. boylii*) and Bullfrogs. However, we excluded California Natural Diversity Database anecdotal records, and the anecdotal records mapped by Jennings and Hayes (1994), because none of those reports were corroborated by independent observations or photographs (John Brode, California Department of Fish and Game, pers. comm.).

We reviewed early herpetological reports from California, as well as historical accounts of Sierra Nevada explorations for additional

information on native California frogs that might provide insight into the early distribution, natural history, or habitat usage of *R. draytonii*. We also examined the field notes of biologists who collected *R. draytonii* specimens, to obtain more details regarding habitat, population size, and sympatric species.

From 1991 through 2012, we searched the Sierra Nevada and Cascades foothills for extant *R. draytonii* populations from Fresno County north to Tehama County, using standard daytime and nighttime survey methods (Fellers and Freel 1995; US Fish and Wildlife Service 1997, 2005). We surveyed as many historical *R. draytonii* localities as possible, and wherever possible we surveyed potential *R. draytonii* habitat within a 20-km radius of each historical locality. For historical records with ambiguous locality data we surveyed the most likely sites of the original collections. For historical sites with access restrictions, we assessed the historical locality habitat visually and conducted daytime surveys of accessible *R. draytonii* potential breeding habitat within 2.0 km of the historical locality.

We considered any current *R. draytonii* population or occurrence to be an extant historical occurrence if living *R. draytonii* were found within 2.0 km of a historical locality. To locate new *R. draytonii* populations outside of this defined historical locality zone, we identified potential breeding and non-breeding habitats from maps and site visits, and we investigated reported recent observations of Sierra Nevada *R. draytonii*. We documented the presence of *R. draytonii* with photographs, and collected genetic samples from a few individuals for phylogenetic analyses (Shaffer et al. 2004).

We obtained UTM coordinates for historical localities from USGS topographic maps or we recorded coordinates during our field surveys. We based coordinates for imprecise historical urban localities (e.g., "Auburn") on the city post office or county courthouse as noted. We estimated coordinates for other imprecise historical sites (e.g., "Two miles south of El Dorado") from potential *R. draytonii* habitat found during field surveys. We obtained these coordinates from portable global positioning system devices and we confirmed them on USGS topographic maps. The datum for all UTM coordinates is NAD27. We estimated pond size, stream reach length, and water depth visually. We calculated distances between localities from UTM coordinates, or we estimated distances from USGS and National Forest maps where noted.

Table 1. Historical records of *Rana draytonii* in the Sierra Nevada and Cascade Mountains of California, USA. We obtained coordinates in the field or from USGS topographic maps. Museum acronyms follow: (American Society of Ichthyologists and Herpetologists, Washington, DC. 2010. Sabaj Perez, M.H. (Ed) Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology: an Online Reference. Version 1.5 (4 Oct. 2010). Available from http://www.asih.org/ [Accessed 20 April 2012]). except: CSUC: California State University, Chico; CSUS: California State University, Sacramento; MJC: Modesto Junior College collection, Modesto, California; YNPM: Yosemite National Park Museum, El Portal, California.

Locality	Elev. (m)	# in series	Estimated distance to nearest road	Date (# of specimens)	Catalogue number (literature reference)
Cascade Mountains: ***Tehama County:***					
Pond at Elliott's Ranch, five miles west of Payne's Creek Post Office, zone 10, 585374E, 4462801N	314	1	0.2 km	5 June 1924	MVZ 9981 (Grinnell et al. 1930)
Sierra Nevada: **Feather River Basin, *Butte County:***					
French Creek, T22N R5E at FS Rd. 22N34, Merrimack District, Plumas National Forest, zone 10, 640090E, 4398191N	615	1	0.0 km	19 Aug. 1970	NLU 29118
One mile toward Oroville from Feather Falls, zone 10, 648086E, 4383708N	840	4	< 1.0 km	9 May 1961 (4)	CSUC 1100–1103
Three miles north of Bidwell Bar, zone 10, 634139E, 4384373N	404	1	< 1.0 km	19 March1960	CSUC 1104
Sierra Nevada: **Bear River Basin, *Placer County:***					
McKibben property, 0.5 miles NE of Dutch Flat, zone 10, 687270E, 4342322N	845	3	0.2 km	29 June 1939 (2), 2 July 1939 (1)	MVZ 29314–29316

Table 1 (*continued*). Historical records of *Rana draytonii* in the Sierra Nevada and Cascade Mountains of California, USA. We obtained coordinates in the field or from USGS topographic maps. Museum acronyms follow: (American Society of Ichthyologists and Herpetologists, Washington, DC. 2010. Sabaj Perez, M.H. (Ed) Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology: an Online Reference. Version 1.5 (4 Oct. 2010). Available from http://www.asih.org/ [Accessed 20 April 2012]). except: CSUC: California State University, Chico; CSUS: California State University, Sacramento; MJC: Modesto Junior College collection, Modesto, California; YNPM: Yosemite National Park Museum, El Portal, California.

Locality	Elev. (m)	# in series	Estimated distance to nearest road	Date (# of specimens)	Catalogue number (literature reference)
American River Basin, *Placer County*:					
Michigan Bluff, zone 10, 695489E, 4323958N	1,062	1	0.0 km	12 Aug. 1916	MVZ 6111
Auburn, zone 10, 666758E, 4307048N (coordinates referenced to Placer Co. Superior Courthouse, 101 Maple St., Auburn)	~372	1	Probably < 1.0 km	19 April 1946	MVZ 51660
American River Basin (Weber Creek), *El Dorado County*:					
One mile SE of Placerville, zone 10, 692618E, 4287976N (coordinates referenced to El Dorado Co. Superior Courthouse, 495 Main St., Placerville)	620	4	< 1.0 km	21–22 May 1935 (4)	MVZ 19057–19060
Weber Creek at Forni Rd., 0.25–0.50 miles above US Highway 50, zone 10, 688915E, 4287045N	480	4	< 1.0 km	16 March 1957 (4)	CSUS 281a–281d
Two miles south of El Dorado, zone 10, 687875E, 4279640N	586	1	0.5 km	31 March 1961	MVZ 187299
Cosumnes River Basin, *Amador County*:					
Tributary to North Fork Cosumnes River, north of Plymouth, zone 10, 687424E, 4269117N	240	1	< 1.0 km	11 April 1942	CU 4220 (Wright & Wright 1949)
Mokelumne River Basin, *Amador County*:					
Middle Bar Rd., 0.9 mile west of State Highway 49, zone 10, 696481E, 4243692N	280	2	0.0 km	30 March 1963 (2)	CSUS 508a, 508b
Tuolumne River Basin (Woods Creek), *Tuolumne County*:					
Woods Creek, edge of Sonora, zone 10, 730000E, 4208168N	570	4	< 1.0 km	23 April 1950 (4)	MVZ 50959–50962
Parrott's Ferry Rd., 2.4 miles north of Sonora, zone 10, 727726E, 4213543N	641	1	0.0 km	7 Feb. 1975	MVZ 134088
Tuolumne River Basin (Tuolumne River), *Tuolumne County*:					
Mather/Hog Ranch, zone 11, 248922E, 4196122N	1,380	11	< 1.0 km	21 July 1922 (1), 2–6 Sept. 1945 (10)	USNM 312015; AMNH 52367, 104140–104148
Swamp Lake, Yosemite National Park, zone 11, 251529E, 4203871N	1,530	5	3.0 km	10 July 1938 (1), 12 July 1939 (1), July 1940 (2), July 1941 (1)	YNPM 22369, 22372, two uncatalogued; CU 4075 (Walker 1946)
Miguel Meadow, Yosemite National Park, zone 11, 250391E, 4204932N	1,530	2	> 3.0 km	11–12 July 1939 (2)	YNPM 22371, 22382 (Walker 1946)
Gravel Pit Lake, Yosemite National Park, zone 11, 251600E, 4205500N	1,536	1	> 3.0 km	7 July 1940	YNPM 22364 (Walker 1946)
Upper Lake near mud flow, Yosemite National Park (unknown locality)	unk	1	Unknown	10 July 1941	YNPM 22365
Merced River Basin, *Mariposa County*:					
Jordan Creek at Jordan Creek Rd., two miles above Greeley Hill Rd., zone 10, 757101E, 4184384N	819	1	0.0 km	Oct. 1967	MJC Uncatalogued
Piney Creek, vicinity of Cadena Rd., zone 10, 735049E, 4178405N	370	>1	0.0 km	March 1972, Nov. 1974	CA Dept. of Fish & Game photographs
San Joaquin River Basin, *Madera County*:					
O'Neals, zone 11, 260524E, 4112252N	398	10	Unknown	6 Nov. 1951 (1), 20 Nov. 1951 (1), 15 Aug. 1952 (8)	MVZ 55515–55516, 57361–53768

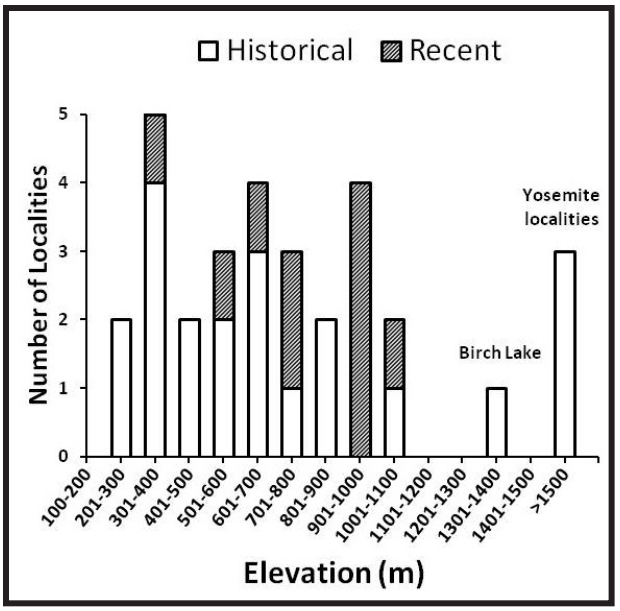

Figure 2. Elevation distribution of 21 historical and 10 recent *Rana draytonii* localities in the Sierra Nevada of California. The graph includes the Cascades Mountains (Paynes Creek) locality and excludes the "Upper Lake" locality (Table 1; see text). Locality details are provided in Tables 1 & 6.

Results

Historical records.—We found only 60 museum specimens of *R. draytonii* from the Sierra Nevada, and one from the southernmost Cascades, all collected between 1916 and 1975 (Table 1). We examined photographs of *R. draytonii* obtained during the 1970s at Piney Creek, Mariposa County in the Sierra Nevada (John M. Brode, pers. comm.), but we found no museum specimens from this locality (Table 1). The Sierra Nevada *R. draytonii* museum specimens and photographs represent 21 localities that extend from French Creek in east central Butte County an estimated 325 km southeast to O'Neals, Madera County (Table 1; Fig. 1). The Cascades Mountains locality extends the distribution about 80 km northwest of French Creek to Paynes Creek in northern Tehama County, for a total of just 22 documented Cascades and Sierra Nevada localities extending 405 km from Paynes Creek to O'Neals (Table 1; Fig 1). These data contrast with over 1,200 *R. draytonii* museum specimens from about 420 coastal and southern California and Baja California localities collected during the same 60-year period. Also, other *R. draytonii* specimens from coastal California date back to the mid-1800's (Baird and Girard 1852), compared with 1916 for the Sierra Nevada. Our literature search revealed only three published references to specific Sierra Nevada *R. draytonii* occurrences (Table 1), all from localities also represented by museum specimens.

We did not locate "Upper Lake" in Yosemite National Park so we have excluded that record and the single Upper Lake museum voucher from further analyses (Table 1). Thus, the analyses below include the remaining 20 Sierra Nevada historical localities plus the Cascades locality, for a total of 21 historical Sierra Nevada/Cascades localities represented by 59 museum specimens and the Piney Creek (Mariposa County) specimen photographs. We could not verify the identification of two cleared and stained specimens (UF 5878) from "4.0 miles NW Coloma" (El Dorado County), so we have excluded this record from our dataset and from Table 1.

Seventeen (81%) of the 21 historical Sierra Nevada and Cascades *R. draytonii* localities included in our dataset are from 240–1,100 m elevation, with 14 of the 17 (82%) below 800 m (Fig. 2). Only the possibly introduced *R. draytonii* populations at Birch Lake and the Swamp Lake-Miguel Meadow-Gravel Pit Lake region of Yosemite National Park (Tuolumne County; discussed below) were from significantly higher elevations (1,300–1,550 m; Table 1; Fig. 2). An estimated 40 km separates the lowest from the highest elevation Sierra Nevada *R. draytonii* localities, excluding the high elevation Birch Lake and Yosemite records.

Only three *R. draytonii* specimens are products of the Museum of Vertebrate Zoology (MVZ) Sierra Nevada and Cascades expeditions. The Snelling specimen (Merced County, Central Valley; Table 2) was obtained from a Snelling resident during the 1914–1916 MVZ Yosemite surveys (Grinnell and Storer 1924), but the frog's origin is unclear because the resident apparently did not identify the collecting site (C.L. Camp 26 May 1915 field notes, Museum of Vertebrate Zoology, University of California, Berkeley). Likewise, the Minkler specimen (Fresno County,

Table 2. Historical records of *Rana draytonii* in the Central Valley of California, USA. We obtained coordinates from USGS topographic maps. Museum acronyms follow: (American Society of Ichthyologists and Herpetologists, Washington, DC. 2010. Sabaj Perez, M.H. (Ed) Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology: an Online Reference. Version 1.5 (4 Oct. 2010). Available from http://www.asih.org/ [Accessed 20 April 2012]).

County	Locality	Elev. (m)	# in series	Habitat type[1]	Date	Catalogue number
Shasta	Clear Creek, south of Redding, zone 10, 552536E, 4484460N	131	1	Creek downstream of tailings	28 Aug 1926	UMMZ 71495
Shasta	Redding, zone 10, 551094E, 4492589N	~167	1	Unknown	4 Oct. 1911	CAS 30662
San Joaquin	Lodi, zone 10, 650977E, 4222435N	15	1	Unknown	19 March 1957	MVZ 65795
Merced	Gadwall, zone 10, 698822E, 4099695N	31	1	Freshwater marsh	19 May 1914	MVZ 5427
Merced	Snelling, zone 10, 726505E, 4155631N	78	1	Unknown	27 May 1915	MVZ 5773
Merced	Merced River at State Highway 99, zone 10, 699803E, 4141538N	29	1	River channel	13 Sept. 1922	CAS 55765
Fresno	Byrd Slough near Minkler, zone 11, 280480E, 4067095N	120	1	Slough/creek	7 Oct. 1916	MVZ 6211
Kern	Buena Vista Lake, zone 11, 291344E, 3896860N	88	1	Vegetated freshwater sump	13 June 1931	UCD 3384 now CAS 218292

[1]Based on original record and on field observations by SJB and GMF

Central Valley; Table 2) was collected at the beginning of the MVZ Sequoia biotic surveys (Sumner and Dixon 1952), and the Paynes Creek specimen (Tehama County; Table 1), the sole Cascades Mountains specimen, was collected during the MVZ Lassen Peak survey (Grinnell et al. 1930).

Central Valley records.—We found only eight *R. draytonii* museum records, representing eight localities, from the Central Valley (Table 2; Fig. 1). Half of the Central Valley specimens were collected before the 1930s, but none were collected before 1911 (Table 2). We consider the Shasta County specimens from Redding (167 m elevation) and from Clear Creek (131 m elevation) to be Central Valley records (Table 2), even though Redding, at the far northern extreme of the Central Valley (Fig. 1) is slightly higher than the 150 m elevation cutoff we used for the Sierra Nevada.

Tulare County in the southern Central Valley was the putative origin of many *R. draytonii* shipped to the San Francisco Bay Area for food during the 19th century (Jennings and Hayes 1985), and Ingles (1932) mentioned *R. draytonii* specimens from the vicinity of Bakersfield (Kern County), but to our knowledge no specimen from either of these regions was ever added to any museum collection. The Tule and Kern River sumps (Tulare and Buena Vista Lakes, Tulare and Kern Counties, respectively) might have supported *R. draytonii*, but the only evidence of their occurrence is a single Buena Vista Lake specimen collected in 1931 (Table 2). Both sumps have been drained and converted to agriculture and they no longer support extensive aquatic habitat (SJB & GMF, pers. obs.).

Historical locality surveys.—Only four of the 21 historical Sierra Nevada/Cascades *R. draytonii* locality records were specific enough

Table 3. Verbatim, estimated, and alternate historical Sierra Nevada *R. draytonii* localities surveyed. Coordinates were obtained in the field. Counties for localities surveyed were the same as for the corresponding verbatim localities. Category codes: P = Surveyed at precise verbatim locality; I = Imprecise or ambiguous verbatim locality, surveyed site listed was estimated by GMF and SJB to be the most likely original collection site; U = Urban area or settled area, surveyed at listed alternate site; A = No current aquatic habitat or access not allowed, surveyed at listed alternate site; N = no survey within 5 km of verbatim locality.

