

**CALIFORNIA RED-LEGGED FROG SURVEYS ON THE LOS
BANOS WILDLIFE COMPLEX, 2002**



California red-legged frog adult. Photo by Catherine Dickert.

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Abstract

The California red-legged frog (*Rana aurora draytonii*) is a large pond frog that is endemic to California and Baja California. It has been extirpated from an estimated seventy percent of its historic range, but persists in coastal drainages of central California, in some Coast and Transverse Range drainages, as well as isolated localities in the Sierra Nevada. California Department of Fish and Game considers this frog a Species of Special Concern. This frog was listed as Threatened under the Endangered Species Act in 1996. We began surveys on the Upper Cottonwood Creek, San Luis, and Little Panoche Wildlife Areas for California red-legged frogs in potential habitats that included stock ponds, ephemeral streams, stream plunge pools, Little Panoche Reservoir and associated downstream water control structures. Survey methods included daytime visual searches and night listening stations. At each location, we recorded amphibian species present, life stage, and presence of any predators. We found California red-legged frogs at the Upper Cottonwood Creek and San Luis Reservoir Wildlife Areas using visual searches. Some of these locations also supported high numbers of Diablo Range garter snakes (*Thamnophis atratus zaxanthus*), which preyed upon metamorph frogs. High numbers of exotic red swamp crayfish (*Procambarus clarki*) were found in one stock pond on the Upper Cottonwood Creek Wildlife Area where California red-legged frogs were absent. These crayfish have also been seen in a rock plunge pool located downstream from sites supporting California red-legged frogs on the Upper Cottonwood Creek Wildlife Area. Plans to deal with this aggressive threat to native wildlife are currently under consideration.

Keywords: California red-legged frogs, wildlife areas, exotic predators

Introduction

The California red-legged frog (*Rana aurora draytonii*) is the southern ranging subspecies of red-legged frog (*Rana aurora*), a species that ranges from south-western British Columbia into north-western Baja California. The northern form, known as the northern red-legged frog (*Rana aurora aurora*), ranges south to a zone of potential overlap or intergradation with the California red-legged frog near Elk, Mendocino County. Evidence exists for the separation of the two subspecies into separate species (Shaffer, presentation to the Sacramento-Shasta Chapter of The Wildlife Society, 2002), but currently subspecies are recognized with the California red-legged frog alone protected as Threatened under the Endangered Species Act (US Fish and Wildlife Service 2002). The California red-legged frog has been extirpated from approximately 70 percent of its former range due to factors such as the introduction of predators, and habitat alteration and destruction (Jennings and Hayes 1994). Its current range does

not include the Central Valley, where it was found historically. It does occur in the hills surrounding the valley to approximately 1500 m in elevation (Jennings and Hayes 1994) and in coastal drainages. Very few isolated populations are known to be extant in the Transverse Range and south.

California red-legged frogs grow to be large frogs (85-138 mm SUL) that inhabit still or slow moving waters (Jennings and Hayes 1994). They can be found in stock ponds, permanent and intermittent streams, and natural ponds. Two types of aquatic habitat are important to the frogs; breeding and summer refuge habitat. Breeding habitat is typically still water with few trees or shrubs surrounding it. This exposure to sunlight helps eggs develop quickly into metamorphs while the pond dries in the hot, dry Mediterranean summers typical in their range. Adult frogs that have finished breeding require habitat with water throughout the summer. These sites are often shaded from sunlight by thick tree canopy, which also helps protect adult frogs from predators. Adult frogs will travel X km over land in a straight line from breeding to over-summer habitat.

California red-legged frogs can be distinguished from bullfrogs (*Rana catesbiana*) by their pronounced dorsolateral ridge (Stebbins 1985). Other distinctive features of California red-legged frogs include a white or cream colored jaw stripe, prominent striping on tibias, and often a red wash on their underside and legs (Wright and Wright 1933).

The objective of our surveys was to document California red-legged frog presence on the Upper Cottonwood Creek, San Luis Reservoir, and Little Panoche Reservoir Wildlife Areas. This included documentation of habitat available to frogs at different stages of their life history and any threats to frogs or their habitat. We characterized occupied habitat as breeding or over-summer habitat based on the age class of frog present and the structure of the vegetation surrounding the pond.

