



Surveys for California Red-legged Frogs on Upper Cottonwood Creek & San Luis Reservoir Wildlife Areas, 2003



Survey site at Upper Cottonwood Creek Wildlife Area. Photo by Christina Sousa.

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Abstract

The California red-legged frog, *Rana aurora draytonii*, is a federally Threatened species and is considered a Species of Special Concern in the state of California. Factors such as habitat destruction, commercial harvest, pollution, and predation by non-native species may have contributed to its decline. The California Department of Fish and Game has been conducting California red-legged frog surveys on Upper Cottonwood Creek and San Luis Wildlife Areas since 2001. We performed visual surveys at stock ponds and other areas with potential habitat. We counted the number of California red-legged frogs present and recorded their life stages. Other reptiles and amphibians, as well as invasive or predatory species were recorded. We visited ten different sites during the 2003 season at the two wildlife areas. California red-legged frogs were observed at seven sites. No invasive species were noted. Habitat quality as well as the frog's co-existence with non-native predators should be of concern when monitoring these populations. Further study will give us important insight on the future management of these wildlife areas.

Keywords: California red-legged frog, *Rana aurora draytonii*, red swamp crayfish, *Procambarus clarkii*, non-native predators

Introduction

Amphibians are considered to be an indicator of environmental quality. They are sensitive to changes in both aquatic and terrestrial conditions because their life cycle includes both. The California red-legged frog, *Rana aurora draytonii*, is federally listed as threatened (U.S. Fish and Wildlife Service 2002). It is also considered a Species of Special Concern in the state of California (Jennings and Hayes 1994). California red-legged frogs (CRLF) have been extirpated from approximately 70% of their historic range (U.S. Fish and Wildlife Service 2002). One factor that may have contributed to the frog's decline was extensive market harvesting during the late 1800's for frog legs (Jennings and Hayes 1985). When CRLF numbers began to decline, bullfrogs (*Rana catesbeiana*) were introduced in order to sustain market demand, and preyed upon CRLF, lowering CRLF numbers further (Jennings and Hayes 1994). Invasive species such as bullfrogs may threaten natives by way of predation, as well as out-competing for resources (Keisecker et al. 2001). California red-legged frog habitat in the San Joaquin Valley has also undergone drastic changes due to the development of agriculture and urbanization. A great deal of habitat has been eliminated through agricultural reclamation efforts. Many locations were drained and levied off and flood control projects have disturbed many ephemeral pool systems. Some areas, which

were once seasonally wet, have been converted into permanent waterways and ponds. In these ponds, water levels may change continuously in order to support the irrigation and drainage needs of farmlands. California red-legged frogs have been extirpated from the Central Valley floor, but persist in the Coast Range, Sierras, and disjunct populations can be found in the Transverse Range and South (USFWS 2002).

Since 2001, biologists from the Los Banos Wildlife Complex have been monitoring populations of CRLF on the Upper Cottonwood Creek (UCCWA) and San Luis Reservoir Wildlife Areas (SLRWA). These areas are located in the eastern foothills of the Coast Range and feature ponds with minimal habitat disturbance. However, since our visual surveys began in 2001, we have found an introduced species of crayfish, the red swamp crayfish (*Procambarus clarkii*), in some of the ponds. This species has a reputation for being aggressive, highly adaptive, and a serious threat to amphibians and other native wildlife (Fidalgo et al. 2001, Gamradt and Kats 1996, Gamradt et al. 1997, Gil-Sánchez and Alba-Tercedor 2002).

The purpose of our surveys was to document California red-legged frog populations, potential habitat, and possible threats to its survival on UCCWA and SLRWA. During previous surveys, we have noted the presence of crayfish at sites where CRLF appear absent. Since it is unknown how far the crayfish can travel over land or up drainages, it is important to monitor all of these ponds with particular emphasis on frog and crayfish presence and apparent absence. Long-term monitoring of red-legged frog habitat and populations could provide important insight for the management of this species. We may also learn more about the CRLF relationship with introduced red swamp crayfish and determine what steps, if any are necessary to protect the native frogs from this introduced species.

Study Area

UCCWA and SLRWA are located approximately 18 miles west of the town of Los Banos along HWY 152 (Figure 1). The area consists primarily of rolling, grassy foothills peppered with oak and some rocky outcroppings. These areas are generally described as California annual grassland and blue oak associations (Sawyer and Keeler-Wolf 1995). The climate consists of hot, dry summers, and cool, short winters. SLRWA is

located in western Merced County (365 ha) adjacent to the San Luis Reservoir and is owned by the U.S. Bureau of Reclamation and California Department of Water Resources. It is operated by the California Department of Fish and Game as part of the Los Banos Wildlife Area Complex. Elevation ranges from about 183 m to 460 m. There are three ponds on the property and one ephemeral creek. UCCWA is located almost entirely in western Merced County (1612 ha) with a small part in eastern Santa Clara County (96.5 ha); it is owned and managed by the California Department of Fish and Game. Elevation ranges from about 200 m near the reservoir to 610 m along the northern ridges. UCCWA has several ponds and ephemeral streams. Both areas receive approximately 28 cm of rainfall per year. There are several ephemeral streams on the property that feature pooled water for part of the year. There are also stock ponds that were created by the previous land owner and wildlife reservoirs that were created by California Department of Fish and Game employees.