Verbatim locality (from Table 1)	Locality surveyed	Distance to verbatim locality (km)	Category
French Creek, T22N R5E at Forest Service Rd. 22N34, Merrimack District, Plumas National Forest, Butte Co.	Verbatim locality surveyed, zone 10, 640090E, 4398191N	0.0	P
Weber Creek at Forni Rd., El Dorado Co.	Verbatim locality surveyed, zone 10, 688915E, 4287045N	0.0	P
Swamp Lake, Yosemite National Park, Tuolumne Co.	Verbatim locality surveyed, zone 11, 251529E, 4203871N	0.0	P
Gravel Pit Lake, Yosemite National Park, Tuolumne Co.	Verbatim locality surveyed, zone 11, 251600E, 4205500N	0.0	P
Three miles north of Bidwell Bar, Butte Co.	Canyon Creek along the Oroville-Quincy Highway, 4.8 km N of Bidwell Bar, zone 10, 634139E, 4384373N	0.0[1]	I
One mile SE of Placerville, El Dorado Co.	Cedar Ravine Creek, 1.6 km SE of Placerville, zone 10, 692618E, 4287976N	0.0[1]	I
Two miles south of El Dorado, El Dorado Co.	A series of headwaters sumps along State Highway 49 3.2 km S of El Dorado, zone 10, 687875E, 4279640N	0.0[1]	I
Tributary to North Fork Cosumnes River, north of Plymouth, Amador Co.	A tailings area 20–50 m E of Big Indian Creek within one km of its confluence with the Cosumnes River along State Highway 49 N of Plymouth (also based on the habitat description provided by Wright & Wright 1949), zone 10, 687588E, 4268172N	?[2]	I
Middle Bar Rd., 0.9 mile west of State Highway 49, Amador Co.	Hunt Gulch Creek at Middle Bar Rd., zone 10, 696481E, 4243692N	0.0[1]	I
Woods Creek, edge of Sonora, Tuolumne Co.	Woods Creek at the N edge of the Sonora urban boundary, zone 10, 729750E, 4208347N	?[2]	I
Parrott's Ferry Rd., 2.4 miles north of Sonora, Tuolumne Co.	Tailings ponds along E side of Parrotts Ferry Rd. 0.4 km N of State Highway 49, 3.8 km N of Sonora, zone 10, 728696E, 4210757N	0.0[1]	I
Mather/Hog Ranch, Tuolumne Co.	Birch Lake at Mather, zone 11, 248922E, 4196122N	0.0[1]	I
Miguel Meadow, Yosemite National Park, Tuolumne Co.	A spring 0.1 km SSE of Miguel Meadow Ranger Station, zone 11, 250391E, 4204932N	?[2]	I
Michigan Bluff, Placer Co.	Big Gun Diggings, ~1.5 km SE of Michigan Bluff, zone 10, 696467E, 4323387N (west pond, closest of four ponds to the verbatim locality)	< 2.0[3]	U
Auburn, Placer Co.	Auburn Ravine Creek, < 8.0 km W of Placer Co. Superior Courthouse in Auburn, zone 10, 662602E, 4306375N	?[4]	U
Paynes Creek, five miles west of Paynes Creek Post Office, Tehama Co.	Paynes Creek (Tehama Co.) 9.2 km W of Paynes Creek Post Office, zone 10, 583585E, 4462542N	~1.2	A
One mile toward Oroville from Feather Falls, Butte Co. (no aquatic habitat found)	2.1 km by road toward Oroville from Feather Falls, zone 10, 647755E, 4383387N	~0.5	A
McKibben Ranch, 0.45 miles NE of Dutch Flat, Placer Co.	Nichols Diggings, 0.45 km W of the presumed McKibben Ranch locality, zone 10, 686408E, 4342259N	~0.45	A
Jordan Creek at Jordan Creek Rd., Mariposa Co.	Unmapped pond 0.8 km N of Jordan Creek pond dam, zone 10, 757156E, 4184093N	~0.8	A

[1]estimated
[2]Unknown, probalby < 2.0 km
[3]All ponds < 2.0 km from verbatim locality
[4]Unknown

Table 3 (*continued*). Verbatim, estimated, and alternate historical Sierra Nevada *R. draytonii* localities surveyed. Coordinates were obtained in the field. Counties for localities surveyed were the same as for the corresponding verbatim localities. Category codes: P = Surveyed at precise verbatim locality; I = Imprecise or ambiguous verbatim locality, surveyed site listed was estimated by GMF and SJB to be the most likely original collection site; U = Urban area or settled area, surveyed at listed alternate site; A = No current aquatic habitat or access not allowed, surveyed at listed alternate site; N = no survey within 5 km of verbatim locality.

Verbatim locality (from Table 1)	Locality surveyed	Distance to verbatim locality	Category
Piney Creek, vicinity of Cadena Rd., Mariposa Co.	Wheeler Creek, Hatch Creek, First Creek, & Second Creek within 5.0 km of Piney Creek at Cadena Rd., zone 10, 735541E, 4181236N (First Creek, closest to the verbatim locality)	< 5.0 km	A
O'Neals, Madera Co.	Not surveyed	N/A	N

to enable us to survey nearly the exact locations where *R. draytonii* had been found previously (Table 3). Nine of the remaining historical records included vague or ambiguous locality data for which we estimated the likely original collection locations based on habitat we found during our field investigations (Table 3). Two other historical records originated within historical and current urban or settled areas of Placer County ("Auburn" and "Michigan Bluff"; Table 3), and to our knowledge neither has *R. draytonii* habitat within its boundaries. For these sites, we surveyed the nearest aquatic habitat to the verbatim locality that we could find (Table 3). Five of the six remaining records lacked aquatic habitat or were impossible to access either because of safety concerns or because of trespass restrictions, so as alternates for these records we surveyed aquatic habitat within 5.0 km of the verbatim localities (Table 3; Appendix 1). We did not survey within 5.0 km of O'Neals (Madera County; Tables 1 & 3).

We conducted 213 surveys at 151 Sierra Nevada locations between 150 and 1,830 m elevation (Table 4). These surveys included at least one survey each of 20 verbatim, estimated, or alternate historical localities, excluding O'Neals (Madera County) as previously noted (Table 4; Appendix 1). Our nearest survey to O'Neals was along Fine Gold Creek within 9.0 km of O'Neals (Appendix 1). We also conducted at least one daytime survey of aquatic habitat within 20 km of each verbatim, estimated, or alternate historical locality to investigate potential regional *R. draytonii* occurrences, including O'Neals (Appendix 1). Big Indian Creek and Dry Creek (Amador County) are within 20 km of "two miles south of El Dorado" (El Dorado County) so surveys of each of these three sites fulfilled the 20-km radius criterion for the other two (Appendix 1).

We conducted night surveys at ten historical localities (Table 4): French Creek at Forest Service Rd. 22N34 (Butte County), Big Gun Diggings near Michigan Bluff (Placer County), Auburn Ravine Creek near Auburn (Placer County), Hunt Gulch at Middle Bar Rd. (Amador County), tailings ponds along Parrotts Ferry Rd. (Tuolumne County), Woods Creek (Tuolumne County), Swamp Lake, Gravel Pit Lake, Miguel Meadow in Yosemite National Park (Tuolumne County), and Jordan Creek (Mariposa County; Table 1; Appendix 1). We conducted multiple night surveys only at the French Creek, Hunt Gulch, Auburn Ravine Creek, and Jordan Creek historical localities (Appendix 1). We conducted night surveys at eight additional Sierra Nevada and Cascades Mountains sites where we found potentially suitable *R. draytonii* breeding habitat within 20 km of historical localities (Appendix 1).

Status of historical populations.—As discussed in detail below we confirmed a large *R. draytonii* population < 1.5 km SE of Michigan Bluff at Big Gun Diggings (Placer County) so

Table 4. Summary of surveys conducted at the 21 historical *R. draytonii* localities in the Sierra Nevada and Cascades Mountains and within 20 km of these localities. Surveys of recent localities are not included (see Appendix 2)

Locality	Historical localities[1]	Sites within 20 km of historical localities[2]	Total
Total # of localities surveyed	20	131	151
Total # of surveys	57	156	213
# of localities with daytime surveys	13	124	137
# of daytime surveys	26	142	168
# localities with night surveys	10	8	18
# of night surveys	19	12	31
# localities with visual habitat assessments only	4	2	6
Visual habitat assessments	12	2	14[1]

[1]Excludes "O'Neals" (Madera Co.; see text and Table 1)
[2]Including 29 surveys within 30 km of O'Neals, Madera Co.

we regard the "Michigan Bluff" record (Table 1) as an extant historical population, the only historical population currently known to be extant. Our surveys for *R. draytonii* at the other historical Sierra Nevada/Cascades *R. draytonii* localities, including verbatim, estimated, and alternate localities, were unsuccessful, but we found suitable *R. draytonii* breeding or non-breeding habitat at or within 5.0 km of all of the verbatim historical localities except O'Neals, where we found suitable habitat within 10 km of the historical locality.

We failed to detect *R. draytonii* within Yosemite National Park despite conducting 103 daytime and seven night surveys in that region (Table 1; Appendix 1; Drost and Fellers 1996). We found no recent *R. draytonii* populations south of Mariposa County or in the Cascades Mountains, but we found substantial suitable *R. draytonii* habitat in both regions; as well as, in the Swamp Lake-Gravel Pit Lake-Miguel Meadow region of Yosemite (Fig. 1; Table 5; Appendix 1).

Recent populations.—Ten Sierra Nevada *R. draytonii* occurrences have been discovered since 1991 (Table 6; Appendix 2). These ten occurrences include the extant historical population at Big Gun Diggings near Michigan Bluff, six new populations, and three new single specimen occurrences. We discovered or confirmed six of the seven populations and the three single frog observations, and we verified photographs of frogs from the remaining location (Youngs Creek, Calaveras County).

The 10 recent occurrences extend from Jack Creek in east central Butte County southeast about 250 km to Cuneo Creek in Mariposa County, only about 75 km less than the Sierra Nevada historical range of approximately 325 km from Butte to Madera Counties. Recent Sierra Nevada *R. draytonii* occurrences span from 330 to 1,020 m elevation (Table 6; Fig. 2), about the same as the historical occurrence elevation range excluding the anomalous high elevation historical Yosemite-region occurrences discussed below. The following accounts discuss each of the 10 post-1991 Sierra Nevada *R. draytonii* discoveries. All observations are ours unless otherwise noted.

***1. Jack Creek pond* (*Butte County*)**.—This population was discovered by SJB on 19 July 1997, at a 300 m^2 abandoned lumber mill pond about 1.3 m in depth formed by an earthen dam across Jack Creek. The dam was about 100 m downstream of the head of Jack Creek ("Hughes Place" on USGS topographic maps, but no pond indicated), 2.4 km upstream of the confluence with French Creek, a tributary of the North Fork

Table 5. Current status of 21 historical Sierra Nevada and Cascade Mountain *Rana draytonii* localities. Dates of the first and most recent surveys include surveys within 5.0 km of the verbatim locality. Significant habitat changes between the earliest and most recent survey dates are based on habitat descriptions recorded during each date.

Basin and historical locality	Dates of first and most recent surveys	Habitat identity, current habitat type and surrounding land use	Significant habitat changes between earliest and most recent surveys	Current habitat assessment
Cascade Mountains; **Paynes Creek - Sacramento River Basin, Tehama County:**				
Pond at Elliott's Ranch, 5 miles west of Payne's Creek Post Office	21 July 1991, 14 Oct. 2012	Vegetated slow stream with wide pools, up to ~0.8 m depth, habitat assessed along State Highway 36 at Paynes Creek crossing (approx. 2 km downstream of original site); all of Paynes Creek is private land; private rangeland	Possible increased use of adjacent highway, no habitat changes evident	Paynes Creek visible from Highway 36 from 4.0 km NE of Paynes Creek community at least 18 km downstream to Dales appears to offer suitable R. draytonii breeding habitat; suitable breeding habitat occurs at Highway 36 crossing
Sierra nevada: **Feather River Basin, Butte County:**				
French Creek at FS Rd. 22N34, Merrimack District, Plumas National Forest	13 July 1997, 23 June 2007	Dredge tailings ponds, forested low gradient creek, mixed use private land section surrounded by Plumas National Forest	None evident	Extensive dredge tailings ponds along French Creek, & other ponds in the surrounding hills, appear to offer suitable *R. draytonii* breeding habitat; bullfrogs unevenly distributed along French Creek within 1.0 km of the historical site
One mile toward Oroville from Feather Falls	19 April 1997, 21 July 2001	Ephemeral springs associated with the head of Little Sucker Run Creek, Lumpkin Rd., 2.3 km by road W of Feather Falls community, private land, mixed use	None evident	Springs & stream headwaters along Lumpkin Rd. to 10 km by road W of Feather Falls community appears to offer suitable *R. draytonii* non-breeding habitat
Three miles north of Bidwell Bar	19 April 1997, 21 July 2001	Canyon Creek, vegetated stream channel, 1–2 m width, unknown depth, scrub & oak woodland; private rangeland, mixed use	Increased use of adjacent highway, no habitat change evident	Canyon Creek for most of its length upstream of Lake Oroville appears to offer suitable *R. draytonii* non-breeding habitat
Bear River Basin, Placer County:				
McKibben property, 0.5 miles NE of Dutch Flat	28 Sept.. 2005 (one survey date)	Tailings ponds, natural stream, canals, mixed coniferous & hardwood forest; private land, mixed use, low density housing < 1.0 km SW of verbatim locality	N/A	McKibben property not found; tailings ponds in the vicinity seemingly offer suitable *R. draytonii* breeding habitat

Table 5 (*continued*). Current status of 21 historical Sierra Nevada and Cascade Mountain *Rana draytonii* localities. Dates of the first and most recent surveys include surveys within 5.0 km of the verbatim locality. Significant habitat changes between the earliest and most recent survey dates are based on habitat descriptions recorded during each date.

Basin and historical locality	Dates of first and most recent surveys	Habitat identity, current habitat type and surrounding land use	Significant habitat changes between earliest and most recent surveys	Current habitat assessment
Sierra Nevada: **American River Basin, Placer County:**				
Michigan Bluff	No surveys at Michigan Bluff community (see Appendices 1 & 2 for details of regional surveys)	Low density houses & cabins, mixed coniferous & hardwood forest; private mixed use, including rangeland & low density housing	N/A	Large *R. draytonii* population occurs < 1.0 km SW at Big Gun Diggings
Auburn	13 May 1995, 28 May 2000	Urban; private rangeland & private mixed use outside of urban boundary	Auburn urban boundary significantly enlarged (particularly northward) since 1995; no significant change in riparian habitat along Auburn Ravine W of Auburn	Apparently suitable *R. draytonii* breeding & non-breeding stream habitat (Auburn Ravine) exists on private land within 2.0 km SW of Auburn urban boundary
American River Basin (Weber Creek), El Dorado County:				
One mile SE of Placerville	12 March 1998, 7 Oct. 2012	Cedar Ravine is a forested stream channel, stream channel approx. 1–2 m wide, unknown depth, low density housing; settled area, private rangeland, & private mixed use surrounding the site	Increased housing construction in Cedar Ravine; riparian habitat corridor has narrowed but remains forested & vegetated	Cedar Ravine creek where visible from Cedar Ravine road appears to offer suitable *R. draytonii* non-breeding habitat
Weber Creek at Forni Rd., 0.25–0.5 miles above US Highway 50	12 March 1998, 7 Oct. 2012	Vegetated 4–6-m wide creek in hardwood forest, up to 1.0 m depth, edge of settled area; private mixed use, low density housing	Increased housing density on slopes N of Weber Creek, increased pooling in Weber Creek at Forni Rd. & upstream ~50 m	Accessed from Forni Rd. bridge; Weber Creek appears to offer suitable *R. draytonii* breeding habitat within 50 m upstream & downstream of the Forni Rd. bridge; extant *R. draytonii* population found at Spivey Pond on the N fork of Weber Creek, 22 km upstream of Forni Rd.
Cosumnes River Basin, El Dorado and Amador Counties:				
Two miles south of El Dorado	12 March 1998, 7 Oct. 2012	Seasonal ponds 20 m W of State Highway 49, 3.2 km by road S of El Dorado; private rangeland surrounds the site	Increased use of adjacent highway, no apparent changes to available riparian habitat	Site is visible from State Highway 49, appears to offer suitable *R. draytonii* breeding habitat

Table 5 (*continued*). Current status of 21 historical Sierra Nevada and Cascade Mountain *Rana draytonii* localities. Dates of the first and most recent surveys include surveys within 5.0 km of the verbatim locality. Significant habitat changes between the earliest and most recent survey dates are based on habitat descriptions recorded during each date.

Basin and historical locality	Dates of first and most recent surveys	Habitat identity, current habitat type and surrounding land use	Significant habitat changes between earliest and most recent surveys	Current habitat assessment
Sierra Nevada: **Cosumnes River Basin, El Dorado and Amador Counties:**				
Tributary to North Fork Cosumnes River, north of Plymouth	26 May 2007 7 Oct. 2012	Big Indian Creek & at least five tailings ponds, sparse hardwood forest; creek is vegetated, approx. 1–2 m wide, unknown depth; private rangeland & private mixed use	Increased use of adjacent highway, no apparent changes to available riparian & tailings pond habitat	Big Indian Creek & associated tailings area appear to offer suitable *R. draytonii* breeding & non-breeding habitat
Mokelumne River Basin, Amador County:				
Middle Bar Rd., 0.9 mile west of State Highway 49	14 Sept. 2006, 7 Oct. 2012	Hunt Gulch creek at Middle Bar Rd., vegetated 1–1.5 m wide, 0.5 m depth, scrub & riparian hardwood forest; private low density settled area, mixed use	No changes to land use, no apparent changes to available riparian habitat	Hunt Gulch creek at Middle Bar Rd. offers suitable *R. draytonii* non-breeding habitat; springs associated with Valparaiso Mine 0.8 km S also offer non-breeding habitat
Tuolumne River Basin (Tuolumne River), Tuolumne County:				
Woods Creek, edge of Sonora	7 July 1999, 7 Oct. 2012	Vegetated creek at edge of urban area, 2–3 m wide, unknown depth; private urban & low density housing, private rangeland E of Woods Creek	Sonora urban boundary greatly expanded E of Woods Creek, increased use of adjacent highway, riparian corridor somewhat narrowed	Woods Creek upstream of the historical locality offers suitable *R. draytonii* breeding & non-breeding habitat
Parrott's Ferry Rd., 2.4 miles north of Sonora	2 July 1999, 7 Oct. 2012	Tailings ponds, oak woodland; low density housing, site is on private land	Increased use of adjacent roadway & nearby state highway, somewhat increased housing density surrounding the site; available tailings pond habitat appears unchanged	Tailings ponds at Parrott's Ferry Rd. < 1.0 km E of State Highway 49 offer suitable *R. draytonii* breeding habitat
Mather (Hog Ranch)	22 April 1993, 16 Sept. 2012	Locality is probably Birch Lake (~1.75 ha), estimated 5% of shoreline is vegetated, located in coniferous forest, public land with restricted access, City of San Francisco recreation site bordered by private rangeland & Yosemite National Park	Possible increased use of adjacent roadway, no other discernable changes within 10 km radius of Birch Lake	Lake supports large bullfrog population, but habitat seems suitable for *R. draytonii* breeding activity

Table 5 (*continued*). Current status of 21 historical Sierra Nevada and Cascade Mountain *Rana draytonii* localities. Dates of the first and most recent surveys include surveys within 5.0 km of the verbatim locality. Significant habitat changes between the earliest and most recent survey dates are based on habitat descriptions recorded during each date.