Study Area

These wildlife areas are located on the east side of the Coast Range in Central California. Summers in this area are hot and dry; winters are cool and short. The Upper Cottonwood Creek and San Luis Reservoir Wildlife Areas can generally be described as blue oak series, featuring blue and live oak woodlands, and as California

annual grassland (Sawyer and Keeler-Wolf 1995). They receive approximately 28 cm of rainfall per year and often experience high winds of up to 55 km/hr. The San Luis Reservoir Wildlife Area (365 ha) is located in western Merced County adjacent to the San Luis Reservoir. It is north of Pacheco State Park and west of the reservoir. State highway 152 runs along its border in a north-east direction. The San Luis Wildlife Area is owned by the U.S. Bureau of Reclamation and California Department of Water Resources as mitigation for the San Luis Reservoir. It is managed by the California Department of Fish and Game as part of the Los Banos Wildlife Complex. Elevation on the San Luis Reservoir Wildlife Area ranges from about 460 m along ridge tops to 183 m at the reservoir's edge. The terrain is hilly, with steep hillsides and deep gullies. There are three ponded areas on the wildlife area and one ephemeral creek.

Upper Cottonwood Creek Wildlife Area is located partially in Merced County (1612 ha) and partially in Santa Clara County (96.5 ha). It is owned and managed by the California Department of Fish and Game. It is bordered by state highway 152 on the south and west, and private range land otherwise. Elevation ranges from about 200 m near the reservoir to 610 m along the northern ridges. This wildlife area also has steep hills and deep canyons. There are several ephemeral streams on the wildlife area, which have pooled areas that may hold water late into the summer. There are several stock ponds that were either constructed as cattle watering holes by previous landowners or as wildlife watering areas since the California Department of Fish and Game acquired the property.

Little Panoche Reservoir Wildlife Area (315 ha) is located in north-western Fresno County. The surrounding landuse is range for sheep and cattle. Climatically, it is drier than Upper Cottonwood Creek or San Luis Wildlife Areas, and receives an average of 13 cm of rainfall per year. It can be characterized as California annual grassland in the Sawyer and Keeler-Wolf system (1995). This wildlife area contains Little Panoche Reservoir, which varies from four to five hectares in area depending on rainfall. Cattail and tule grow along the edges of the reservoir and the creek that feeds it. *Atriplex* (*Atriplex* sp.) and bladderpod (*Isomeris arborea*) shrubs have been planted on the wildlife area. The wildlife area is owned by the U.S. Bureau of Reclamation and

California Department of Water Resources, and is managed by the California Department of Fish and Game.

Methods

To locate California red-legged frogs on the wildlife areas we used daytime visual searches and nocturnal listening sessions. We learned the locations of drainages and stock ponds and focused on these habitats for searches. Spring and summer visits were made to each survey site for daytime visual surveys. At each site, we recorded any amphibian or reptile species present and their abundance. We counted California red-legged frogs and recorded their life stage. We also noted any potential predators and cohabitants present.

Night listening stations were located along routes that passed potential California red-legged frog habitat. At each station, observers spent five minutes listening for any calling amphibians. Calls were rated according to the following system: a single calling frog was rated 1, more than one calling frog with distinct spaces in between calls was rated 2, and a full chorus in which individuals could not be distinguished was rated 3. Surveys took place at least one hour after sunset during the spring months.

Results

California red-legged frogs were found on the Upper Cottonwood Creek and San Luis Reservoir Wildlife Areas, but were not found on the Little Panoche Reservoir Wildlife Area. Potential California red-legged frog habitat that we checked at the Little Panoche Reservoir Wildlife Area included Little Panoche Creek, a marshy area where the creek feeds into the reservoir, the reservoir itself, a pool downstream of the detention dam, and the stream below the dam. We visited this wildlife area looking for California red-legged frogs five times in total; twice at night and three times during the day. The Pacific chorus frog (*Pseudacris regilla*) was the only amphibian detected on the wildlife area.

On the San Luis Reservoir Wildlife Area, California red-legged frogs were found at only one site. Adults were found at the Lost Pond site in October. Lost Pond is a deep pool on an ephemeral stream that runs through a canyon on this wildlife area.