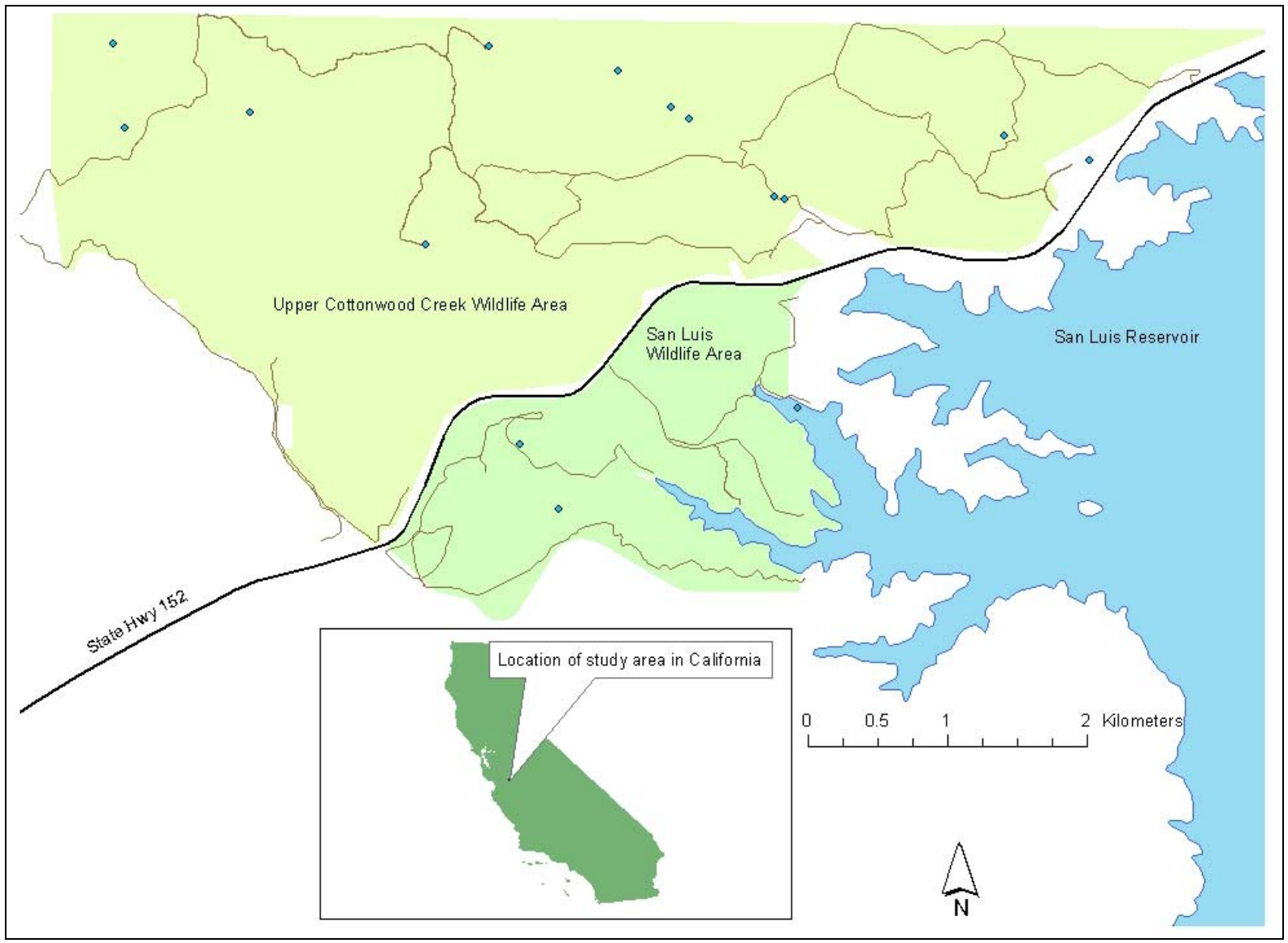


Figure 1. Location of study sites for California red-legged frog surveys during 2003.