Basin and historical locality	Dates of first and most recent surveys	Habitat identity, current habitat type and surrounding land use	Significant habitat changes between earliest and most recent surveys	Current habitat assessment
Tuolumne River Basin (Tuolumne River), Tuolumne County:				
Swamp Lake, Yosemite National Park	18 Sept. 1996, 8 July 1997 (GMF), Photographs from 29 May 2005 provided by Jason Meigs	Vegetated natural pond (~8 ha) & associated marshland, up to 20 m depth (Smith & Anderson 1992), coniferous forest; public land in Yosemite National Park	No apparent changes in surrounding land or available riparian habitat	Large bullfrog population, site offers suitable *R. draytonii* breeding habitat at unusually high elevation
Miguel Meadow, Yosemite National Park	19 June 1997, 10 July 1997 (GMF) Photographs from 29 May 2005 provided by Jason Meigs	Meadow/coniferous forest with associated seasonal creek & springs, public land in Yosemite National Park	No apparent changes in surrounding land or available riparian habitat	Bullfrogs may be present; in years when the water persists into late summer the site may offer suitable *R. draytonii* breeding habitat at unusually high elevation
Gravel Pit Lake, Yosemite National Park	18 Sept. 1996, 18 June 1997 (GMF) Photographs from 29 May 2005 provided by Jason Meigs	Excavated, vegetated artificial pond, coniferous forest, public land in Yosemite National Park	No apparent changes in surrounding land or available riparian & aquatic habitat	Bullfrogs present; in years when the water persists into late summer the site may offer suitable *R. draytonii* breeding habitat at unusually high elevation
Merced River Basin, Mariposa County:				
Jordan Creek at Jordan Creek Rd., 2 miles above Greeley Hill Rd.	24 June 1993, 18 March 2010	Vegetated creek, mixed scrub, oak woodland; private rangeland	Increased use of adjacent roadways, no aquatic habitat changes evident	Site appears to offer suitable *R. draytonii* breeding & non-breeding habitat
Piney Creek, vicinity of Cadena Rd.	3 June 1993 (one survey of Piney Creek, surveys of nearby sites through 6 April 2010)	Vegetated creek, scrub, oak woodland; low density housing, private rangeland	Increased use of adjacent roadways, increased housing development, no aquatic habitat changes evident	Site appears to offer suitable *R. draytonii* breeding & non-breeding habitat in Piney Creek
San Joaquin River Basin, Madera County:				
O'Neals	2 June 1993 (Little Fine Gold Creek, 8-10 km NE of O'Neals)	Private agricultural & rangeland	Increased use of adjacent roadways	Region appears to offer suitable *R. draytonii* breeding & non-breeding habitat in Miami, Jose, Saginaw, Little Fine Gold Creeks

Table 6. Recently discovered or confirmed *Rana draytonii* occurrences in the Sierra Nevada, California, USA. Coordinates for specific locations within the listed localities are included in Appendix 2.

County	Locality	Elev. (m)	Habitat type & approximate date of manmade habitat creation	Breeding habitat present	Date discovered or confirmed	Observer
Butte	Pond at head of Jack Creek, 27 km NNE of Oroville	768	One manmade in-stream pond, impounded 1909 (Beckstrom & Braun 1992)	Yes	19 July 1997	SJB
Yuba	Little Oregon Creek, 34 km ESE of Oroville	617	Two manmade tailings ponds, 1850's - 1870s (Clark 1963)	Yes	6 Oct 2000	USFS, SJB, GMF
Nevada	Sailor Flat, 7 km NE of Nevada City	925	Two manmade excavated ponds (age unknown)	Yes	17 Sept. 2003	Private landowner, GMF
Placer	Big Gun Diggings ~1.0 km ESE of Michigan Bluff, 8 km ENE of Foresthill	1,020	Four manmade tailings ponds, 1850's–1870's (Clark 1963)	Yes	9 July 2006	Private landowner, GMF
Placer	Ralston Ridge near Pennsylvania Point, 10 km ESE of Foresthill	995	Manmade pond, late 20th century (estimated)	No	24 June 2001	David Muth, GMF
El Dorado	Little Silver Creek, 14 km SSE of Foresthill (Placer Co.)	950	Natural stream	No	10 Sept. 2009	USFS, GMF
El Dorado	Tributary to Bear Creek, 14 km SSE of Foresthill (Placer Co.)	790	Natural stream	No	10 Sept. 2009	GMF
El Dorado	Spivey Pond, Weber Creek, 17 km E of Placerville	986	Manmade in-stream pond, 1940's (Elena DeLacey, pers. comm.)	Yes	1 July 1997	GMF
Calaveras	Youngs Creek, 5 km NE of Valley Springs	330	Natural stream	Yes	Oct. 2003	Robert Stack
Mariposa	Cuneo Creek, 3 km NE of Coulterville	550	Manmade in-stream pond, age unknown	Yes	8 June 1992	GMF, Charles Drost

of the Feather River. The Jack Creek/French Creek confluence is 1.7 km downstream of the historical French Creek *R. draytonii* locality at Forest Service Rd. 22N34 (Table 1; Fig. 1), so 4.1 stream-km and 3.0 straightline-km separate the Jack Creek pond from the historical French Creek locality.

The Jack Creek pond impounded spring flow and limited runoff in an area where a lumber mill and a box manufacturing plant were constructed in 1909 by the Swayne Lumber Company (Beckstrom and Braun 1992). Fire destroyed the

mill in 1916, and in the early 1920's the property was sold to the Hughes family who used the pond primarily as a scenic enhancement and for livestock water supply (Paul Beckstrom, pers. comm.). In 1985, the property was sold to the Diamond Lumber company and later to the Soper-Wheeler Company (Strawberry Valley, California), and was logged, replanted, and transferred to the Plumas National Forest in about 2005 (Cindy Roberts, Plumas National Forest, Oroville, CA, pers. comm.). Comparison of the pond in 1997 with photographs of the same pond in 1914 (Beckstrom and Braun 1992) shows that by 1997 it was considerably smaller and presumably much shallower than when it was a mill pond.

Less than 100 m downstream from the lumber mill pond was "Camp Enjoyment," a resort that included "Perla Laguna," a lake also impounded by a dam across Jack Creek (Bornefeld 1976). Camp Enjoyment closed in 1917 and the Perla Laguna dam has collapsed, but the lakebed remained evident in the 1990's. During the summers of 1998 and 1999, SJB found up to four large adult *R. draytonii* in the lakebed during night surveys (Appendix 2), which suggests that the Hughes Place pond frogs dispersed downstream into the lakebed during the summer.

The meadow vegetation surrounding the Jack Creek pond was primarily exotic annual grasses. Dense willows (*Salix* spp.) bordered the head of the pond, though about half of the shoreline was unshaded. Sedges (*Carex* spp.) bordered the rest of the pond and Water Purslane (*Ludwigia palustris*) covered almost the entire pond water surface by the early summer. Samples of the *L. palustris* gathered by SJB during 1998 and 1999 yielded dozens of aquatic invertebrates per estimated kg of vegetation, potential forage for transformed and adult frogs. By midsummer the pond water was turbid from detritus and suspended algae, potential tadpole forage. The pond water level receded during the summer and the water was nearly gone by mid-August of 1997 and 1998. Tanoak (*Notholithocarpus densiflorus*) forest occurred about 50 m upslope of the pond, and conifer seedlings planted during the 1985 reforestation program were beginning to overgrow the surrounding meadow by 2000. The conifers may eventually shade the pond enough to limit *Carex* and *L. palustris* growth. The earthen dam appeared to have been reconstructed several times over the years.

At the time of discovery, the Jack Creek *R. draytonii* population was the largest ever documented in the Sierra Nevada. SJB found approximately 31 adult and 123 newly transformed *R. draytonii* on 19, 20, and 26 July 1997. We also found 60 adult and almost 100 newly transformed frogs at the pond during 13 summer surveys from later in 1997 every summer through 2002 (Appendix 2). However, three largely unproductive surveys in 2007 suggested that adult frogs and annual recruitment had declined significantly (Appendix 2). Since the available habitat and aquatic biota appeared to have changed little if at all since 1997 we cannot explain this apparent decline in the Jack Creek pond *R. draytonii* population.

The pond supported a large population of Western Pond Turtles (*Emys marmorata*). We also observed Common Garter Snakes (*Thamnophis sirtalis*) in late summer hiding in grass clumps scattered in the *L. palustris* growth, where we saw the snakes ambush and consume newly metamorphosed frogs. We palpated several recent *R. draytonii* metamorphs from Common Garter Snakes and from a subadult Sierra Garter Snake (*T. couchii*) at the Jack Creek pond in 1997 and 1998.

***2. Little Oregon Creek* (*Yuba County*).—**Little Oregon Creek is a tributary to the North Fork of the Yuba River. The Little Oregon Creek population was discovered in two ponds between Oregon Hill Rd. and the creek by Plumas National Forest personnel in September 2000 (Cindy Roberts, pers. comm.). *Rana draytonii* surveys conducted at the site in 1997 by SJB did not detect the ponds because they were hidden in dense blackberry scrub (*Rhus* sp.) that covered the entire creek bottom, and there was little reason to suspect the presence of ponds or *R. draytonii*. The ponds were revealed after a 1999 fire destroyed the vegetation (SJB, pers. obs.). According to USGS and USFS maps the ponds were on private land at least into the 1990's, but they are now part of the Plumas National Forest (Cindy Roberts, pers. comm.).

During our first visit to the site on 9 October

2000 we found *R. draytonii* in two small, spring fed ponds about 70 m apart within a riparian hardwood forest. The ponds were formed by enclosed depressions in placer mine tailings probably associated with a 19th century gold mining district (Clark 1963). The larger pond was about 95 m^2 in surface area, while the smaller pond was just 14 m^2; both ponds were about 0.5 m deep. The substrate was coarse gravel and cobble, similar to tailings distributed throughout the area. In midsummer, alder (*Alnus* sp.), Big Leaf Maple (*Acer macrophyllum*), and other deciduous hardwoods shade from 0% at the larger pond to about 50% at the smaller pond. Both ponds lacked bordering or emergent vegetation, but floating pondweed (*Potamogeton* sp.) covered much of the surface of the larger pond by late summer.

We have observed a maximum of only four adult *R. draytonii* at the larger pond, and two at the smaller pond (Appendix 2). The largest was a female about 13 cm SUL, and the smallest was about 9 cm SUL. While no metamorphs have been found, at least one *R. draytonii* tadpole was observed in the smaller pond in July 2001 and another in June 2005. We also found three adults in the larger pond in July 2007, an indication that the population has persisted, albeit at a very low level.

Several other tailings ponds exist within 500 m of the above two ponds, and five larger manmade ponds exist in the Plumas National Forest "Dobbins" watershed within 4 km of the *R. draytonii* population, but *R. draytonii* has not been reported in any of the other ponds or streams in the Little Oregon Creek drainage or in adjacent drainages.

***3. Sailor Flat* (*Nevada County*).**—The Sailor Flat population was discovered in 2000 by David Funk, a biological consultant who reported the population to the USFWS with permission from the private landowner (David Funk, pers. comm.). GMF visited the two ponds with David Funk on 17 and 18 September 2003. The eastern pond was approximately 630 m^2 with an estimated maximum depth of 2.0 m. The second pond, about 250 m to the west, was approximately 360 m^2 with a maximum depth of 3.0 m. Neither of the Sailor Flat ponds is shown on USGS 7.5' series topographic maps. Extensive bordering marshland and riparian vegetation was present, suggesting that both ponds are permanent. The eastern pond is formed by an earthen dam, and the other pond is an off-stream excavation. The ponds are situated about 2.0 km south of the South Yuba River at an elevation of 960 m.

Both ponds have 50−75% shade from overhanging willows and alder. The substrate is mostly mud and silt, with some sand. No fish were detected during a day and night visit to each of the ponds. The ponds support substantial floating and emergent vegetation, mostly composed of duckweed (Lemnaceae) and cattails (*Typha* sp.). The surrounding woodlands are primarily Ponderosa Pine (*Pinus ponderosa*), California Black Oak (*Quercus kelloggii*), Incense Cedar (*Calocedrus decurrens*), and Big Leaf Maple.

On 17 September 2003, one tadpole and one adult male *R. draytonii* (8.1 cm SUL) were found in the eastern pond, and that night an 8.9 cm adult male was found in the western pond (Appendix 2). Surveys by others in 2009 detected as many as 10 adults (Patricia Tatarian, pers. comm.).

***4. Big Gun Diggings* (*Placer County*).**—Big Gun Diggings is just 1.0 km SE of the small community of Michigan Bluff, and the Big Gun Diggings *R. draytonii* population seems likely to be the source population for the historical Michigan Bluff *R. draytonii* specimen, which was apparently collected within Michigan Bluff (Tables 1, 5, & 6). Big Gun Diggings supports by far the largest *R. draytonii* population ever discovered in the Sierra Nevada, and one of the largest anywhere in California. With encouragement from David Funk, the private landowner of Big Gun Diggings reported the population to the USFWS in 2006 (David Funk, pers. comm.). The Big Gun Diggings site was acquired by Westervelt Ecological Services (Sacramento, California) in 2007, and is now privately held as a *R. draytonii* habitat mitigation bank (Westervelt Ecological Services. 2012. Big Gun Conservation Bank. Available from http://www.wesmitigation.com/mitigation-conservation-projects/big-gun-conservation-

bank.cfm#page=general [Accessed on 29 November 2012]).

The site included six mine tailings ponds associated with the 19th century Michigan Bluff gold mining district (Clark 1963), situated at 1,015 m elevation on a bluff 11.8 km northeast of the Middle Fork of the American River. The pond substratum included substantial rock cobble mixed in with smaller gravel, mud, and silt. Aquatic vegetation consisted of sparse cattail growth and overhanging willows. Terrestrial vegetation including grasses, willows, Ponderosa Pine, and manzanita (*Arctostaphylos* sp.) grew to the very edges of most of the ponds. The largest pond was approximately 1.4 ha, with a maximum depth of 1.5 m. The two smallest ponds were approximately 500 m^2 and 150 m^2. The western and southern ponds were approximately 250 m apart, with as little as one-third that distance between any two of the others.

On the night of 9 July 2006, GMF and David Funk counted 48 adult *R. draytonii* at four of the six ponds in less than an hour (Appendix 2). Presumably, more adult frogs would have been seen had we surveyed all of the ponds. During a brief 9 September 2009 nighttime visit, 29 adult and 54 subadult frogs were seen in just two of the ponds. Of 15 adults captured that night, four were females that ranged from 8.9–11.6 cm SUL, and 11 were males that ranged from 8.5–10.7 cm. The largest female was 160.1 g, and the largest male was 123.5 g.

***5. Ralston Ridge* (*Placer County*).**—In early June 2000 biological consultant David Muth (pers. comm.) found a large female *R. draytonii* in an isolated pond along a power line right-of-way at the west end of Ralston Ridge, near the Rubicon River. At the same pond about two weeks later on 24 June 2000 GMF found a large female *R. draytonii* that may have been the same frog. The pond was impounded by a road embankment that created a silt-bottomed depression at the confluence of two ephemeral stream channels. The adjacent vegetation was coniferous forest with Ponderosa Pine, Sugar Pine (*Pinus lambertiana*), Douglas Fir (*Pseudotsuga menziesii*), and Black Oak (*Quercus velutina*), with an understory of manzanita and other shrubs. Aquatic, bordering, or emergent vegetation was entirely absent from the pond. Water depth markers at the site indicated that the pond probably did not exceed 1.5 m in depth and rarely contained significant water past early June.

The Ralston Ridge frog may have emigrated from the Big Gun Diggings population, which is only 4.6 km NNW of the Ralston Ridge pond. However, dispersal between the two sites would entail traversing two steep-sided (> 50°) gorges that are 550 m and 400 m deep, and crossing two branches of the American River. These barriers might substantially reduce the number of immigrants from the Big Gun Diggings population. Perhaps for that reason, five subsequent visits by us have failed to detect *R. draytonii* at the Ralston Ridge pond. Furthermore, five surveys conducted by SJB in 2005–2006 in the vicinity of Ralston Ridge have not identified any suitable *R. draytonii* breeding habitat closer than Big Gun Diggings (Appendix 1, Michigan Bluff surveys). The origin of the only one or two *R. draytonii* ever seen at the Ralston Ridge pond remains a mystery.

6. *Little Silver Creek*.—In September 2009, El Dorado National Forest personnel (Claudia Funari, pers. comm.) found a large female *R. draytonii* along Little Silver Creek, a first order tributary to Rock Creek, which drains into the South Fork of the American River. On 10 September 2009 GMF found one adult *R. draytonii* during a daytime survey of Little Silver Creek (Appendix 2). The Little Silver Creek frog was found at an elevation of 950 m where the creek was only 0.5 m wide and 0.3 m deep. Little Silver Creek at the *R. draytonii* discovery site closely resembles characteristic *R. draytonii* non-breeding habitat in coastal California (Fellers and Kleeman 2007). The surrounding woodland included Ponderosa Pine, Incense Cedar, Black Oak, Pacific Madrone (*Arbutus menziesii*), and Pacific Dogwood (*Cornus nuttallii*). Ferns occured in and along the creek channel.

7. *Bear Creek tributary* (*El Dorado County*).—On the same date as the Little Silver Creek survey by GMF, Patrick Kleeman and GMF found an adult male *R. draytonii* in an

unnamed tributary to Bear Creek, which drains into Rock Creek downstream of Little Silver Creek. The straightline distance between Little Silver Creek and the Bear Creek tributary is 2.5 km, but 19 stream-km, including the connecting portion of Rock Creek, separate the two sites where *R. draytonii* was found. The Bear Creek tributary frog was at 790 m elevation where the creek was 0.7 m wide and just 0.2 m deep. The habitat along the Bear Creek tributary was similar to that along Little Silver Creek, with the addition of Big Leaf Maple, and the site may also be non-breeding *R. draytonii* habitat.

Surveys by others of a privately owned pond approximately 300 m downstream of the Bear Creek tributary frog location revealed a significant *R. draytonii* population of > 25 adult frogs and several juveniles and tadpoles (Rob Grasso, USFS, pers. comm.). That pond may support the source population for both the Little Silver Creek frogs and the frog found in the Bear Creek tributary.