Cattail grows along its edges and trees line it on both sides (Figure 1). Only adult frogs were seen at this site; no larvae or eggs were seen earlier in the year. We checked the stream for potential California red-legged frog habitat in other places, but it dried in late spring. There were two additional ponds on the San Luis Reservoir Wildlife Area that we surveyed for California red-legged frogs, but no frogs were found. One is a stock pond that dried in the summer of 2002, and the other is a large pond that receives overflow from the San Luis Reservoir. A dam keeps water in this pond in the summer when the reservoir water level is low. Several large fish were observed in this pond that may be amphibian predators.

At Upper Cottonwood Creek Wildlife Area, California red-legged frogs were found at eight sites. Four of these sites appear to be adult over-summer habitat, with no other life stages present (Table 1). Two sites could be considered breeding habitat as they contained eggs or larvae and metamorphs. The final two sites contained adults and younger life stages. There were three sites that were considered potential habitat for California red-legged frogs at Upper Cottonwood Creek Wildlife Area, but where no frogs were observed. At two of these sites the introduced crayfish *Procambarus clarkii* was found. One of these sites, Lower East Pond, is a stock pond in which these crayfish were very abundant. The second site with crayfish was a plunge pool on the Main Canyon Creek. Crayfish were seen in the pool on two occasions at lower densities than seen at Lower East Pond. The third site that did not support California red-legged frog was a small stock pond that dried sometime before our visit on August 2, 2002.

California red-legged frogs seemed to coexist with native predators in several ponds. The garter snake *Thamnophis atratus zaxanthus* was found at nine sites where California red-legged frogs were also found (Table 2). These snakes were often quite abundant, especially in the stock pond sites.

Discussion

We were unable to find any California red-legged frogs at Little Panoche Reservoir Wildlife Area, suggesting the population level there is quite low. California Department of Water Resources biologists found at least one California red-legged frog

downstream of the detention dam in 2001 while they were conducting surveys in that area (California Natural Diversity Database 2001). If the California red-legged frog population on the Little Panoche Reservoir Wildlife Area has died out, the source population that could repopulate the property has not been found yet. California red-legged frogs may exist in stock ponds on privately owned ranch lands that surround the wildlife area.

On the San Luis Wildlife Reservoir Area, we found California red-legged frogs in Lost Pond. This habitat is most likely only used by the frogs in the summer, as summer refuge. We visited this site several times in the spring and found no evidence of breeding. The San Luis Reservoir and Upper Cottonwood Creek Wildlife Areas are adjacent to one another, but state highway 152 forms the boundary between them. This highly traveled road (Annual Average Daily Traffic of 28,000, CA Dept. Trans statistics) probably creates an impenetrable barrier for frog dispersal between the two wildlife areas. The adult frogs seen on San Luis Reservoir Wildlife Area may have come to their summer refuge at Lost Pond from breeding grounds on Pacheco State Park. This park has several drainages and small ponds that could provide California red-legged frog breeding habitat. California red-legged frogs have been documented in the park (CNNDDB 2003). Lost Pond is about 275 m from the Pacheco Park border. It is interesting to note that we also found an adult western toad on the San Luis Wildlife Area, but have not documented this species breeding on the wildlife area either. Western toads may forage and shelter on the San Luis Reservoir Wildlife Area as well, using habitat on Pacheco Park for breeding.

Lost Pond was created when a firebreak was constructed perpendicular to a drainage on the San Luis Reservoir Wildlife Area. Maintenance of this firebreak resulted in a dam of dirt and rock building up in the drainage preventing flow in this area and creating the pond environment. The condition of this dam should be inspected yearly and maintenance of this firebreak should continue in order to reinforce the dam and preserve the frogs' over-summer habitat. The Lost Pond drainage dries downstream of this pond in summer. Of the three ponds on the wildlife area, Lost Pond provides the only known over-summer habitat for California red-legged frogs. Lizard Pond is a much smaller pond, at approximately 0.005 ha. It is shallow and dries early in

summer. Big Fish Pond is large (0.5 ha) and deeper than Lizard Pond, but it is infested with predatory fish that enter the pond yearly with raising reservoir water levels. It is also an additional kilometer farther from the Pacheco Park border than Lost Pond is.

