Monitoring of the California Red-legged Frog, *Rana aurora draytonii*, within Properties of the Los Baños Wildlife Area Complex, 2008

California red-legged frog eggs; Photo by Christina Sousa

Prepared By: Christina L. Sousa
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For additional copies, contact: Resource Assessment Program
Ca Department of Fish & Game
18110 W. Henry Miller Rd.
Los Baños, CA 93635
Phone: (209) 826-0463
Fax: (209) 826-1761

Abstract

The California red-legged frog, *Rana aurora draytonii*, is federally listed as Threatened 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 all have contributed to its decline. The California Department of Fish & Game has been conducting surveys for this species on the San Luis Reservoir and Upper Cottonwood Creek Wildlife Areas since 2001. Between January and July of 2008, we performed frog surveys on these properties, and additionally at Lower Cottonwood Creek Wildlife Area and Little Panoche Reservoir Wildlife Area at a total of 24 sites. Our monitoring consisted primarily of daytime visual surveys and a limited number of night surveys. We were able to confirm frog presence and breeding activity at several sites on Upper Cottonwood Creek Wildlife Area, and observed frog calls during breeding season at Little Panoche Reservoir Wildlife Area. Habitat quality, restoration possibilities, future monitoring, and frog health continue to be key factors in our monitoring efforts.

Keywords: California red-legged frog, Rana aurora draytonii, visual survey, frog call survey, wildlife area

Introduction

The California red-legged frog, *Rana aurora draytonii*, is federally listed as Threatened (U.S. Fish and Wildlife Service 2002), and 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). Extensive market harvesting during the late 1800's for frog legs may be one factor that has contributed to the frog's decline (Jennings and Hayes 1985). When CRLF numbers began to decline, bullfrogs (*Rana catesbeiana*), were introduced in order to sustain market demand, but preyed upon CRLF, thus lowering their numbers further (Jennings and Hayes 1994). Invasive species such as bullfrogs may also threaten natives by out-competing for shared resources (Keisecker et al. 2001). CRLF 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, with many locations having been drained and levied off. Flood control projects have

disturbed a great deal of ephemeral pool systems as well. Some areas that were once seasonally wet, have since been converted into permanent waterways and ponds. These ponds are not ideal CRLF habitat because water levels can often fluctuate in order to support the irrigation and drainage needs of farmlands. Permanent water also supports bullfrogs, which can out compete and prey upon CRLF.

Though CRLF have been extirpated from the Central Valley, they do persist in the Coast Range, Sierras, and disjunct populations can be found in the Transverse Range and south (U.S. Fish & Wildlife Service 2002). Since 2001, biologists from the Los Baños Wildlife Area Complex have been monitoring CRLF populations on the Upper Cottonwood Creek Wildlife Area (UCCWA) and San Luis Reservoir Wildlife Area (SLRWA), and performed limited surveys at Lower Cottonwood Creek Wildlife Area (LCCWA) during 2007. These properties are located in the eastern foothills of the Coast Range and feature man-made stock ponds, springs, and ephemeral pools and drainages. Little Panoche Reservoir Wildlife Area (LPRWA), also found along the Coast Range but slightly further south, contains a permanent body of water in the form of a permanent reservoir along with one ephemeral stream. CRLF were detected at this property during previous occasions, and surrounding land also harbors man-made stock ponds where frog populations could also exist. The purpose of our surveys was to detect CRLF presence, determine if breeding sites exist on our properties, and to assess any possible threats to the survival of this species. Long-term monitoring of CRLF and their habitat could provide important insight for the management of this species. Prior to 2006, only opportunistic monitoring was completed when Department personnel were available. During 2007 however, a new strategy had been adopted to monitor CRLF populations on these Department-owned lands during regular intervals by use of our own standardized protocol. Cattle grazing contracts at some study sites have also played an important role in controlling non-native grasses and to assist with fire prevention. Continued monitoring of the health of CRLF populations was a priority for the Department, as well as studying the effects that cattle presence may have on this species. This year, several factors differed from previous surveys. Due to less precipitation, a decision was made not to graze any of the properties and allow for sparse grasses to recover and thus no cattle disturbance occurred at any of the ponds.

In addition, restoration plans have begun at LCCWA in order to further develop the limited water sources and riparian habitat. Though CRLF have not been observed here previously, LCCWA is in close proximity to lands that do support frog populations. We were able to incorporate regular surveys at this wildlife area in order to monitor aquatic sites for the possibility of CRLF presence. Because CRLF have been observed at LPRWA during other Department efforts in the past, we also visited this wildlife area to determine if CRLF are still present. This property harbors a large reservoir edged in most locations by thick cattail, making both visual surveys and dip-netting efforts difficult and time consuming. However, we incorporated two night surveys here in an effort to confirm presence by way of frog call observations during breeding season. During 2008, we concluded all of our surveys during July, which is a few months earlier than we had during previous years. This decision was based on several factors including state budgetary constraints, a shift in available personnel, and a need to prioritize our staff for other projects already underway. We were able to gain valuable information that can assist us in directing the future management of these wildlife areas and in making proper decisions on how to continue to monitor CRLF during up-coming years.