8. *Spivey Pond* (*El Dorado County*).—In the early 1990s, California Department of Fish and Game biologists identified Spivey Pond along the North Fork of Weber Creek 22 km upstream of the historical Weber Creek locality at Forni Rd. (Table 1), as potential *R. draytonii* breeding habitat (Stafford Lehr, California Department of Fish and Game, pers. comm.). The biologists also observed a frog, tentatively identified as *R. draytonii*, along the creek upstream of the pond. On 1 July 1997, GMF and USFWS biologist Maria Boroja found six adult *R. draytonii* during a nighttime boat survey of Spivey Pond. In 26 surveys through 2003, GMF and his field crews have never observed more than three adult *R. draytonii* (Appendix 2). Egg masses were found three times with a maximum of three found by Kathleen Freel on 29 April 1998. *Rana draytonii* tadpoles have also been observed three times, but never more than one individual in a day (Appendix 2). Bullfrogs were first observed by GMF at the site in 2000, and were also seen on nine subsequent visits through 2003. A single Bullfrog was also reported from Spivey Pond in 2009 (Elena DeLacey, American River Conservancy, pers. comm.). American River Conservancy (ARC) biologists have observed *R. draytonii* at the pond as recently as May 2010 (Elena DeLacey, pers. comm.).

Spivey Pond was a 0.6 ha lumber storage pond that was created by damming the south fork of Weber Creek in the early 1940's. The estimated pond depth was 2.5–3.0 m. The predominant surrounding vegetation type was mixed Ponderosa Pine and oak woodland. Willows bordered most of the pond including along the dam, with substantial cattail growth along about 30% of the south bank of the pond and additional sparse cattail growth at the outflow. Spivey Pond is the only pond currently known to support *R. draytonii* that appears on US Geological Survey topographic maps. We have observed Rainbow Trout (*Oncorhynchus mykiss*), Sierra Newts (*Taricha sierrae*), Western Pond Turtles, and Sierra Garter Snakes at the pond.

In 1997, the Spivey Pond dam was reinforced with riprap (GMF, pers. obs.). As insurance against the loss of the pond from a dam collapse, the ARC created an off-stream, 900 m^2 pond about 1.0 m in depth 45 m downstream of Spivey Pond (Elena DeLacey, pers. comm.). Juvenile *R. draytonii* were observed at the new pond in 2009, although it is unknown whether these frogs came from eggs deposited in the new pond, or whether frogs emigrated from Spivey Pond or elsewhere along Weber Creek (Elena DeLacey, pers. comm.).

9. *Youngs Creek* (*Calaveras County*).—In 2003, a private landowner reported a small *R. draytonii* population on his property along Youngs Creek to the USFWS, and three adult *R. draytonii* were confirmed by Robert Stack (pers. comm.) of the Jumping Frog Research Institute (Angels Camp, California) in October of that year. This is the only known recent *R. draytonii* population in the Sierra Nevada foothills that we have not visited, and most of the information presented here was provided by the USFWS. The USFWS also shared photographs of Youngs Creek frogs which we confirmed were *R. draytonii*.

The frogs occupied the outflow of a spring along the main stem of the creek, which flows through oak savannah, 1.4 km upstream (north) from the creek's confluence with Spring Valley

Creek (CNDDB 2008). The frogs occurred on a 3.7-ha cattle ranch that has been active for over 150 years (Stack 2004). USFWS biologists (pers. comm.) estimated that the Youngs Creek *R. draytonii* population included at least 10 adult frogs and was reproductive.

10. *Cuneo Creek* (*Mariposa County*).—On 8 June 1992, GMF found 25 *R. draytonii* tadpoles in a pond on private land along Cuneo Creek at an elevation of 550 m (Drost and Fellers 1996). The pond area was approximately 600 m^2, and was formed by a dam across Cuneo Creek, 850 m upstream from its confluence with Maxwell Creek, about 1.5 km NE of Coulterville. The estimated depth was 2.0 m. Willows grew around part of the pond perimeter, and the surrounding area was Live Oak (*Quercus chrysolepis*/*wislizenii*) woodland. No amphibians were observed during a 15 July 1992 survey. Additional daytime surveys for *R. draytonii* did not locate any *Rana* along Cuneo Creek upstream of the pond (9 June 1993), or downstream along Maxwell Creek (25 May 1993).

Recent populations summary.—Since 1991, seven probable breeding populations of Sierra Nevada *R. draytonii* have been found, and three apparent non-breeding Sierra Nevada *R. draytonii* occurrences have been recorded where only a single individual was found at each. The Little Oregon Creek, Sailor Flat, and Big Gun Diggings breeding populations each comprise multiple ponds, and *R. draytonii* was also found in a new pond excavated recently near Spivey Pond. Probable breeding sites include six mine tailings ponds (four at Big Gun Diggings and two at Little Oregon Creek), one excavated pond (Sailor Flat pond), four in-stream impoundments (Jack Creek pond, Spivey Pond/Weber Creek, Cuneo Creek pond, and Sailor Flat pond), and one natural stream (Youngs Creek; Table 6; Appendix 2). Non-breeding sites include two natural streams (Little Silver Creek and Bear Creek tributary) and one small pool impounded by a road embankment (Ralston Ridge pond).

Oak savannah or oak woodland, usually with riparian, marshland, or aquatic vegetation at *R. draytonii* breeding habitat, predominated at sites lower than 800 meters elevation. Mixed hardwood/coniferous forest with or without significant riparian or marshland vegetation at *R. draytonii* breeding habitat characterized the higher elevation sites. Estimated breeding population sizes varied from just a few adults (Little Oregon Creek ponds) to probably well over 100 adults (Big Gun Diggings ponds). Population sizes appeared to be correlated with aquatic habitat size (Big Gun Diggings ponds, Sailor Flat ponds, and Little Oregon Creek ponds) or with availability and density of aquatic vegetation that supports tadpole and transformed frog forage (Jack Creek pond). Recent Sierra Nevada *R. draytonii* populations are apparently reproductively viable or were recorded near a site where a viable population occurs (Little Silver Creek, Bear Creek tributary, and Ralston Ridge pond).

Discussion

History of Sierra Nevada* Rana draytonii *records.—Scientific confirmation that *R. draytonii* existed in the Sierra Nevada dates only from the MVZ specimen collected at Michigan Bluff, Placer County in 1916 (Table 1). The absence of earlier records is probably attributable to the remoteness of the Sierra Nevada before about 1850, and the relative inattention that Sierra Nevada biota received from early explorers and naturalists (Yarrow 1875; Beidleman 2006). For example, the Museum of Vertebrate Zoology collection at the University of California, Berkeley, established in 1908 (Rodriguez-Robles et al. 2003), includes only one pre-1900 Sierra Nevada amphibian specimen (*Rana sierrae*) (The Museum of Vertebrate Zoology at Berkeley. 2011. Collections Database. Available from http://arctos.database.museum/SpecimenSearch.cfm [Accessed 16 July 2011]). Likewise, only 30 of 1,312 pre-1900 California amphibian specimens in the combined collections of the California Academy of Sciences (est. 1853) and the Stanford University Natural History Museum originated in the Sierra Nevada or Cascade Mountains, and none of those specimens was *R. draytonii*. Also, with the possible exceptions of the 10-specimen series from Birch Lake in Mather (Tuolumne County; Table 1) and the 10-

specimen series from O'Neals (Madera County; Table 1), none of the historical Sierra Nevada collections appear to be a product of a survey that focused on *R. draytonii*.

The development of public roads into the Sierra Nevada from 1930 to 1960 greatly facilitated travel and increased human access to foothills aquatic habitat. All of the 21 historical *R. draytonii* localities in the Sierra Nevada and the Cascades were very close to public roads or were within recreation areas (Table 1). For that reason, and because of the absence of pre-20th century records of *R. draytonii* in the Sierra Nevada, documentation of the historical distribution of *R. draytonii* is probably far from complete. Further, new locality records of Sierra Nevada *R. draytonii* were added as specimens to museums at a relatively uniform rate for over 60 years (about one new locality every three years, with only two localities duplicated between collections), suggesting that the geographic density of frog populations remained relatively stable, albeit rather low, at least into the 1970's.

Sierra Nevada* Rana draytonii *habitat.—Published information on *R. draytonii* habitat in the Sierra Nevada is limited. Basey (1969, 1976) described the habitat as "permanent pools of foothill streams" and Walker (1946) reported that *R. draytonii* in the Tuolumne River basin of Yosemite National Park prefer large ponds alongside streams, although none of the Yosemite *R. draytonii* localities conform to that description. Grinnell and Storer (1924) stated that Yosemite-region *R. draytonii* inhabit "quiet streams and pools," but cited the Central Valley specimen from Snelling as their only observation of this frog. Wright and Wright (1949) reported Sierra Nevada *R. draytonii* in an Amador County mine tailings pond near a tributary to the Cosumnes River.

Our surveys revealed that natural ponds are nearly absent in the Sierra Nevada foothills, but quiet pools and backwaters where *R. draytonii* could breed are not uncommon along low gradient streams that characterize the region. Twelve historical Sierra Nevada and Cascades locality records were narrow permanent or near-permanent creeks (Table 5), typically within a few hundred meters of the headwaters, as are three recent *R. draytonii* occurrences. This suggests that Sierra Nevada *R. draytonii* use stream habitat in the same manner as do Coast Range populations (Fellers and Kleeman 2007), and given the absence of natural ponds, it seems most likely that permanent or near-permanent stream courses, and possibly associated springs, comprised the principal natural *R. draytonii* breeding and non-breeding habitat throughout much of its Sierra Nevada distribution. Our observations indicate that suitable breeding pools along any of these streams are typically quite small with limited forage for tadpoles or adult frogs, and it is doubtful than many Sierra Nevada foothills streams could historically have supported large or geographically extensive *R. draytonii* populations. Limited breeding habitat and consequential species scarcity in Sierra Nevada streams may explain the seeming historical rarity of Sierra Nevada *R. draytonii*.

Six of the recent Sierra Nevada *R. draytonii* populations occupy a total of 11 manmade ponds including in-stream impoundments and excavated tailings and other ponds. Seven of these ponds are known to exceed 90 years of age (Table 6). None exceed 3.0 m in depth and at least seven do not exceed 2.0 m. The recent *R. draytonii* population at the Big Gun Diggings tailings ponds far outnumbers any of the known recent Sierra Nevada stream breeding or non-breeding populations (Table 6), and it rivals in size any coastal *R. draytonii* population known to us. Old mine tailings ponds and abandoned lumber mill ponds (Clark 1963), largely on private land, still offer thousands of hectares of potential *R. draytonii* breeding habitat in the northern and central Sierra Nevada.

High elevation populations.—A notable elevation gap separates the Birch Lake/Yosemite National Park *R. draytonii* (Tuolumne River canyon) from the rest of the Sierra Nevada records (Table 1; Fig. 2). Jennings and Hayes (1994) suggested that the high-elevation *R. draytonii* populations were established from artificially translocated individuals. From 1915 through 1925, thousands of workers from the San Francisco Bay area, where frogs were a popular food item, inhabited this region (Jennings and Hayes 1985; Buck 2008). These

workers constructed O'Shaughnessy Dam, which impounded Hetch Hetchy reservoir on the Tuolumne River. The workers could have translocated *R. draytonii*, which was reputed to be the most desirable US food frog (Wright and Wright 1942; Jennings and Hayes 1985), to the nearby ponds and lakes to provide a local source of food for the work crews. Additionally, Gravel Pit and Birch Lakes (Table 1) are flooded manmade depressions that were excavated to provide aggregate material for construction of O'Shaughnessy Dam, and Birch Lake was later used as a lumber mill pond (Hanson 1985; Buck 2008). Photographs of Birch Lake from the 1920's (Buck 2008) show extensive bordering and emergent vegetation that is commonly associated with *R. draytonii* breeding habitat (Jennings and Hayes 1994), but our observations indicate that most of that cover is now gone (Table 5; Appendix 1). Birch Lake now supports a large Bullfrog population, but we do not have enough survey data to conclude that *R. draytonii* has been extirpated from the lake (Appendix 1).

Swamp Lake, on the plateau northwest of O'Shaughnessy Dam, is an ancient glacial pothole (Smith and Anderson 1992) that may either have been a *R. draytonii* introduction site or a potential source of naturally occurring *R. draytonii* which colonized the newly constructed Gravel Pit and Birch Lakes. Swamp Lake's relatively high elevation (1,530 m) does not preclude the natural occurrence of *R. draytonii*; this species occurs at 2,200 m in the Sierra San Pedro Martir, Baja California, Mexico, where climate and seasonal precipitation patterns resemble those at mid-elevation in the Sierra Nevada (Slevin 1928; Welsh 1988). We cannot rule out a natural origin for *R. draytonii* at Swamp Lake (Table 1), but the Gravel Pit and Birch Lake *R. draytonii* must have originated from dispersing individuals from Swamp Lake, or more likely from translocations, as suggested by Jennings and Hayes (1994).

Status of historical populations.—As previously noted, we did not detect *R. draytonii* in the Sierra Nevada locations from which they had been collected historically, except at Big Gun Diggings near Michigan Bluff (Table 1; Appendix 1). This is a paradox because the aquatic habitat at all of the surveyed historical sites except within "Auburn" and "Michigan Bluff" (community) seemingly remains capable of supporting *R. draytonii* (Table 5; Appendix 1). We also observed no exotic fish or amphibians at any of the verbatim or estimated historical localities where we conducted day or night surveys (Appendix 1) except for Bullfrogs at French Creek, Birch Lake, and nearby Yosemite National Park sites. Further, with the possible exception of Birch Lake, to our knowledge none of the historical sites have a documented 20th century history of habitat loss or modification.

For several reasons, however, we remain unconvinced that our unsuccessful surveys of the historical sites and their vicinities (other than within Yosemite National Park) truly indicate that *R. draytonii* no longer exists at some of these localities. Over half of the historical Sierra Nevada *R. draytonii* locality records were narrow streams, and over half of the stream specimens were found from May onward, a combination of season and habitat that suggests that many of the historical stream localities were non-breeding habitats (Fellers and Kleeman 2007). In our experience, finding *R. draytonii* in such non-breeding habitat during daytime surveys in coastal regions is largely a matter of chance because in such settings these frogs are scarce, cryptic, secretive, and strongly nocturnal. Changes in vegetation and channel morphology resulting from winter storms may also cause these frogs to occupy different reaches along the same stream from year to year, so that it is unlikely that frogs will be found repeatedly along the same stream reach (Fellers and Kleeman 2007). Finally, despite our efforts, private land access restrictions and safety concerns prevented us from conducting more than two night surveys at any of the verbatim or estimated historical pond or stream localities except for a 4.0-m reach of Hunt Gulch Creek at Middle Bar Rd. (Amador County) and the French Creek tailings ponds at Forest Service Rd. 22N34 (Butte County; Appendix 1). These restrictions meant that we could not use the most effective survey tool at many sites where the documented historical occurrence of *R. draytonii* might have made those surveys particularly useful (Fellers and Kleeman 2006; Appendix 1).

Thus, in light of the significant elapsed time since the historical sites were discovered, and because of the circumstances that limited the types of surveys we could conduct, we do not believe that the absence of successful surveys of historical localities, except possibly for the Yosemite National Park populations, indicates that *R. draytonii* has been extirpated from these sites.

Central Valley records.—Before dams were constructed in the rivers that flow into the Central Valley, the rivers typically overflowed and flooded large sections of the valley during the spring runoff (Fleskes 2012). The timing of seasonal flooding may have made permanent colonization of the Central Valley by *R. draytonii* difficult or impossible because of high water, low water temperatures, high water flows, and water level fluctuations. In contrast, potential natural *R. draytonii* breeding habitat including river channels, permanent marshy overflow basins, and sloughs is now widespread and ubiquitous in the Central Valley. Manmade habitat potentially suitable for breeding, such as farm ponds, rice fields, and canals, is also widespread.

Rana draytonii has not populated Central Valley and river terrace vernal pools, probably because these shallow seasonal pools rarely remain wet long enough in the summer to allow *R. draytonii* tadpoles to grow to a size for metamorphosis. River channels offer suitable breeding habitat in backwaters and along slow reaches, yet only one *R. draytonii* specimen originated from a Central Valley river channel (Table 2). The near absence of *R. draytonii* from Central Valley marshy overflow pools and sloughs is surprising because these waterways seem to offer suitable *R. draytonii* breeding habitat (Hayes and Jennings 1988; Jennings and Hayes 1994). Perhaps the historical presence of native predatory fish such as Sacramento Perch (*Archoplites interruptus*), and the current presence of exotic centrarchid predatory fish such as Green Sunfish (*Lepomis cyanellus*) in these types of habitat (Moyle 2002) precluded colonization by *R. draytonii* after dams were constructed upstream. Reproductive populations of *R. draytonii* seem to have been extremely rare or more likely absent from the California Central Valley during historical times. In fact, all of the Central Valley museum specimens (Table 2) could easily have been waifs carried downstream from nearby foothills during spring runoff.

Recent populations.—The recent population and single-frog discoveries described in the present study show that *R. draytonii* remains widespread in the Sierra Nevada. However, even relatively large Sierra Nevada *R. draytonii* populations can be cryptic and can fluctuate significantly in little time, for no discernible reason. For example, *R. draytonii* was found in Piney Creek near Coulterville (Mariposa County) well into the 1970's (Table 1), but our 1990's investigations of this region documented *R. draytonii* (25 tadpoles) only from nearby Cuneo Creek (Table 6; Drost and Fellers 1996). A survey of Cuneo Creek just five weeks after this discovery failed to detect *R. draytonii*, and a survey one year later was also unsuccessful (Appendix 2). Conversely, further north at Jack Creek (Butte County) SJB found no frogs at all during a three-hour late afternoon survey on 13 July 1997, but just six days later on 19 July 1997 SJB found almost two dozen subadults and ten large adults at the same pond in the afternoon and at night (Appendix 2).

The large size and density of the recent *R. draytonii* populations at the Jack Creek pond and Big Gun Diggings demonstrate that *R. draytonii* can develop large populations in the Sierra Nevada, as it does in coastal California. Likewise, the Little Oregon Creek population demonstrates that this species can colonize and reproduce in very small ponds, seemingly far from other populations. Single-frog occurrences along Little Silver and Bear Creek tributaries, and at the Ralston Ridge pond, show that Sierra Nevada *R. draytonii* can disperse from breeding sites and may persist in marginal habitat.