Upper Cottonwood Creek Wildlife Area provides the most important California red-legged frog habitat of any property in the Los Banos Wildlife Complex. Breeding occurs at six sites and individuals in all stages of life have been documented on the area. An important exotic predator, the bullfrog, is absent from the wildlife area. At approximately 1601 ha, the area is large enough to contain both breeding and over-summer sites enmeshed in an annual grassland matrix. If California red-legged frogs exist in metapopulations, where local extinctions occur in habitats that are later repopulated by individuals dispersing from nearby subpopulations, this system could successfully function at Upper Cottonwood Creek Wildlife Area. The wildlife area is adjacent to cattle ranches where similar habitat exists and frogs have been documented on one neighboring ranch that is protected by TNC easement (CNNDB X). Thus the area available for California red-legged frog dispersal is even larger than the wildlife area provides alone.

Annual grasses may have negative impacts on California red-legged frogs. The frogs may have difficulty traveling through the dense grasses and be more easily predated. In summer when the grasses have dried, the potential for brush fire increases, which can be started both intentionally and unintentionally by motorists on highway 152 or by recreational users of the wildlife area. Cattle grazing may reduce the thatch on the area, thus facilitating frog movement and reducing fuel load.

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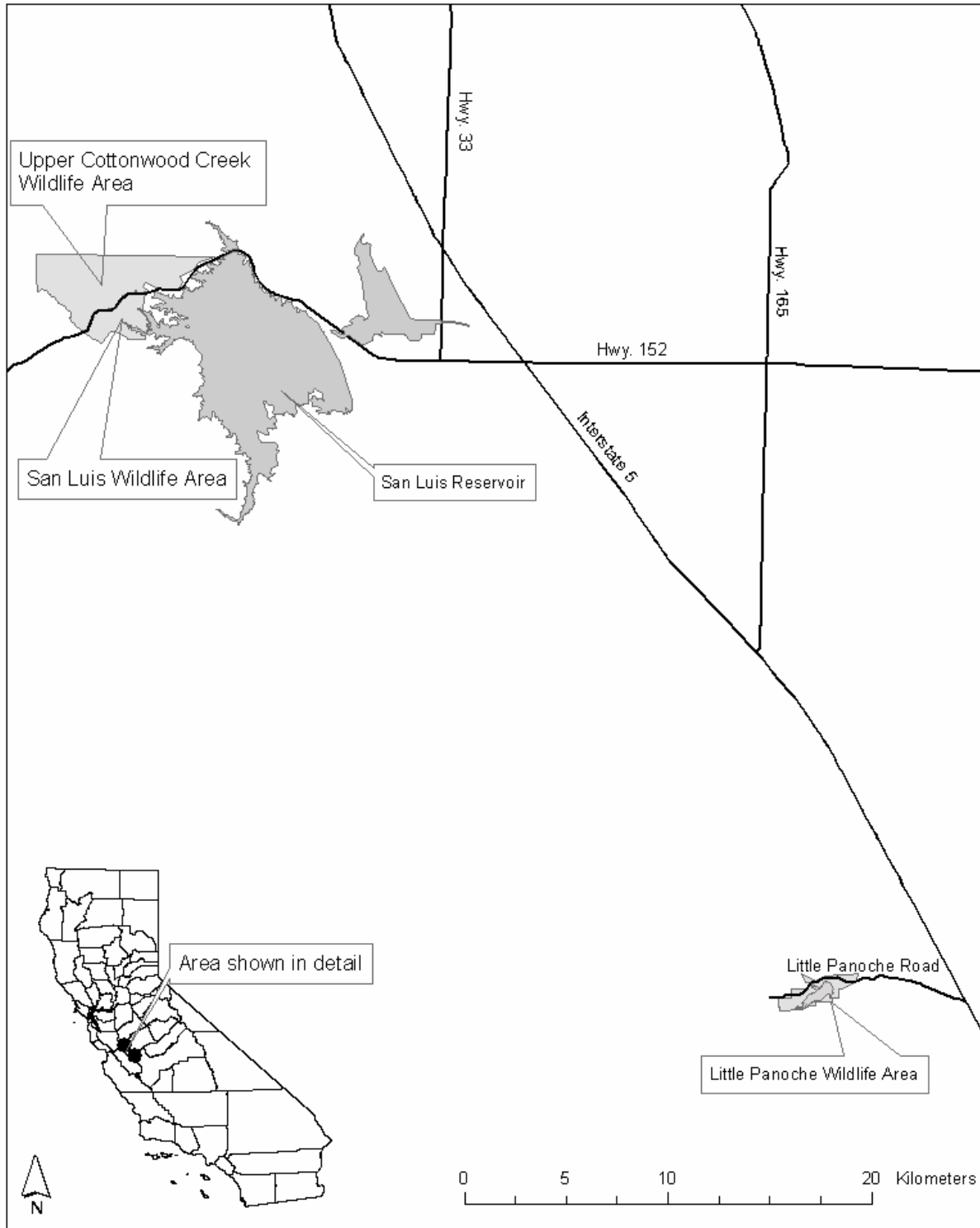