Methods

Visual surveys are generally conducted during spring and summer months while adult frogs were active and evidence of breeding was likely to be present. We noted all life stages, which included adults, metamorphs, tadpoles, and egg masses. In order to minimize our impact on the habitat, the soles of any footwear used for the survey(s) were bleached, scrubbed and rinsed, and bleached once more for at least one minute. Thermometers used to obtain water temperatures were also cleaned. During the survey, great care was also taken in keeping away from the water's edge. On our descent to a given pond, one or two photos were taken from a distance so that an image of the entire pond and its surroundings would be captured. When actually hiking in to a pond for surveying, we stopped well before reaching the water in order to scan the edges and water surface with our binoculars. During this time we tried to see any frogs that may have been floating, swimming, or basking, as well as any movement in or near the water. Often, snakes and frogs could be seen this way before becoming aware of our presence. Crayfish were another important animal that we looked for. We tried to spot crayfish either moving near the edge of a pond (in or out of the water) or shooting across the surface of the water. In our data books, we recorded the date, time, location, air temperature (taken in the shade), and we made note of weather or environmental conditions. We recorded all animals we could identify with our binoculars. As we walked towards a pond, particular attention was given to the edges of the water where we occasionally we saw frogs jump, or observed snakes on the water surface during our approach.

Once we reached a pond, we walked the perimeter of the pond with our binoculars, camera, and data books. We recorded species and counted the number of reptiles and amphibians that we observed (including their life stage). We visually searched the water, edges, and banks of each pond. We recorded species such as the crayfish or any other animals observed. Since our counts were often of tadpoles or newt larvae, we sometimes had to estimate the number of individuals that were sighted. Photographs of animals were taken whenever the opportunity arose. Finally, we

recorded the water temperature by reaching out over the water and keeping our feet away from the water's edge.

Results

Thirteen surveys were conducted at UCCWA during the 2003 field season (with a total of eleven different locations) and one survey was conducted at SLWA. We found CRLF in eight of the eleven areas that were studied (Table 1). One of these sites was at the SLWA and the other ten were at UCCWA. Dead crayfish were found in Lower East Pond after it had dried up. Many of the ponds that contained red-legged frogs also contained native predators. These included the Diablo Range garter snake, *Thamnophis atratus zaxanthus*, and the California newt, *Taricha torosa* (Table 2).

Table 1. California red-legged frog life stages found per site during 2003 surveys at Upper Cottonwood Creek and San Luis Reservoir Wildlife Areas. (Life Stage: M = Metamorph; T = Tadpole; A = Adult)

Site Name	Date Surveyed	Location	CRLF Present	/	Life Stage
Lost Souls Drainage	03/06/2003	UCCWA	Yes		M
Lower East Pond	03/28/2003	UCCWA	Yes		T
Upper East Pond	03/28/2003	UCCWA	No		-
O'Connell Stock Pond	05/07/2003	UCCWA	Yes		A + T
Fin Dome Pond	05/07/2003	UCCWA	Yes		A + T
Muddy Reservoir	06/06/2003	UCCWA	Yes		A
Main Creek Canyon	07/11/2003	UCCWA	No		-
Red-legged Frog Pond	07/11/2003	UCCWA	No		-
Deer Reservoir	07/11/2003	UCCWA	Yes		A + T
Upper East Pond	07/17/2003	UCCWA	No		-
Lower East Pond	07/17/2003	UCCWA	No		-
Lost Pond	08/14/2003	SLRWA	Yes		A
Lower East Pond	09/11/2003	UCCWA	No – Dry		-
County Line Reservoir	10/23/2003	UCCWA	Yes		A

Table 2. Species diversity found during the 2003 surveys of Upper Cottonwood and San Luis Reservoir Wildlife Area sites. (Number of individuals given includes all life stages.)

Site Name	Species Observed	# of Individuals
Lost Souls Drainage	<i>R. a. draytonii</i>	1
Lower East Pond	<i>R. a. draytonii</i>	15+
	<i>Pseudacris regilla</i>	1
	<i>P. clarkii</i>	30+
Upper East Pond	<i>T. a. zaxanthus</i>	1
O'Connell Stock Pond	<i>R. a. draytonii</i>	10+
	<i>T. a. zaxanthus</i>	12
	<i>T. tarosa</i>	12+
Fin Dome Pond	<i>R. a. draytonii</i>	15+
Muddy Reservoir	<i>R. a. draytonii</i>	9
	<i>T. tarosa</i>	1 dead
	<i>Unidentified snake</i>	1
Main Creek Canyon Plunge Pool	<i>P. regilla</i>	12+
	<i>T. a. zaxanthus</i>	2
	<i>T. tarosa</i>	5+
Red-legged Frog Pond	No animals seen	0
Deer Reservoir	<i>R. a. draytonii</i>	4
	<i>T. a. zaxanthus</i>	2
	<i>T. tarosa</i>	50+
Lost Pond	<i>R. a. draytonii</i>	1
County Line Reservoir	<i>R. a. draytonii</i>	200+
	<i>T. tarosa</i>	1