The Sierra Nevada distribution of *R. draytonii* seems to have declined very little, if at all, at least since the 1960's. The 10 recent Sierra Nevada *R. draytonii* localities occupy the same estimated 250-km range from Butte to Mariposa Counties as all but the O'Neals (Madera County) historical locality, and the recent localities close some distribution gaps evident in the historical

records such as Yuba and Calaveras Counties (Fig. 1). The recent populations occur within the 300–1,100-m elevation bracket, much like the historical localities but excluding the historical Yosemite localities where *R. draytonii* seems to have disappeared (Tables 1 and 6; Fig 2). Although the elevations of the recent localities appear to be skewed somewhat toward the upper end of that elevation bracket (Fig. 2), the non-random nature of our work and of the historical surveys preclude any conclusions regarding this slight difference. We have no information regarding extant Cascades Mountains populations.

Most of the Sierra Nevada foothills territory where *R. draytonii* has ever been recorded (Tables 1 and 6) has long been privately owned, and most of the recent populations (Table 6) were discovered on private land by the landowner or during surveys with the landowner's permission. Private landowner interest and researcher access to private land will undoubtedly continue to be crucial to discovering new Sierra Nevada *R. draytonii* populations.

***Human impacts to Sierra Nevada* Rana draytonii.—**Before 1849, the Sierra Nevada experienced little impact from human activities, which were limited to sporadic logging and vegetation clearing for homesteads (Farquhar 1965). This changed radically with the 1848 discovery of gold at Coloma in the Sierra Nevada foothills east of Sacramento. The discovery triggered the 1849 California Gold Rush that brought tens of thousands of prospectors to the Sierra Nevada foothills. Prospecting for gold extended from the Feather River (Plumas and Butte Counties) south to the Merced River (Mariposa County), throughout almost the entire Sierra Nevada range of *R. draytonii* (Caughey 1948; Clark 1963). The initial gold rush consisted primarily of miners who used shovels, sluice boxes, and pans to find gold in stream gravels, including most of the Sierra Nevada streams where *R. draytonii* has been recorded (Clark 1963). After only a few years, small scale methods gave way to industrial techniques such as hydraulic erosion of gold-bearing canyon walls, and dredging of stream and river gravel (Aubury 1905; Caughey 1948; Greenland 2001). From 1849 through 1875 these activities altered or destroyed perhaps one million hectares of Sierra Nevada natural habitat below about 1,525 m elevation from Mariposa County north to Plumas County (Clark 1963; Farquhar 1965). The resulting tailings, gravel deposits, channelized streams, and eroded mountainsides remain little changed today, visible throughout the current distribution of *R. draytonii* in the Sierra Nevada. Although gold mining must have at least temporarily extirpated many Sierra Nevada *R. draytonii* populations, these activities also created aquatic habitat suitable for *R. draytonii*. The recent Big Gun Diggings and Little Oregon Creek *R. draytonii* populations (Table 6), and the historical French Creek, Parrots Ferry Rd., Big Indian Creek, and Dutch Flat *R. draytonii* localities (Table 1) all occupy or occupied tailings ponds created by gold mining.

Extensive logging began in the Sierra Nevada with the beginning of the Gold Rush (Farquhar 1965; Beckstrom and Braun 1992). Like gold mining, log extraction and milling productivity increased rapidly as more efficient technology became available. Thus, draft animals and small waterwheel-powered mills were used into the 1850's, railroads and local steam-powered mills were the standard until the 1930's, and these were then replaced by roads, trucks, helicopters, and distant regional mills (Beckstrom and Braun 1992; Fregulia 2008). By 1940 most of the Sierra Nevada had been denuded of forests at least once (Storer and Usinger 1963; Fregulia 2008). Logging in the Sierra Nevada continues today, although it is tightly regulated on federal lands. Erosion and runoff that frequently accompany extensive logging can damage or destroy nearby or down slope *R. draytonii* habitat, and wholesale timber removal alters microclimates so that local aquatic ecosystems may change significantly. However, like gold mining, logging's effects on *R. draytonii* have sometimes been beneficial. Lumber mill ponds such as the Jack Creek pond, Birch Lake, and Spivey Pond have provided new habitat that sometimes supports large reproductive *R. draytonii* populations. Increased sunlight from tree removal in the vicinity of pools may

increase aquatic vegetation so that tadpole foraging habitat expands, much as it very likely did at the Jack Creek pond when the mature upslope timber was removed in 1985.

At least 158 dams span river and stream channels within the geographic and elevation range where *R. draytonii* occurs in the Sierra Nevada (California Department of Water Resources, Division of Safety of Dams. 2013, Listing of Dams. Available from http://www.water.ca.gov/damsafety/damlisting/index.cfm [Accessed 4 April 2013]). The ponds and reservoirs impounded by these dams range in surface area from < 100 m^2 to almost 65 km^2 (Lake Oroville). The largest reservoirs have inundated hundreds of kilometers of stream and river channels to the detriment of native aquatic biota, both in the reservoirs and downstream of the dams (Mount 1995; Moyle 2002). Although small impoundments such as the Jack Creek pond and Spivey Pond (Table 6) can support *R. draytonii*, manmade ponds seem to support frogs only if allowed to develop into near-natural water bodies. This process may require decades, and will normally occur only if human disturbance is minimized. Large reservoirs are extremely unlikely to support *R. draytonii*, and reservoirs may harm native aquatic biota by supporting exotic species such as centrarchid fish (Moyle 2002). Tributary streams that flow into reservoirs may be colonized by exotic predatory fish and thus increase the vulnerability of *R. draytonii* populations. Large dams on the Sierra Nevada rivers seemingly have caused the greatest permanent human-related negative impact to foothill aquatic-breeding amphibian populations, including *R. draytonii*.

Bullfrogs are frequently blamed for extirpations of native amphibians, including *R. draytonii*, although data documenting this process are generally lacking (Moyle 1973; Hayes and Jennings 1986; Jennings and Hayes 1994; US Fish and Wildlife Service 2002). We found Bullfrogs at Swamp Lake, Miguel Meadow, and Gravel Pit Lake within Yosemite National Park (Table 1), at Birch Lake and Piney and Jordan Creeks west of Yosemite National Park, throughout the region east and northeast of O'Neals (Madera, Fresno, and Mariposa Counties), along much of Weber Creek (El Dorado County), in French Creek (Butte County), and at 18 of the remaining Sierra Nevada sites that we surveyed (Table 1; Appendix 1). However, Bullfrogs are largely absent from other Sierra Nevada sites where *R. draytonii* populations have been recorded historically and since 1990, even when Bullfrogs occur close by. For example, a large Bullfrog population occupies French Creek at the confluence with Jack Creek only 2.4 km downstream of the Jack Creek *R. draytonii* pond, but no Bullfrogs have been reported from the Jack Creek pond in the 16 years since the discovery of *R. draytonii* at the pond. Perhaps Bullfrogs have not yet "found" the Jack Creek pond, but given the readily traversable riparian corridor between the two areas and the likely > 50 y history of both populations, this is not a plausible explanation. Likewise, since we are not certain that *R. draytonii* was ever part of the native Yosemite anuran fauna, it is unclear whether Bullfrogs really replaced *R. draytonii* in Yosemite. Perhaps the Bullfrogs were also introduced as a food source during construction of the O'Shaughnessy Dam (Jennings and Hayes 1985, 1994) and were better able to persist in these highly disturbed sites than was *R. draytonii* (D'Amore et al. 2010). We do not have sufficient information to determine whether Bullfrogs have been a consistent detrimental factor in Sierra Nevada *R. draytonii* population biology and conservation, but the presence of Bullfrogs at so many aquatic locations in the Sierra Nevada foothills is certainly a conservation concern. The interaction of the two anuran species in the Sierra Nevada warrants further study.

Chytrid fungus (*Batrachochytrium dendrobatidis*), a significant pathogen of many anuran species, has recently been discovered in the Jack Creek (Hughes Place), Sailor Flat, Big Gun Diggings, and Spivey Pond *R. draytonii* populations (Tatarian and Tatarian 2010), but no chytrid-related mortality in adult or tadpole *R. draytonii* has been reported at any of these sites. Similar apparently non-lethal chytrid infection has been observed in coastal *R. draytonii* populations (Padgett-Flohr 2008; Fellers et al. 2011), which suggests *R. draytonii* is less vulnerable to the pathogenic effects of chytrid

infection than are some other anuran species. Despite these observations, it remains critically important that this virulent pathogen not be spread among anuran populations, including *R. draytonii* in the Sierra Nevada. Biologists working with Sierra Nevada *R. draytonii* populations should continue to follow established equipment disinfection practices for preventing cross-contamination of breeding pools (e.g., US Fish and Wildlife Service 2005).

In our view, human population growth is the most significant long-term threat to the survival of *R. draytonii* in the Sierra Nevada. More than 850,000 people currently inhabit the Sierra Nevada foothills, an increase of at least 10% since 2000 (California Department of Finance, Sacramento, California. 2011. E-4 Population Estimates for Cities, Counties and the State, 2001–2010, with 2000 & 2010 Census Counts. Available from http://www.dof.ca.gov/research/demographic/reports/estimates/e-4/2001-10/view.php [Accessed 26 March, 2012]). Growth has been particularly dramatic in the central Sierra Nevada foothills. For example, the Placer County human population in the Sierra Nevada foothills almost doubled from about 67,000 in 2000 to over 121,000 in 2010 (California Department of Finance. 2011. *op. cit.*). Our observations indicate that development continues nearly unabated in the central Sierra Nevada foothills, and human population growth with attendant development has become robust in some other Sierra Nevada foothills regions such as Nevada City (Nevada County) and Sonora (Tuolumne County). With more new residents will come more land development, and almost inevitable modification and destruction of aquatic habitats and ecosystems that will affect many species including *R. draytonii*.

In summary, logging and 19th century gold mining have altered or destroyed significant terrestrial and aquatic habitat across the entire Sierra Nevada distribution of *R. draytonii*, but those activities have also created small ponds and lakes that can support large *R. draytonii* populations. Conversely, large Sierra Nevada river impoundments have destroyed extensive terrestrial and aquatic habitat, without creating any identifiable *R. draytonii* breeding or non-breeding habitat within or downstream of the impoundments. Bullfrogs are widely presumed to have significant deleterious effects on *R. draytonii*, but in the Sierra Nevada, their impacts to *R. draytonii* populations are unclear. Likewise, chytrid fungus exists but is seemingly of limited pathogenicity in Sierra Nevada *R. draytonii* populations. Habitat destruction resulting from unchecked urban development is probably the most serious long term threat to *R. draytonii* in the Sierra Nevada.

Recommendations.—Until 1997, the principal impediment to conserving *R. draytonii* in the Sierra Nevada was that no Sierra Nevada *R. draytonii* populations were known to be extant. In this paper we report 10 Sierra Nevada *R. draytonii* localities discovered since 1991, including nine discovered since 1996 when *R. draytonii* was Federally listed as a Threatened species. Moreover, because none of these areas had been protected from damage or destruction, all of these populations could have been lost before biologists knew they existed. Thus, there is reason for optimism that more surveys in the foothills will detect more suitable breeding habitat and more *R. draytonii* populations, and that with habitat protection *R. draytonii* will continue to survive in the Sierra Nevada.

Hundreds of kilometers of natural streams and countless mapped and unmapped manmade ponds in the 150–1,100 meter elevation bracket in the Sierra Nevada remain to be surveyed for *R. draytonii*. Although much of the aquatic Sierra Nevada habitat in this elevation range could support *R. draytonii*, the most likely breeding habitat includes large stream pools and old manmade ponds such as 19th century mining tailings ponds, small in-stream impoundments, and pre-1940 lumber mill ponds. The streams and ponds where *R. draytonii* were found historically should also be surveyed again, but stream surveys should extend far beyond the limited sites where the original specimens were found. Favorable streamside and pond habitat should be surveyed repeatedly during the spring and summer. Nighttime surveys are more likely to detect adult *R. draytonii* than are daytime surveys (Fellers and Kleeman 2006), but subadults, particularly recent metamorphs, may

be found during the day in midsummer (SJB & GMF unpubl. data; Appendix 2). Neither the absence of aquatic vegetation nor the presence of fish or Bullfrogs is good evidence that *R. draytonii* is absent.

Because most currently known Sierra Nevada *R. draytonii* populations appear to be small (e.g., < 10 adults at the Little Oregon Creek ponds) and their sizes tend to fluctuate, future population declines might be difficult to recognize until it is too late to reverse them. For that reason, all Sierra Nevada *R. draytonii* need special protection and monitoring to help ensure their survival. Six of the ten recent localities are currently protected on federal lands or other refuges. Habitat at Jack Creek pond, Spivey Pond, and Big Gun Diggings is managed specifically for *R. draytonii*. As new *R. draytonii* populations are discovered, they should be similarly protected to ensure that *R. draytonii* remains a member of the Sierra Nevada anuran fauna.

Conclusions

We have shown that with the exception of the Yosemite-region occurrences and the possible exception of the southernmost portion of the historical range of *R. draytonii* in the Sierra Nevada, the current distribution of this species in the Sierra Nevada has declined very little, if at all, since the 1960's (Fig. 1). We have also shown that *R. draytonii* has likely always been scarce and difficult to detect in the Sierra Nevada, and that breeding assemblages were almost certainly confined historically to small stream pools seldom capable of supporting many frogs. Because this species is secretive, scarce, and cryptic, discovery of Sierra Nevada *R. draytonii* populations is largely a matter of chance, made even more difficult because of private land access restrictions. For that reason, the status of historical Sierra Nevada *R. draytonii* populations has been difficult to assess, although Yosemite-region populations (that may have originated from translocations) appear to have been extirpated. We have reported seven new probable breeding Sierra Nevada *R. draytonii* populations, plus three single-specimen occurrences in non-breeding habitat. We have also concluded that reproductive *R. draytonii* populations probably never occurred in the Central Valley of California because extensive natural winter and spring flooding in the river lowlands precluded breeding activity and water declines during the early summer precluded tadpole survival to metamorphosis in seasonal ponds.

Recent Sierra Nevada *R. draytonii* populations occupy diverse aquatic habitats, including natural streams and manmade ponds. Aquatic habitat size, history, water depth, and aquatic vegetation differ widely among the 10 recent Sierra Nevada *R. draytonii* occurrences documented in this paper. Paradoxically, some manmade tailings and lumber mill ponds created in the 1800's and early 1900's support larger Sierra Nevada *R. draytonii* populations than are likely to have occurred historically along streams. We believe that more Sierra Nevada *R. draytonii* populations await discovery, and that comprehensive surveys for this species are urgently needed because human population growth and associated development is increasing rapidly in the Sierra Nevada foothills. Without sustained efforts to find them, Sierra Nevada *R. draytonii* populations could be lost to land use changes and human encroachment before they are identified.

Finally, popular accounts and Internet sources commonly cite the humorist Mark Twain's 1865 allegorical tale of "The Celebrated Jumping Frog of Calaveras County" as evidence that *R. draytonii* was formerly a well-known Sierra Nevada species, even though the tale offers no clue regarding the title character's identity. Further, *R. boylii*, an impressive leaper, inhabits several Calaveras County creeks and would seem as likely a candidate for Twain's anuran character if indeed the species' identity was relevant to the story (which it clearly is not). In our opinion, Mark Twain's jumping frog is best left in the world of humor and allegory as Twain clearly intended, and we discourage the citation of the tale as evidence of anything but Mark Twain's profound understanding of human nature.

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APPENDIX 1. Surveys within 20 km of the 21 historical Sierra Nevada *Rana draytonii* localities. Each verbatim historical locality (HL; Table 1) is shown in **bold**, followed by surveys of the same site or of areas within 20 km of the same site, below 1,830 m elevation, conducted by SJB or GMF since 1990. Type of survey: VHA = Visual Habitat Assessment, DS = Daytime Survey, NS = Nighttime Survey; Anuran species: AB = *Anaxyrus boreas*, PR = *Pseudacris regilla*, LC = *Lithobates catesbeianus*, RB = *Rana boylii*, RS = *Rana sierrae*; Aquatic turtle species: EM = *Emys marmorata*.