Figure 1. California red-legged frog survey sites in Fresno, Merced, and Santa Clara Counties, 2002.



Figure 2. Lost Pond at San Luis Reservoir Wildlife Area as it appeared in May, 2002.

Table 1. California red-legged frog life stages present per site type at Upper Cottonwood Creek Wildlife Area, 2002.

<i>Site Name</i>	<i>Site Type</i>	<i>Life stages present</i>
Upper East Pond	Stock pond	Adult
RLF Pond	Stream pool	Adult
O'Connell Stock Pond	Stock pond	Eggs
Muddy Reservoir	DFG Wildlife Pond	Adults, metamorphs, larvae, eggs
Deer Reservoir	DFG Wildlife Pond	Adults
Main Canyon Creek	Stream pool	Adults
County Line Reservoir	Stock Pond	Larvae, metamorphs
Secret Pond	Stock Pond	Metamorphs, adults, larvae

Table 2. Sites at Upper Cottonwood Creek and San Luis Reservoir Wildlife Areas where California red-legged frogs were found with Diablo Range garter snakes (*Thamnophis atratus zaxanthus*).

Pond name	Date visited	Air temp (time)	California red-legged frog life stage	Predators	Coinhabitants	Wildlife area
County Line Reservoir	4/23/2002	83° F (1430)	larvae	<i>Thamnophis atratus</i>	Odinata adults and larvae water boatmen (Corixidae) water striders (Gerridae)	UCCWA
County Line Reservoir	9/4/2002	Unknown	metamorphs	none	none	UCCWA
Creek above Deer Res	5/23/2002	Unknown	adult	none	none	UCCWA
Deer Reservoir	8/9/2002	83° F (0810)	adult	<i>T. atratus</i>	none	UCCWA
Lost Pond	10/18/2002	68° F (unknown)	adult	none	none	SLRWA
Lost Pond	10/5/2002	Unknown	adult	none	none	SLRWA
Muddy Reservoir	3/13/2002	57° F (1330)	eggs, metamorph	none	Domestic cattle <i>T. torosa</i>	UCCWA
Muddy Reservoir	5/23/2002	85° F (1120)	larvae and adults	<i>T. atratus</i>	<i>Pseudacris regilla</i> <i>Taricha torosa</i> Odonata adults	UCCWA
Muddy Reservoir	5/6/2002	75° F (1140)	adult and metamorph	<i>T. atratus</i>	<i>T. torosa</i>	UCCWA
Muddy Reservoir	8/28/2002	85° F (0810)	adults and metamorphs	<i>T. atratus</i>	none	UCCWA
O' Connel Stock Pond	3/15/2002	54° F (1010)	eggs	<i>T. atratus</i>	<i>T. torosa</i> Odinata larvae	UCCWA
RLF Pond	8/9/2002	83° F (0810)	adult	none	none	UCCWA
Secret Pond	10/4/2002	Unknown	metamorphs	none	none	UCCWA
Secret Pond	4/23/2002	84° F (after 1430)	larvae and adult	<i>T. atratus</i>	<i>T. torosa</i> <i>S. occidentalis</i>	UCCWA
Upper East Pond	5/2/2002	76° F (1350)	adult	<i>T. atratus</i>	<i>T. torosa</i>	UCCWA

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