In late June of 2003, a fire burned approximately 1012 hectares of UCCWA. The areas surveyed on July 11th were untouched by the fire. The Main Creek Canyon Plunge Pool, Deer Reservoir, and Red-legged Frog Pond did not appear to have any habitat disturbance. However, Upper and Lower East Ponds were re-surveyed on July 17th and were in the direct path of the fire (Figure 2). Both ponds were completely surrounded by burned vegetation but still had some untouched vegetation near the edges. Our first survey of these two ponds was on March 28th, 2003. We visually observed three clusters of California red-legged frog tadpoles in Lower East Pond, and

one *T. a. zaxanthus*, in Upper East Pond. Our second visit to these ponds, July 17th, followed the fire and nothing but insects were seen at either pond.



Figure 2. Upper East Pond before (left) and after (right) a fire during June of 2003 at Upper Cottonwood Creek Wildlife Area.

Discussion

During the 2002 surveys of UCCWA and SLRWA, the only ponds where California red-legged frogs were not observed, were either dry or contained crayfish (Dickert 2003). This might suggest a correlation between crayfish presence and frog absence. However, by the same methods, our 2003 data have shown that CRLF were considered absent from several ponds, even though we only observed crayfish in one of them. We cannot conclude that crayfish (or any species) are absent from a pond simply because we did not observe them, and an example of this would be our surveys of Lower East Pond. A survey from 2001 showed crayfish presence but no confirmed frog sightings. However, during this year's first survey of Lower East Pond, we observed a great deal of CRLF tadpoles. Our second survey, which followed the fire, yielded nothing but insect sightings. The pond edges had filled in considerably with cattail and this made visual surveying quite difficult. Also, being later in the summer, both Upper and Lower East Ponds were considerably murkier with algal growth and possibly due to ash in the water, making visual surveys difficult. It is possible that the metamorphs already left the pond earlier, that fire played a role in their possible absence, or they were eaten by the crayfish that were finally observed on our third survey (after the pond

had dried). Because the timing and conditions of each survey may produce different observations, our data informs us only of species presence when observed. With this, we have been able to show that the CRLF co-exists with other aquatic species, including natural predators. We have not shown that they co-exist with crayfish however. Other information such as temperatures and bank-side vegetation may be gathered for ponds where frogs have been confirmed. By recording life stages, we can determine which ponds are used for breeding. CRLF were found in ponds this season where they were considered absent last season (and vice versa). It is still unclear why frogs appear to be in some ponds and not in others. Our sampling effort plays a role in this detection as we do not sample each pond often enough.

Two seasons of presence / absence surveys is not enough to determine trends in our data. However, we do know that California red-legged frog populations remain at UCCWA and SLRWA. Gathering more data is of great importance. With further study, we may find trends for red-legged frog presence, such as with pond temperatures, elevations, and co-inhabitants. It is important to maintain the native habitat for these threatened animals.

Management Implications

Future management of UCCWA and SLRWA should include a review of routine fire break maintenance. Construction of new fire breaks should not cause excessive erosion or require that fill be pushed into a stream. Acceptable fire breaks should also be maintained. One example of this would be Lost Pond on SLWA where previous fill has actually created and maintained frog habitat.

Grazing at UCCWA or SLRWA must also be taken into consideration. One benefit of grazing is that it would reduce fire load and thus fire-fighting activities on the areas. Also, shorter grass may facilitate frog over-land movement when adults travel to different breeding, summer, and wintering sites. They may get tangled in tall grass and become more susceptible to predation. However, bringing cattle onto these lands may pose serious threats. Drainages and ponds could be trampled and egg masses might be damaged. It is possible that potential contaminants such as chytrid could be tracked into frog habitat. Water pollution is a serious threat as well. The cattle not only create

pollution by way of feces and erosion from trampling, but they may be dusted with pesticide or could have other contaminants present.

Finally, the feasibility of crayfish removal or barriers should be investigated. Trapping for crayfish could cause potential frog mortality. Frogs trapped with crayfish might be eaten and submerged traps will cause frogs to drown. Attempting to remove crayfish however, may be futile if they are coming from the San Luis Reservoir. When the reservoir is full, water backs up onto UCCWA through culverts that run under highway 152. A barrier small enough to prevent crayfish from entering these culverts would easily clog and water flow would be inhibited. Therefore barriers might only be an option if they are extended out away from the culvert. Such a project would require coordination with other agencies such as the Department of Water Resources, CalTrans, and the U.S. Bureau of Reclamation.

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