Date, Surveyor(s), survey site #	Surveyed locality	Distance & bearing from HL	Type of survey	Anuran & aquatic turtle sp. observed
Pond at Elliott's Ranch, 5 miles [8.0 km] west of Paynes Creek Post Office, Tehama County, zone 10, 585374E, 4462801N				
21 July 1991 SJB no survey #	Paynes Creek at State Highway 36, 9.2 SW of Paynes Creek community, Tehama Co., zone 10, 583585E, 4462542N, 280 m elev.	1.8 km W	DS	PR: 10+ larvae; unidentified subadult ranid
14 Oct. 2012 SJB 2012-1014-1	″	″	DS	None
22 June 1995 GMF L-177	Tributary to Plum Creek, from N, Tehama Co., zone 10, 596098E, 4462495N, 671 m elev.	10.7 km E	DS	PR: 50 larvae; RB: 1 adult; EM: 2 adults
16 Sept. 1996 GMF L-514	Finley Lake off Rd 774A, 11 miles WSW of Mineral, Tehama Co., zone 10, 597650E, 4458200N, 851 m elev.	13.1 km WNW	DS	LC: 250 adults, 900 subadults, 10 larvae
13 July 2010 GMF L-514	″	″	NS	PR: 10 larvae LC: 12 adults
22 May 1997 GMF L-529	Stock pond (unmapped) 1 km NW of Finley Lake, near SE base of Finley Butte, zone 10, 596468E, 4458840N, 793 m elev.	11.8 km WNW	DS	PR: 330 subadults, 31 larvae
14 Apr. 2001 GMF L-529	″	″	″	PR: 7 adults, 20 larvae
9 May 2001 GMF L-529	″	″	″	PR: 3 adults, 80 larvae
4 Mar. 2002 GMF L-529	″	″	NS	PR: 30 adults
11 May 2002 GMF L-529	″	″	DS	PR: 100 larvae
31May 2002 GMF L-529	″	″	″	PR: 5 subadults, 350 larvae
4 Mar. 2002 GMF P-565	Unmapped pond 6.5 km W of Finley Lake, Tehama Co., zone 10, 590983E, 4457693N, 668 m elev.	7.4 km SE	NS	PR: 16 adults
11 May 2002 GMF P-565	″	″	DS	PR: 90 larvae
28 May 1997 GMF L-532	Stock pond on W side of Plum Creek Rd - just inside USFS boundary, Tehama Co., zone 10, 598893E, 4461196N, 915 m elev.	13.6 km WNW	DS	PR: 200 larvae
28 May 1997 GMF L-533	Fish & Game pond on Plum Creek Rd at Border of National Forest & State land, Tehama Co., zone 10, 598720E, 4461300N, 903 m elev.	13.4 km WNW	DS	PR: 30 subadults, 75 larvae

French Creek, T22N R5E, at FS Rd. 22N34, Plumas National Forest, Butte Co., zone 10, 640090E, 4398191N

12 July 1997 SJB 1997-0712-5	Tailings ponds at French Creek, FS Rd. 22N34, Butte Co., zone 10. 640090E, 4398191N, 615 m elev.	0	DS	PR (calling); LC: 2 adults
12 July 1997 SJB 1997-0712-6	″	″	NS	PR (calling) LC: 12 adults
26 July 1997 SJB 1997-0726-2	″	″	NS	PR: 2 adults LC: 5 adults
16 Aug. 1998 SJB 1998-0816-1	″	″	DS	LC: 1 adult
10 July 1999 SJB 1999-0710-2	″	″	NS	PR (calling); LC: 4 adults, 1 subadult
15 July 2001 SJB 2001-0715-2	″	″	NS	LC: 1 adult
23 June 2007 SJB 2007-0623-3	″	″	NS	PR (calling); Unidentified ranid

One mile [1.6 km] toward Oroville from Feather Falls, Butte Co., zone 10, 648086E, 4383708N

19 Apr. 1997 SJB 1997-0419-2	Lumpkin Rd., 2.3 km W of Feather Falls community, (head of Little Sucker Run) Butte Co. zone 10, 647755E, 4383387N, 775 m elev.	~0.5 km W	DS	None
21 July 2001 SJB 2001-0721-3	″	″	DS	″
2 July 1996 GMF U-036	Fall River directly above Feather Falls, off of Lumpkin Rd, Butte Co., zone 10, 648700E, 4390420N, 610 m elev.	6.7 km SSW	DS	PR: 500 larvae RB: 1 adult

Three miles [4.8 km] north of Bidwell Bar, Butte Co., zone 10, 634139E, 4384373N

19 Apr. 1997 SJB 1997-0419-1	Canyon Creek, 4.8 km N of Bidwell Bar historical site (Bidwell Bar is now submerged in Lake Oroville), Butte Co., zone 10, 633722E, 4384179N, 298 m elev.	0.5 km N	VHA	None
21 July 2001 SJB 2001-0721-5	″	″	DS	RB: 1 adult
1 July 1996 GMF U-035	Williams Pond, 1.8 km S of Brush Creek Admin site, Butte Co., zone 10, 642500E, 4392663N, 1000 m elev.	11.7 km SW	DS	LC: 5 adults, 15 larvae

McKibben property, 0.5 miles [0.8 km] NE of Dutch Flat, Placer Co., zone 10, 687270E, 4342322N

28 Sept. 2005 SJB 2005-0928-1	Dredge pond 1.0 km SW of Dutch Flat Station, Placer Co., zone 10, 686138E, 4339839N, 963 m elev.	~2.7 km SW	VHA	None
28 Sept. 2005 SJB 2005-0928-2	Pond in Nichols Diggings, Diggins Hill Rd., 0.37 km WNW Main St., Dutch Flat, Placer Co., zone 10, 686408E, 4342259N, 901 m elev.	0.9 km W	VHA	None
16 July 2002 GMF T-558	Shirttail Canyon, E of Sugar Pine Reservoir, Placer Co., zone 10, 692521E, 4335201N, 1116 m elev. (coordinates & elevation approximate)	~8.9 km SSE	DS	LC: 1 adult

Michigan Bluff, Placer Co., zone 10, 695489E, 4323958N

30 Sept. 2005 SJB 2005-0930-1	Pond along Iowa Hill Rd., 10.97 mile marker, Placer Co., zone 10, 686785E, 4331866N, 896 m. elev.	11.8 km NW	VHA	None
5 Oct. 2005 SJB 2005-1005-1	Stream along Volcanoville Rd., 0.8 km NNE Wentworth Springs Rd., Placer Co., zone 10, 697863E, 4313575N, 1053 m elev.	10.7 km S	DS	PR: 10+ subadults, 10+ larvae
29 Sept. 2005 SJB 2005-0929-1	Brimstone Creek at Finning Mill Rd., Placer Co., zone 10, 693505E, 4327575N, 1027 m elev.	4.1 km NNW	DS	None

Auburn, Placer Co., zone 10, 666758E, 4307048N

13 May 1995 SJB 1995-0513-1	Drainage channel at NE jct Bell Rd. & State Highway 49, Placer Co., zone 10, 664974E, 4312122N, 416 m elev.	5.2 km NNW	DS	None
20 May 1995 SJB 1995-0520-1	″	″	NS	PR (calling); LC: 2 subadults
3 Apr. 2000 SJB 2000-0403-1	1400 m reach of Auburn Ravine Creek, 4.2 km WSW of Placer Co. Superior Courthouse, Auburn, Placer Co., zone 10, 662602E, 4306375N, 207 m elev.	4.2 km WSW	VHA	None
8 Apr. 2000 SJB 200-0408-1	″	″	DS	PR (calling)
29 Apr. 2000 SJB 2000-0429-1	″	″	DS	PR (calling)
27 May 2000 SJB 2000-0527-1	″	″	NS	PR (calling)
28 May 2000 SJB 2000-0528-1	″	″	NS	PR (calling) LC (1 adult)

One mile [1.6 km] SE of Placerville, El Dorado Co., zone 10, 692618E, 4287976N

12 Mar. 1998 SJB 1998-0312-1	Cedar Ravine Rd., 0.8 km SE of El Dorado Co. Superior Courthouse, Placerville, El Dorado Co., zone 10, 691931E, 4288251N, 586 m elev.	~0.7 km NW	VHA	None
7 Oct. 2012 SJB 2012-1007-1	″	″	VHA	None

Weber Creek at Forni Rd., 0.25-0.5 miles [0.4—0.8 km] above US Highway 50, El Dorado Co., zone 10, 688915E, 4287045N

12 Mar. 1998 SJB 1998-0312-2	Weber Creek at Forni Rd., Placerville, El Dorado Co., zone 10, 688915E, 4287045N, 480 m elev.	0	VHA	None
7 Oct. 2012 SJB 2012-1007-2	″	″	DS	None
17 May 2000 SJB 2000-0517-1	Weber Creek, 50-240 m downstream of Weber Reservoir Dam, El Dorado Co., zone 10, 700513E, 4287818N, 684 m elev.	11.6 km E	DS	None
17 May 2000 SJB 2000-0517-1N	″	″	NS	PR: 2 adults

24 May 2000 SJB 2000-0524-1	″	″	DS	″
24 May 2000 SJB 2000-0524-1N	″	″	NS	PR: 4 adults; LC: 15 subadults
17 July 1997 GMF T-056	Weber Creek, upstream from Coon Hollow Rd. bridge, El Dorado Co., zone 10, 692080E, 4286000N, 537 m elev.	3.4 km ESE	DS	None
5 Aug. 1997 GMF T-073	Weber Creek, El Dorado Irrigation District property E & W of Cedar Ravine Rd., El Dorado Co., zone 10, 695020E, 4286910N, 537 m elev.	6.1 km E	DS	PR: 2 adults; LC: 1 adult
10 Mar. 1999 GMF P-413	Pond 100 m S El Dorado Rd. at Shady Lane, Placerville, El Dorado Co., zone 10, 687193E, 4286703N, 145 m elev.	1.8 km WSW	DS	PR: 4 adults; LC: 3 adults, 4 subadults
21 Oct. 2009 GMF P-791	Unnamed pond ~200 m SW of edge of Finnon Reservoir, El Dorado Co., zone 10 695648E, 4296317N, 752 m elev.	11.4 km SW	DS	LC: 3 subadults
Two miles [3.2 km] south of El Dorado, El Dorado Co., zone 10, 687875E, 4279640N				
12 Mar. 1998 SJB 1998-0312-3	State Highway 49, 3.2 km by road SSW of El Dorado, El Dorado Co., zone 10, 687875E, 4279640N, 586 m elev.	0	VHA	None
7 Oct. 2012 SJB 2012-1007-3	″	″	VHA	None (ponds dry)
Tributary to North Fork Cosumnes River, north of Plymouth, Amador Co., zone 10, 687424E, 4269117N (approximate coordinates)				
23 May 1994 GMF Y-447	Dry Creek at Hwy 124 crossing, Amador Co., zone 10, 683207E, 4253596N, 183 m elev.	16.1 km SSW	DS	LC: 1 adult, 103 larvae
26 May 2007 SJB 2007-0526-1	Big Indian Creek, 0.75 km S of confluence with Cosumnes River, Amador Co., zone 10, 687543E, 4268634N, 286 m elev.	Unknown	VHA	None
7 Oct. 2012 SJB 2012-1007-4	″	″	VHA, DS	None
Middle Bar Rd., 0.9 mile [1.4 km] west of State Highway 49, Amador Co. (Hunt Gulch), zone 10, 696481E, 4243692N				
14 Sept. 2006 SJB 2006-0914-1	Middle Bar Rd. at Hunt Gulch crossing, Amador Co., zone 10, 696481E, 4243692N, 274 m elev.	0	DS	PR: 1 adult
7 Oct. 2006 SJB 2006-1007-1	″	″	NS	PR: 1 adult
28 Oct. 2006 SJB 2006-1028-1	″	″	″	None
26 May 2007 SJB 2007-0526-2	″	″	″	None
27 Jan. 2012 SJB 2012-0127-1	″	″	DS	None

7 Oct. 2012, SJB 2012-1007-5	″	″	″	None (creek dry)
14 Sept. 2006 SJB 2006-0914-2	Springs associated with Valparaiso Mine along Middle Bar Rd., 0.75 km S Hunt Gulch crossing, Amador Co., zone 10, 696431E, 4242939N, 260 m elev.	0.75 km S	DS	PR: 1 adult
7 Oct. 2006 SJB 2006-1006-2	″	″	NS	None
28 Oct. 2006 SJB 2006-1028-2	″	″	″	″
26 May 2007 SJB 2007-0526-3	″	″	″	PR: 5 adults
27 Jan. 2012 SJB 2012-0127-2	″	″	DS	″
7 Oct. 2012 SJB 2012-1007-6	″	″	″	″
Woods Creek, edge of Sonora, Tuolumne Co., zone 10, 730000E, 4208168N				
2 July 1999 SJB 1999-0702-3	Woods Creek, N edge of Sonora urban boundary, Tuolumne Co., zone 10, 729750E, 4208347N, 570 m elev.	0.31 km N	VHA	None
9 July 1999 SJB 1999-0709-3	″	″	NS	Unidentified ranid
7 Oct. 2012 SJB 2012-1007-7	Woods Creek at Tennessee Gulch, NW of Sonora urban boundary, Tuolumne Co., zone 10, 729690E, 4209393N, 583 m elev.	1.3 km N	VHA	None
Parrott's Ferry Rd., 2.4 miles [3.8 km] north of Sonora, Tuolumne Co., zone 10, 727726E, 4213543N				
2 July 1999 SJB 1999-0702-2	Parrott's Ferry Rd., 3.0 km N of Sonora, Tuolumne Co., zone 10, 727726E, 4213543N, 672 m elev.	0	DS	None
9 July 1999 SJB 1999-0709-2	″	″	NS	Unidentified ranid
7 Oct. 2012 SJB 2012-1007-8	″	″	VHA	None (ponds dry)
2 July 1999 SJB 1999-0702-1	Coyote Creek at Main Street, Vallecito, Calaveras Co. (Stanislaus River basin), zone 10, 721745E, 4218195N, 530 m elev.	10.2 km NW	DS	LC: 14 larvae
2 July 1999 SJB 1999-0709-1N	″	″	NS	LC: 5 subadults
9 July 1999 SJB 1999-0709-1	″	″	DS	LC: 5 larvae
9 July 1999 SJB 1999-0709-1N	″	″	NS	LC: 2 subadults

Mather /Hog Ranch/ Birch Lake, Yosemite National Park, Tuolumne Co., zone 10, 248839E, 4196310N

16 Sept. 2012 SJB 2012-0916-1	Birch Lake, Mather, Tuolumne Co., zone 11, 248839E, 4196310N, 1380 m elev.	0	DS	LC (9 adults, 8 subadults, 2 larvae)
22 Apr. 1993 GMF Y-043	Evergreen Rd. 2.0 km N of Ackerson Mtn/Bear Mtn intersection, Tuolumne Co., zone 11, 248365E, 4192312N, 1391 m elev.	4.0 km S	DS	EM: 1 adult
22 Apr. 1993 GMF Y-044	Pond on W side of Evergreen Rd. 0.5 km N of Ackerson Mt/Bear Mt. Rd intersection, Tuolumne Co., zone 11, 249087E, 4191661N, 1403 m elev.	4.7 km SSE	DS	PR, 100 larvae
18 June 1998 GMF Y-1513	Unnamed pond 5.2 km SW of O'Shaughnessy Dam, 2.1 km NE of Hetch Hetchy entrance to Yosemite N.P., zone 11, 252213E, 4198940N, 1495 m elev.	4.3 km NE	DS	PR: 1 adult, 21 larvae
11 July 2004 GMF Y-1513	″	″	″	PR: 20 larvae
4 Sept. 2006 GMF Y-1513	″	″	″	PR: 2 adults, 4 larvae
18 June 1998 GMF Y-1514	Unmapped pond 5.2 km SW of O'Shaughnessy Dam, 2.1 km NE of Hetch Hetchy entrance to Yosemite N.P., Tuolumne Co., zone 11, 252080E, 4199010N, 1495 m elev.	4.2 km NE	DS	PR: 1 adult, 17 larvae
11 July 2004 GMF Y-1514	″	″	″	PR: 13 larvae
18 June 1998 GMF Y-1515	Unnamed pond 6.2 km SW of O'Shaughnessy Dam, 1.3 km NE of Hetch Hetchy entrance to Yosemite N.P., Tuolumne Co., zone 11, 251900E, 4198060N, 1592 m elev.	3.5 km NE	DS	PR: 4 adults, 127 larvae; EM: 2 adults
10 July 2004 GMF Y-1515	″	″	″	PR: 2 subadults, 23 larvae
4 Sept. 2006 GMF Y-1515	″	″	″	PR: 34 subadults, 4 larvae
29 June 2001 GMF Y-2068	Unnamed seasonal wetland (pond), 3.7 km S of O'Shaughnessy Dam, Tuolumne Co., zone 11, 254705E, 4199730N, 1696 m elev.	6.8 km NE	DS	PR: 1 subadult, 10 larvae
12 July 2004 GMF Y-2068	″	″	″	PR: 59 larvae
5 Sept. 2006 GMF Y-2068	″	″	″	PR: 11 subadults, 2 larvae

Swamp Lake, Yosemite National Park, Tuolumne Co., zone 11, 251529E, 4203871N

18 Sept. 1996 GMF Y-1246	Swamp Lake, Tuolumne Co., zone 11, 251529E, 4203871N, 1530 m elev.	0	DS	PR: 4 larvae
18 June 1997 GMF Y-1246	″	″	DS	PR: 44 larvae; LC: 18 adults, 25 subadults, 607 larvae; EM: 6 adults

8 July 1997 GMF Y-1246	″	″	NS	PR: 1 adult; LC: 30 subadults, 300 larvae
18 June 1997 GMF Y-1260	Unnamed pond/wetland, 0.4 km W of Swamp Lake, downstream. Tuolumne Co., zone 11, 250602E, 4204185N, 1529 m elev.	1.0 km W	DS	PR: 1 subadult, 16 larvae; LC: 2 adults
19 June 1997 GMF Y-1262	Unnamed pond 0.6 km NW of Swamp Lake, Tuolumne Co., zone 11, 250983E, 4204529N, 1549 m elev.	0.6 km NW	DS	PR: 70 larvae
10 July 1997 GMF Y-1262	″	″	NS	PR: 2 adults, 6 subadults, 50 larvae; EM: 1 adult
19 June 1997 GMF Y-1263	Unnamed pond 0.8 km NW of Swamp Lake, Tuolumne Co., zone 11, 250822E, 4204680N, 1549 m elev.	0.8 km NW	DS	PR: 1 larva
19 June 1997 GMF Y-1267	Unnamed pond, 3.7 km SW of Swamp Lake, Tuolumne Co., zone 11, 248354E, 4201777N, 1574 m elev.	3.7 km SW	DS	PR: 1 subadult, 1000 larvae
19 June 1997 GMF Y-1269	Unnamed pond, 4.0 km SW of Swamp Lake, Tuolumne Co., zone 11, 248480E, 4201040N, 1592 m elev.	4.0 km SW	DS	PR: 54 larvae; EM: 6 adults
19 June 1997 GMF Y-1270	Unnamed pond, 3.9 km SW of Swamp Lake, Tuolumne Co., zone 11, 249071E, 4200691N, 1543 m elev.	3.9 km SW	DS	PR: 50 larvae
19 June 1997 GMF Y-1279	Unmapped pond, 2.4 km SW of Swamp Lake, Tuolumne Co., zone 11, 250270E, 4201690N, 1495 m elev.	2.4 km SW	DS	PR: 1 subadult, 10 larvae
20 June 1997 GMF Y-1264	Unnamed wetland, 1.4 km SW of Swamp Lake, Tuolumne Co., zone 11, 250700E, 4202400N, 1601 m elev.	1.4 km SW	DS	PR: 50 larvae
20 June 1997 GMF Y-1272	Unnamed pond & associated wet meadow, 2.3 km SW of Swamp Lake, Tuolumne Co., zone 11, 249841E, 4201907N, 1504 m elev.	2.3 km SW	DS	PR: 2 subadults, 100 larvae
21 June 1997 GMF Y-1274	Unnamed pond 1.7 km WNW of Hetch Hetchy Dam (1.7 km E of Swamp Lake), Tuolumne Co., zone 11, 253414E, 4204034N, 1653 m elev.	1.7 km E	DS	PR: 60 larvae; EM: 1 adult, 1 subadult
21 June 1997 GMF Y-1275	Second unnamed pond 1.7 km WNW of O'Shaughnessy Dam (1.7 km E of Swamp Lake), Tuolumne Co., zone 11, 253494E, 4204064N, 1653 m elev.	2.0 km E	DS	EM: 1 subadult
21 June 1997 GMF Y-1276	Unnamed seasonal pond 1.7 km WNW of O'Shaughnessy Dam (1.7 km E of Swamp Lake), Tuolumne Co., zone 11, 253548E, 4204273N, 1696 m elev.	2.1 km E	DS	None
21 June 1997 GMF Y-1278	Unnamed pond/wetland 1.0 km ENE Swamp Lake, Tuolumne Co., zone 11, 252858E, 4203954N, 1617 m elev.	1.0 km ENE	DS	PR: 25 larvae; LC : 1 adult; EM: 1 adult
8 July 1997 GMF Y-1282	Marsh/pond 0.8 km W of Swamp Lake, Tuolumne Co., zone 11, 250318E, 4203891N, 1563 m elev.	0.8 km W	DS	PR: 17 subadults, 5 larvae
9 July 1997 GMF Y-1283	Marsh/pond 0.8 km E of Swamp Lake, Tuolumne Co., zone 11, 252551E, 4203750N, 1623 m elev.	0.8 km E	DS	PR: 1 subadult, 100 larvae

9 July 1997 GMF Y-1284	Unmapped pond 0.9 km E of Swamp Lake, Tuolumne Co., zone 11, 252620E, 4203630N, 1636 m elev.	0.9 km E	DS	PR: 2 subadults, 30 larvae
9 July 1997 GMF Y-1285	Unmapped pond 0.5 km SE of Swamp Lake, Tuolumne Co., zone 11, 252150E, 4203500N, 1662 m elev.	0.7 km SE	DS	PR: 12 larvae; EM: 1 subadult
9 July 1997 GMF Y-1286	Unmapped pond 0.9 km SE of Swamp Lake, Tuolumne Co., zone 11, 252452E, 4203147N, 1653 m elev.	1.2 km SE	DS	PR: 7 subadults, 60 larvae
9 July 1997 GMF Y-1287	Drainage downstream (W) from Swamp Lake, Tuolumne Co., zone 11, 251170E, 4203980N, 1491 m elev.	0.64 km W	DS	LC: 1 adult
16 June 1998 GMF Y-1503	Unmapped pond 3.0 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252929E, 4201317N, 1074 m elev.	2.9 km SE	DS	PR: 800 larvae
17 June 1998 GMF Y-1504	Unmapped pond 3.5 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252424E, 4201201N, 1086 m elev.	2.8 km SSE	DS	PR: 50 larvae
17 June 1998 GMF Y-1505	Unnamed pond, 3.5 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252404E, 4201183N, 1086 m elev.	2.8 km SSE	DS	PR: 600 larvae
17 June 1998 GMF Y-1506	Unnamed pond 3.5 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252292E, 4201104N, 1089 m elev.	2.9 km SSE	DS	PR: 400 larvae
17 June 1998 GMF Y-1507	Unnamed pond 3.6 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252458E, 4200973N, 1086 m elev.	3.0 km SSE	DS	PR: 750 larvae; EM: 3 adults, 1 subadult
17 June 1998 GMF Y-1508	Unnamed pond 3.8 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252334E, 4200953N, 1086 m elev.	3.0 km SSE	DS	PR: 250 larvae
17 June 1998 GMF Y-1509	Unnamed pond 3.8 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252166E, 4200638N, 1022 m elev.	3.3 km SSE	DS	PR: 1 subadult, 500 larvae
17 June 1998 GMF Y-1510	Unnamed pond 2.6 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 252850E, 4201580N, 1037 m elev.	2.6 km SSE	DS	PR: 1 subadult
18 June 1998 GMF Y-1511	Unnamed pond 2.3 km SW of O'Shaughnessy Dam, Poopenaut Valley, Tuolumne Co., zone 11, 253317E, 4201957N, 1104 m elev.	2.6 km SE	DS	PR: 300 larvae
18 June 1998 GMF Y-1512	Meadow 0.4 km SSE of O'Shaughnessy Dam, Tuolumne Co., zone 11, 255486E, 4203043N, 1180 m elev.	4.0 km ESE	DS	PR: 55 larvae
11 July 2004 GMF Y-1512	″	″	″	PR: 46 larvae
21 Sept. 1998 GMF Y-1678	Unnamed pond 1.0 km N of Tuolumne River & 3.4 km S of Swamp Lake, Tuolumne Co., zone 11, 250463E, 4200560N, 1394 m elev.	3.5 km S	DS	PR: 4 subadults, 14 larvae
21 Sept. 1998 GMF Y-1679	Unnamed pond 1.2 km N of Tuolumne River & 3.1 km S of Swamp Lake, Tuolumne Co., zone 11, 250262E, 4200770N, 1394 m elev.	3.4 km S	DS	PR: 2 adults, 12 subadults, 35 larvae
21 Sept. 1998 GMF Y-1681	Unnamed pond 1.0 km N of Tuolumne River & 3.6 km S of Swamp Lake, Tuolumne Co., zone 11, 250035E, 4200471N, 1473 m elev.	3.7 km S	DS	PR: 22 adults, 14 larvae

21 Sept. 1998 GMF Y-1682	Unmapped pond 1.0 km N of Tuolumne River & 2.5 km S of Swamp Lake, Tuolumne Co., zone 11, 250200E, 4200550N, 1430 m elev.	3.6 km S	DS	PR-5 subadults, 10 larvae
30 June 2001 GMF Y-2073	Unmapped pond. 1.71 km NW of O'Shaughnessy Dam, Tuolumne Co., zone 11, 253890E, 4204701N, 1702 m elev.	2.5 km NE	DS	PR: 41 larvae
30 June 2001 GMF Y-2074	Unnamed seasonal pond. 1.5 km NW of O'Shaughnessy Dam, Tuolumne Co., zone 11, 253913E, 4204542N, 1707 m elev.	2.5 km ENE	DS	PR: 65 larvae
30 June 2001 GMF Y-2075	Unnamed seasonal pond. 1.6 km NW of O'Shaughnessy Dam, Tuolumne Co., zone 11, 253798E, 4204511N, 1702 m elev.	2.4 km ENE	DS	PR: 47 larvae
30 June 2001 GMF Y-2076	Unnamed seasonal pond. 1.6 km NW of O'Shaughnessy Dam, Tuolumne Co., zone 11, 253721E, 4204460N, 1705 m elev.	2.3 km ENE	DS	PR: 27 larvae
Miguel Meadow, Yosemite National Park, Tuolumne Co., zone 11, 250391E, 4204932N				
27 Apr. 1993 GMF Y-052	Eleanor Creek below Lake Eleanor Dam, Tuolumne Co., zone 11, 247020E, 4206302N, 1373 m elev.	3.6 km ESE	DS	None
19 June 1997 GMF Y-1261	Unnamed pond 0.5 km S of Miguel Meadow Ranger Station, Tuolumne Co., zone 11, 250746E, 4204343N, 1537 m elev.	0.7 km SSE	DS	PR: 20 larvae; LC: 5 adults, 2 subadults; EM: 1 adult
10 July 1997 GMF Y-1261	″	″	NS	PR: 35 larvae; LC: 7 adults
20 June 1997 GMF Y-1280	Miguel Creek, 0.2 km downstream from Miguel Meadow Ranger Station, Tuolumne Co., zone 11, 250260E, 4204920N, 1525 m elev.	0.2 km SW	DS	None
21 June 1997 GMF Y-1273	Unnamed pond 2.88 km SSE of Miguel Meadow Ranger Station, zone 11, 249688E, 4202160N, 1513 m elev.	2.88 km SSE	DS	PR: 21 subadults, 150 larvae
10 July 1997 GMF Y-1288	Tributary of Miguel Creek, from Miguel Meadow Ranger Station through Miguel Meadow to Fork in Creek, Tuolumne Co., zone 11, 251673E, 4205015N, 1549 m elev.	1.3 km E	DS	None
10 July 1997 GMF Y-1289	Miguel Creek from Miguel Meadow to Gravel Pit Lake, Tuolumne Co., zone 11, 251306E, 4205416N, 1537 m elev.	0-1.0 km ENE	DS	None
11 July 1997 GMF Y-1292	Miguel Creek ~1.5 km below (SW) of Miguel Meadow, Tuolumne Co., zone 11, 247700E, 4204900N, 1385 m elev.	2.7 km W	DS	“
5 Sept. 1997 GMF Y-1477	Unnamed lake in Kendrick Creek drainage, 10.5 km NE of Miguel Meadow Ranger Station, Tuolumne Co., zone 11, 255760E, 4213525N, 1733 m elev.	10.1 km NE	DS	EM: 9 adults, 2 subadults
5 Sept. 1997 GMF Y-1478	Unnamed lake, Kendrick Creek Canyon, 2.3 km SE of Flora Lake, Tuolumne Co., zone 11, 256305E, 4214065N, 1772 m elev.	10.9 km NNE	DS	None
5 Sept. 1997 GMF Y-1479	Unnamed Lake, Lower Kendrick Creek Canyon, 3.2 km ESE of Flora Lake, Tuolumne Co., zone 11, 256872E, 4214276N, 1761 m elev.	11.4 km NNE	DS	None

6 Sept. 1997 GMF Y-1483	Unnamed lake, Lower Kendrick Creek Canyon, 2.0 km SE of Flora Lake, Tuolumne Co., zone 11, 255127E, 4213120N, 1787 m elev.	9.5 km NE	DS	EM: 1 adult, 1 subadult
6 Sept. 1997 GMF Y-1485	Unnamed lake, Lower Kendrick Creek Canyon, 2.4 km SE of Flora Lake, Tuolumne Co., zone 11, 255138E, 4212924N, 1796 m elev.	9.3 km NE	DS	None
6 Sept. 1997 GMF Y-1486	Unnamed lake, Lower Kendrick Creek Canyon, 2.5 km SSE of Flora Lake, Tuolumne Co., zone 11, 254613E, 4212577N, 1674 m elev.	8.7 km NE	DS	None
6 Sept. 1997 GMF Y-1487	Unnamed lake 1.4 km N of Laurel Lake, Tuolumne Co., zone 11, 254156E, 4211018N, 1784 m elev.	7.2 km NE	DS	PR: 11 subadults, 20 larvae; RS: 1 adult, 2 subadults
6 Sept. 1997 GMF Y-1488	Unnamed lake 2.2 km N of Laurel Lake, Tuolumne Co., zone 11, 254539E, 4211812N, 1754 m elev.	8.0 km ENE	DS	"
6 Sept. 1997 GMF Y-1489	6.9 km ESE of Flora Lake, Tuolumne Co., zone 11, 257171E, 4213603N, 1790 m elev.	11.0 km NE	DS	PR: 2 adults
6 Sept. 1997 GMF Y-1490	Unnamed pond adjacent to Kendrick Creek, 1.4 km SSW of Edith Lake, Tuolumne Co., zone 11, 257803E, 4214477N, 1790 m elev.	12.1 km NE	DS	None
6 Sept. 1997 GMF Y-1493	0.6 km SSE Edith Lake outflow, Tuolumne Co., zone 11, 258551E, 4215105N, 1922 m elev.	13.3 km NE	DS	PR: 1 adult
19 June 1998 GMF Y-1518	Unnamed meadow adjacent to FS Rd 1N97 on Kibbie Ridge 0.9 km S of Wilson Meadow, Tuolumne Co., zone 11, 245108E, 4204224N, 1315 m elev.	5.3 km WSW	DS	PR: 1 adult
19 June 1998 GMF Y-1519	Wilson Meadow, 1.8 km SE of Cherry Lake Dam, Tuolumne Co., zone 11, 245380E, 4205280N, 1464 m elev.	5.0 km W	DS	PR: 300 larvae
19 June 1998 GMF Y-1520	Unmapped meadow 100 m NE of Wilson Meadow, Tuolumne Co., zone 11, 245580E, 4205600N, 1473 m elev.	4.9 km WNW	DS	PR: 40 larvae
Gravel Pit Lake, Yosemite National Park, Tuolumne Co., zone 11, 251600E, 4205500N				
18 Sept. 1996 GMF Y-1245	Gravel Pit Lake, Tuolumne Co., zone 11, 251600E, 4205500N, 1536 m elev.	0	DS	None
18 June 1997, GMF Y-1245	"	"	"	PR: 106 larvae; LC: 16 adults, 58 subadults, 325 larvae; EM: 4 adults, 1 subadult
26 June 2006 GMF Y-1245	"	"	NS	PR: 10 adults; LC: 5 adults
21 June 1997 GMF Y-1277	Unnamed pond 2.1 km SE of Gravel Pit Lake, Tuolumne Co., zone 11, 253587E, 4204488N, 1693 m elev.	2.1 km SE	DS	PR: 1 subadult, 60 larvae; EM: 2 adults, 2 subadults
30 June 2001 GMF Y-2072	Unnamed seasonal pond, 2.16 km NNW of O'Shaughnessy Dam, Tuolumne Co., zone 11, 254533E, 4205669N, 1695 m elev.	2.9 km E	DS	PR: 59 larvae

Jordan Creek at Jordan Creek Rd., 2 miles [3.2 km] above Greeley Hill Rd., Mariposa Co., zone 10, 757101E, 4184384N

19 Apr. 1993 GMF Y-030	Bean Creek at Greeley Hill Rd., 40 m W of Fiske Rd., Greeley Hill community, Mariposa Co., zone 10, 752968E, 4181114N, 976 m elev.	5.3 km SW	DS	LC: 45 adults, 5 larvae
19 Apr. 1993 GMF Y-031	N Fork Merced River at Greeley Hill Rd., near Bower Cave, Mariposa Co., zone 10, 761118E, 4181694N, 717 m elev.	4.8 km SW	DS	LC: 5 larvae
19 Apr. 1993 GMF Y-032	Smith Creek & Rd. 2S45, 2.6 km E of Smith Station Rd. on Greeley Hill Rd., Mariposa Co., zone 10, 757257E, 4182615N, 875 m elev.	1.8 km SSE	DS	PR: 30 larvae
19 Apr. 1993 GMF Y-033	Blackstone Creek. 0.8 mi E of Smith Station Rd. on Greeley Mtn. Rd., Mariposa Co., zone 10, 756216E, 4182274N, 885 m elev.	2.3 km SSW	DS	PR: 10 larvae
9 June 1993 GMF Y-160	Unnamed creek along Old Yosemite Rd., ~4.8 km NE junction w/ Greeley Hill Rd, Mariposa Co., zone 11, 236375E, 4181688N, 1014 m elev.	9.0 km ESE	DS	EM: 1 subadult
24 June 1993 GMF Y-196	Moore Creek on Moore Creek Rd 0.5 km S of State Highway 120, Mariposa Co., zone 10, 758019E, 4187611N, 915 m elev.	3.4 km NNE	DS	PR: 120 larvae
24 June 1993 GMF Y-197	Jordan Creek at Moore Creek Rd bridge, Mariposa Co., zone 10, 760643E, 4182223N, 747 m elev.	4.2 km NNW	DS	PR: 1 subadult, 2 larvae
17 Mar. 2009 GMF P-778	Unmapped pond 0.8 km N of Jordan Creek pond dam, Mariposa Co., zone 10, 757156E, 4184093N, 806 m elev. (coordinates & elevation approximate)	0.8 km N	NS	PR: 17 adults
18 Mar. 2010 GMF P-778	″	″	″	PR: 18 adults; LC: 1 adult

Piney Creek, vicinity of Cadena Rd., Mariposa Co., zone 10, 735049E, 4178405N

20 Apr. 1993 GMF Y-036	Wheeler Creek at end of Piney Creek Rd, N end of Lake McClure, Mariposa Co., zone 10, 736668E, 4175038N, 259 m elev.	3.7 km SE	DS	None
3 June 1993 GMF Y-147	Penon Blanco Rd E Fork Piney Creek, 3.1 km E of Granite Sp. Rd. & Penon Blanco intersection, Mariposa Co., zone 10, 740854E, 4178360N, 549 m elev.	5.8 km E	DS	AB: 2 subadults; PR: 10 larvae; LC: 1 subadult
3 June 1993 GMF Y-148	Penon Blanco Rd., E Fork Piney Creek, 2.7 km E of Granite Sp. Rd & Penon Blanco Intersection, Mariposa Co., zone 10, 740675E,4178350N, 549 m elev.	5.6 km E	DS	AB: 55 subadults; PR: 3 larvae; LC: 1 adult
17 Mar. 2009 GMF P-777	Unmapped pond 0.5 km SW Penon Blanco Point, Mariposa Co., zone 10, 742974E, 4180704N, 573 m elev. (coordinates & elevation approximate)	8.2 km WSW	DS	EM: 21 adults
6 Apr. 2010 GMF P-777	″	″	″	EM: 11 adults
3 June 1993, GMF Y-149	Stock pond on Marshes Flat Rd 0.08 km S of junction w/Lozano Rd., Tuolumne Co., zone 10, 735297E, 4180269N, 336 m elev.	1.9 km NNE	DS	AB: 400 subadults, 200 larvae; PR: 26 subadults, 75 larvae
3 June 1993 GMF Y-150	First Creek, Marshes Flat Rd 1.5 km N of junction w/Lozano Rd. Tuolumne Co., zone 10, 735541E, 4181236N, 287 m elev.	2.9 km NNE	DS	PR: 3 larvae

3 June 1993 GMF Y-151	Hatch Creek, Marshes Flat Rd 1.4 km N junction w/Lozano Rd. Tuolumne Co., zone 10, 735389E, 4181426N, 305 m elev.	3.0 km NNE	DS	PR: 75 larvae
3 June 1993 GMF Y-152	Second Creek, Marshes Flat Rd 2.6 mi ESE junction w/Lozano Rd., Tuolumne Co., zone 10, 735736E, 4181952N, 336 m elev.	3.6 km NNE	DS	PR: 15 larvae
4 May 1994 GMF Y-151B	Hatch Creek, upstream from confluence w/Second Creek, Tuolumne Co., zone 10, 735648E, 4182054N, 336 m elev.	3.7 km NNE	DS	PR: 60 larvae; RC: 3 adults, 5 subadults; EM: 3 adults
5 June 2003 GMF Y-2571	N shore Lake McClure, Mariposa Co., zone 10, 743872E, 4175461N, 255 m elev.	9.2 km WNW	DS	AB: 1 adult, 42 subadults, 5 larvae
O'Neals, Madera Co., zone 11, 260524E, 4112252N				
19 May 1993 GMF Y-108	Stock pond on Oak Grove Rd. S of Blade Creek crossing, Mariposa Co., zone 11, 245818E, 4138356N, 458 m elev.	29.9 km NW	DS	LC: 20 adults, 13 larvae
19 May 1993 GMF Y-109	Rock Creek along Oak Grove Rd., T7R19E Sec 15, Mariposa Co., zone 11, 244395E, 4135127N, 305 m elev.	28.0 km NW	DS	PR: 35 larvae; LC: 8 subadults, 55 larvae; EM: 1 adult
19 May 1993 GMF Y-110	Specimen Springs, Jct Bailey Flats Rd. & Specimen Springs Rd., Madera Co., zone 11, 245873E, 4132592N, 290 m elev.	25.1 km NNW	DS	LC: 1 larva
19 May 1993 GMF Y-111	Chowchilla River on Specimen Springs Rd. next to Kit Fox Rd., Madera Co., zone 11, 245666E, 4130294N, 850 m elev.	23.4 km NW	DS	LC: 7 adults, 4 subadults, 10 larvae
19 May 1993 GMF Y-112	Coarsegold Creek, State Highway 49 1.6 km N of Coarsegold, Madera Co., zone 11, 262868E, 4127774N, 734 m elev.	15.7 km N	DS	PR: 1 metamorph; LC: 1 larva; EM: 1 adult
20 May 1993 GMF Y-117	Miami Creek at State Highway 49, Madera Co., zone 11, 259880E, 4135756N, 595 m elev.	23.5 km NNW	DS	PR: 150 larvae LC: 6 adults, 16 larvae
26 May 1993 GMF Y-130A	Chapman Creek off Raymond Rd, Madera Co., zone 11, 238435E, 4127406N, 206 m elev.	26.8 km NW	DS	AB: 1 subadult, 650 larvae; PR: 1 subadult, 150 larvae; LC: 9 adults, 226 larvae; EM: 1 adult
26 May 1993 GMF Y-131	Daulton Creek SW of Knowles Junction on Rd. 607, 4.8 km E of Jct of Roads 607 & 29, Madera Co., zone 11, 239832E, 4119433N, 196 m elev.	21.9 km WNW	DS	AB: 25 subadults; PR: 15 subadults
26 May 1993 GMF Y-132	Stock water trough 3.5 km SW of jct Roads 607 & 29, Madera Co., zone 11, 235969E, 4118173N, 210 m elev.	25.3 km WNW	DS	AB: 30 subadults; PR: 8 subadults
26 May 1993 GMF Y-135	Crooks Creek at Co. Rd. 600 (Ahwahnee or Grub Gulch Rd), Madera Co., zone 11, 257021E, 4136741N, 583 m elev.	24.7 km NNW	DS	PR: 1 subadult, 15 larvae; LC: 15 adults, 10 larvae
27 May 1993 GMF Y-136	E fork Chowchilla River at Co. Rd. 810 (0.16 km S of Co. Rd. 800) near Bailey Flats, Madera Co., zone 11, 251151E, 4136386N, 336 m elev.	25.9 km NNW	DS	LC: 2 adults, 1 subadult, 1 larva
27 May 1993 GMF Y-137	Co. Rd. 810, 0.5 km S of Co. Rd. 800 (Bailey Flats) in small creek channel leading to E fork Chowchilla River, Madera Co., zone 11, 251457E, 4136224N, 336 m elev.	25.6 km NNW	DS	AB: 400 larvae

2 June 1993 GMF Y-142	Rancheria Creek on Echo Valley Rd. (Co. Rd. 423) 0.32 km E of Rd. 426 Crane Valley Rd. (E of Oakhurst), Madera Co., zone 11, 267998E, 4131929N, 839 m elev.	21.1 km NNE	DS	PR: 350 larvae; LC: 1 adult
2 June 1993 GMF Y-143	Little Finegold Creek & Rd. 200 0.8 km E of Rd. 221, Madera Co., zone 11, 274236E, 4121186N, 807 m elev.	16.4 km NE	DS	PR: 100 larvae; LC: 1 adult, 1 subadult, 60 larvae EM: 1 adult
2 June 1993 GMF Y-145	Little Finegold Creek at Co. Rd. 200, 1.9 km E of Finegold Bridge, Madera Co., zone 11, 268007E, 4119140N, 458 m elev.	10.2 km NE	DS	PR: 2 subadults; LC: 6 adults, 2 subadults, 10 larvae
2 June 1993 GMF Y-146	Fine Gold Creek at Co. Rd. 200, 1.4 km NE of House Camp Rd., Madera Co., zone 11, 266648E, 4117707N, 403 m elev.	8.2 km NE	DS	LC: 7 adults, 1 subadult, 40 larvae
6 June 1994 GMF S-462	Unnamed tributary to Jose Cr, on USFS Rd 9S07B, ~2.0 km from jct w/USFS 9S07, Fresno Co., zone 11, 289005E, 4106489N, 1098 m elev.	29.1 km ESE	DS	PR: 6 larvae
7 June 1994 GMF S-463	Jose Creek tributary, at jct of Old Railroad Grade & USFS Rd 9S07, ~4.4 km from jct USFS Rd 9S07 & Italian Bar Rd, Fresno Co., zone 11, 289422E, 4110966N, 946 m elev.	28.9 km E	DS	PR: 197 larvae; EM: 2 adults, 2 subadults
28 Sept. 1994 GMF S-464A	Jose Creek off Italian Bar Rd, off Jose Basin Rd, Fresno Co., zone 11, 288622E, 4112818N, 549 m elev.	28.1 km E	DS	PR: 3 subadults; RB: 15 adults, 409 subadults; EM: 21 adults, 4 subadults
27 Sept. 1994 GMF S-464B	Jose Creek off Italian Bar Rd, off Jose Basin Rd, Fresno Co., zone 11, 288660E, 4112790N, 610 m elev.	28.14 km E	DS	PR: 1 subadult; RB: 4 adults, 77 subadults; EM: 8 adults
8 June 1995 GMF S-464A/B	Jose Creek off Edison Rd., Fresno Co., zone 11, 288980E, 4112300N, 586 m elev.	28.5 km E	DS	PR: 4 adults, 39 larvae; RB: 6 adults, 7 metamorphs; EM: 1 adult, 4 subadults
21 June 1999 GMF S-464B/C	Jose Creek, Jose Basin Rd. downstream to Southern California Edison bridge, Fresno Co., zone 11, 288950E, 4111720N, 763 m elev.	28.4 km E	DS	PR: 90 larvae; RB: 2 subadults; EM: 4 adults, 2 subadults
7 June 1994 GMF S-464C	Jose Creek, on USFS Rd 9S07, ~2.8 km from jct with Italian Bar Rd, Fresno Co., zone 11, 288914E, 4111697N, 911 m elev.	28.4 km E	DS	PR: 155 larvae; EM: 5 adults, 1 subadult
7 June 1994 GMF S-465	Willow creek, on Co. Rd. 235, 4.5 mi from jct w/ Powerhouse Rd, just NW of Redinger Lake on the San Joaquin River, Madera Co., zone 11, 281599E, 4114447N, 415 m elev.	21.2 km ENE	DS	LC: 15 larvae
2 June 1993 GMF S-465D	S Fork of Willow Creek at Rd 200 in South Fork, Madera Co., zone 11, 278496E, 4122771N, 781 m elev.	20.8 km NE	DS	LC: 1 adult
2 May 1995 GMF S-694A	Saginaw Creek tributary to San Joaquin River off Minarets (Mammoth pool) Rd/FS Rd 81 (Minarets District), 9.4 km from jct Italian Bar Rd., Madera Co., zone 11, 286495E, 4120638N, 1183 m elev.	27.3 km ENE	DS	PR: 1 metamorph
4 May 1995 GMF S-694B	Saginaw Ck, 200 m downhill from Minarets Rd./FS Rd 81, 7.2 km from jct Italian Bar Rd, Madera Co., zone 11, 285598E, 4118634N, 1196 m elev.	25.9 km ENE	DS	PR: 1 adult, 100 larvae; EM: 7 adults

18 July 1995 GMF Y-694C	Saginaw Creek, lower reach (above & below rd 225, above the N shore of Redinger Lake), Madera Co., zone 11, 285596E, 4116284N, 525 m elev.	25.4 km ENE	DS	EM: 1 subadult
4 May 1995 GMF S-698	Hookers Cr, off FS Rd 8S44, 1.0 km E of Minarets Rd, 10.6 km E of jct Italian Bar Rd., Madera Co., zone 11, 288504E, 4119892N, 1178 m elev.	29.0 km ENE	DS	EM: 1 adult
19 July 1995 GMF S-698B	Hookers Creek (S of road 81) in sections 30 & 29 of T8S, R24E], Madera Co., zone 11, 287010E, 4119536N, 1190 m elev.	27.5 km ENE	DS	PR: 1 subadult, 40 larvae; EM: 4 adults, 3 subadults
8 June 1995 GMF S-715	Mill Creek tributary to Jose Creek, Fresno Co., zone 11, 288938E, 4112664N, 666 m elev.	28.4 km E	DS	EM: 2 adults, 4 subadults

APPENDIX 2. Surveys of recent Sierra Nevada *R. draytonii* populations and occurrences. Type of survey: DS = Daytime Survey, NS = Nighttime Survey;. Starred (*) surveys at Jack Creek (16 August 1998 and 3 September 1999) were conducted in the Perla Laguna lakebed downstream of the Jack Creek pond.

Date	Type of Survey	*Rana draytonii* observed				Surveyor; Survey #
		Adults	Subadults & metamorphs	Larvae	Egg masses	
Jack Creek pond, Butte County (zone 10, 637151E, 4398630N)						
3 July 1996	DS	0	0	0	0	GMF; P-393
13 July 1997	DS	0	0	0	0	SJB; 1997-0713-3
19 July 1997	DS	2	21	5	0	SJB; 1997-0719-4
19 July 1997	NS	8	0	0	0	SJB; 1997-0719-4
20 July 1997	DS	3	42	7	0	SJB; 1997-0720-1
26 July 1997	DS	4	60	7	0	SJB; 1997-0726-1
26 July 1997	NS	14	0	0	0	SJB; 1997-0726-1
14 Aug. 1997	NS	11	18	0	0	SJB; 1997-0814-1
19 June 1998	DS	4	0	0	0	SJB; 1998-0619-1 GMF; P-393
19 June 1998	NS	16	0	8	0	SJB; 1998-0619-1 GMF; P-393
16 Aug. 1998*	NS	2	0	0	0	SJB; 1998-0816-2
10 July 1999	DS	7	18	0	0	SJB; 1999-0710-1
3 Sept. 1999*	NS	4	0	0	0	SJB; 1999-0903-1
29 July 2000	DS	0	32	0	0	SJB; 2000-0729-1
29 July 2000	NS	8	0	0	0	SJB; 2000-0729-2
15 July 2001	DS	1	22	0	0	SJB; 2001-0715-1
6 July 2002	DS	0	2	0	0	SJB; 2002-0706-2
6 July 2002	NS	4	0	0	0	SJB; 2002-0706-2
22 Aug. 2002	DS	0	1	2	0	GMF; P-393
22 Aug. 2002	NS	3	1	0	0	GMF; P-393
28 Aug. 2003	DS	2	1	0	0	GMF; P-393
29 Aug. 2003	NS	7	2	0	0	GMF; P-393
23 May 2007	NS	3	1	0	0	GMF; P-393
23 June 2007	DS	0	1	1	0	SJB; 2007-0623-2
17 July 2007	DS	0	1	4	0	SJB; 2007-0717-2
Little Oregon Creek ponds, Yuba County						
North pond (zone 10, 657152E, 4365792N)						
5 July 1997	DS	N/A (habitat covered in scrub, not evident)				SJB; 1997-0705-3
6 Oct. 2000	NS	4	0	0	0	GMF; P-494 SJB; 2000-1006-1
7 July 2001	NS	2	2	0	0	SJB; 2001-0707-4
14 July 2001	NS	1	2	0	0	SJB; 2001-0714-5
21 Aug. 2002	NS	1	0	0	0	GMF; P-494
28 Aug. 2003	NS	1	0	0	0	GMF; P-494
9 July 2006	DS	0	0	0	0	SJB; 2006-0709-1
22 May 2007	NS	0	0	0	0	GMF; P-494
17 July 2007	NS	3	0	0	0	SJB; 2007-0717-1
30 July 2008	NS	1	0	0	0	SJB; 2008-0730-1
14 June 2011	NS	0	0	0	0	GMF; P-494
15 June 2011	NS	0	0	0	0	GMF; P-494
South pond (zone 10, 657212E, 4365764N)						
6 Oct. 2000	NS	2	0	0	0	GMF; P-495 SJB; 2000-1006-2
7 July 2001	NS	1	1	0	0	SJB; 2001-1007-2
14 July 2001	NS	1	0	2	0	SJB; 2001-1014-2
21 Aug. 2002	NS	0	0	0	0	GMF; P-495
28 Aug. 2003	NS	0	0	0	0	GMF; P-495
9 July 2006	DS	0	0	1	0	SJB; 2006-0709-2
22 May 2007	NS	0	0	0	0	GMF; P-495
11 July 2007	NS	0	0	0	0	SJB; 2007-0711-2
14 June 2011	NS	0	0	0	0	GMF; P-495
15 June 2011	NS	0	0	0	0	GMF; P-495
Sailor Flat ponds, Nevada County						
East pond (zone 10, 675797E, 4353190N)						
17 Sept. 2003	DS	1	0	1	0	GMF; Y-2648
18 Sept. 2003	NS	0	0	0	0	GMF; Y-2648
West pond (zone 10, 676041E, 4353229N)						
17 Sept. 2003	DS	1	0	0	0	GMF; Y-2649

Date	Type of Survey	*Rana draytonii* observed				Surveyor; Survey #
		Adults	Subadults & metamorphs	Larvae	Egg masses	
18 Sept. 2003	NS	0	0	0	0	GMF; Y-2649
Big Gun Diggings ponds, Placer County						
West pond (zone 10, 696467E, 4323387N)						
9 July 2006	NS	28	0	0	0	GMF; P-669A
9 Sept. 2009	NS	13	50	0	0	GMF; P-669A
Central pond (zone 10, 696589E, 4323497N)						
9 July 2006	NS	16	0	0	0	GMF; P-669B
9 Sept. 2009	NS	16	4	0	0	GMF; P-669B
North pond (zone 10, 696570E, 4323550N)						
9 July 2006	NS	2	2	0	0	GMF; P-669C
South pond (zone 10, 696637E, 4323570N)						
9 July 2006	NS	2	0	0	0	GMF; P-669D
Ralston Ridge pond, Placer County (zone 10, 698548E, 4319404N)						
24 June 2001	NS	1	0	0	0	GMF; P-528
3 Apr. 2002	DS	0	0	0	0	GMF; P-528
18 Apr. 2002	NS	0	0	0	0	GMF; P-528
20 May 2002	DS, NS	0	0	0	0	SJB; 2002-0520-1
17 Apr. 2003	NS	0	0	0	0	GMF; P-528
3 June 2008	NS	0	0	0	0	GMF; P-528
Little Silver Creek, El Dorado County (zone 10, 693416E, 4308624N)						
10 Sept. 2009	DS	1	0	0	0	GMF; P-788
Bear Creek tributary, El Dorado County (zone 10, 692269E, 4306363N)						
10 Sept. 2009	DS	1	0	0	0	GMF; P-790
Spivey Pond, El Dorado County (zone 10, 708820E, 4291082N)						
1 July 1997	NS	6	0	1	0	GMF; T-049
2 July 1997	DS	0	0	1	0	GMF; T-049
16 Mar. 1998	DS	2	0	0	0	GMF; T-049
6 Apr. 1998	DS	0	0	0	0	GMF; T-049
						SJB; 1998-0406-2
6 Apr. 1998	NS	1	0	0	0	GMF; T-049
29 Apr. 1998	DS	0	0	0	3	GMF; T-049
13 May1998	NS	3	0	0	0	GMF; T-049
14 May 1998	DS	0	0	1	2	GMF; T-049
27 May 1999	DS	0	0	0	0	GMF; T-049
27 May 1999	NS	0	0	0	0	GMF; T-049
26 Apr. 2000	NS	0	0	0	0	GMF; T-049
27 Apr. 2000	DS	2	0	0	1	GMF; T-049
27 Apr. 2000	NS	0	0	0	0	GMF; T-049
24 Aug. 2000	DS, NS	0	0	0	0	GMF; T-049
12 Sept. 2000	NS	0	2	0	0	GMF; T-049
14 Sept. 2000	NS	0	0	0	0	GMF; T-049
11 Oct. 2000	NS	0	0	0	0	GMF; T-049
12 Oct. 2000	DS, NS	0	0	0	0	GMF; T-049
1 May 2001	DS	0	0	0	0	GMF; T-049
1 May 2001	NS	2	0	0	0	GMF; T-049
15 Mar. 2002	DS	0	0	0	0	GMF; T-049
2 Apr. 2002	NS	0	0	0	0	GMF; T-049
23 Apr. 2002	NS	3	0	0	0	GMF; T-049
29 May 2002	NS	1	0	0	0	GMF; T-049
30 May 2002	DS	0	0	0	0	GMF; T-049
17 Apr. 2003	DS, NS	0	0	0	0	GMF; T-049
22 Sept. 2003	DS	0	0	0	0	GMF; T-049
24 May 2006	DS, NS	0	0	0	0	SJB; 2006-0524-1
20 June 2007	DS	0	0	0	0	SJB; 2007-0620-1
19 July 2008	DS	0	0	0	0	SJB; 2008-0719-2
Youngs Creek, Calaveras County (zone 10, 693938E, 4232894N (approx. coordinates))						
No surveys						
Cuneo Creek, Mariposa County (zone 10, 747986E, 4180764N)						
8 June 1992	DS	0	0	25	0	GMF; Y-158
15 July 1992	DS	0	0	0	0	GMF; Y-158
9 June 1993	DS	0	0	0	0	GMF; Y-158