Study Area

All four study sites are located within relatively close distance to the city of Los Baños, off of Interstate 5, and are located primarily in Merced and Fresno counties (Figure 1). These properties are a part of the California Department of Fish and Game's Los Baños Wildlife Area Complex. Each is utilized by the public for recreation and hunting, with LPRWA being frequently visited for fishing as well. The Lower Cottonwood Creek, Upper Cottonwood Creek, and San Luis Reservoir Wildlife Areas are located approximately 24 kilometers (15 miles) west of the town of Los Baños along Highway 152, and are closely tied together with the exception of some privately owned land between the Lower and Upper Cottonwood Creek units. LPRWA is approximately 45 kilometers (28 miles) further south along Interstate 5, and can be accessed westward along Little Panoche Road. Vegetation associations for these areas are generally described as California annual grassland, but both SLRWA and UCCWA also include blue oak habitat series (Sawyer and Keeler-Wolf 1995). Climate here consists

of hot, dry summers, and relatively short and cool winters. The average rainfall is 28 cm per year (California Department of Fish and Game unpublished data 1970-2006).

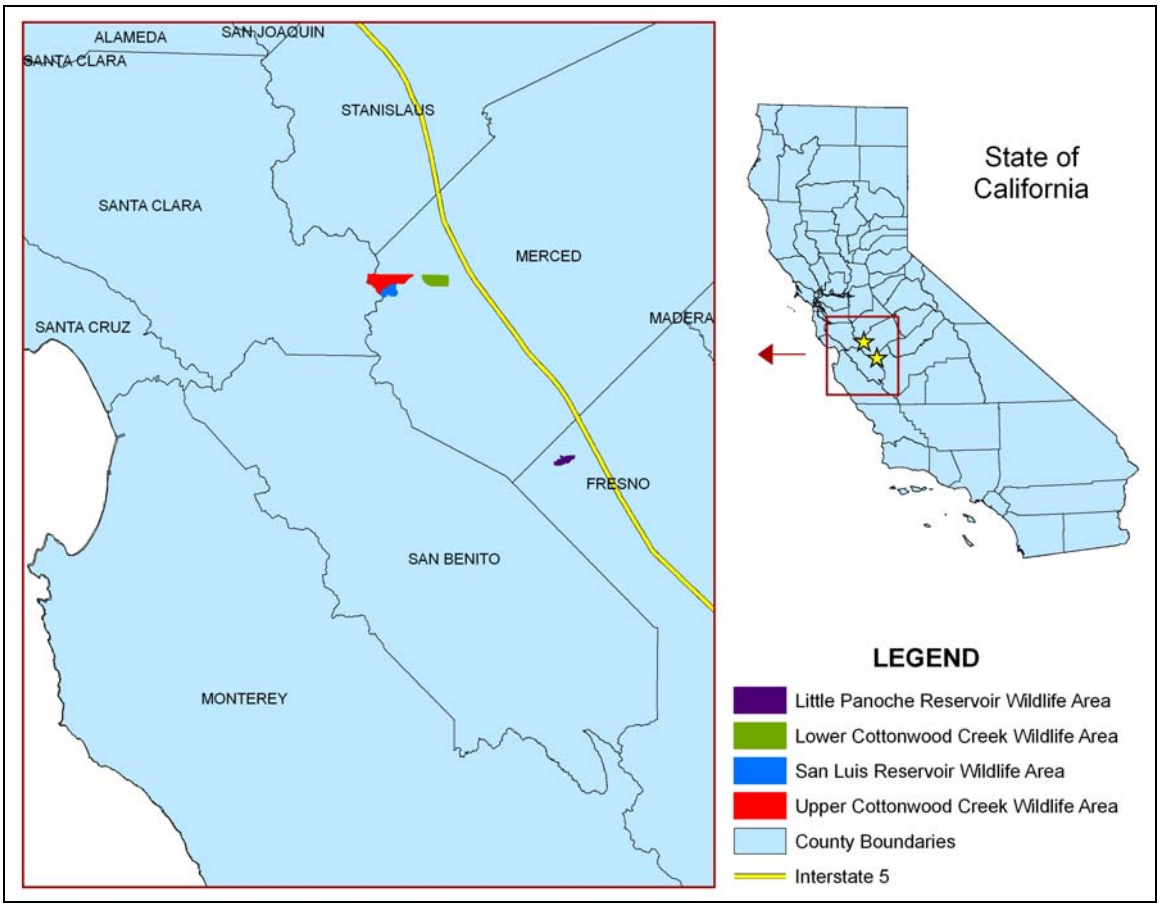

Figure 1. Locations of four California Department of Fish and Game wildlife areas where California red-legged frog monitoring took place during 2008.

LPRWA (335 ha) is located in Fresno County and contains a large, permanent body of water, as well as one moderate stream, which tends to dry mid to late-summer (Figure 2). Unlike the other properties we surveyed this year, the aquatic habitat monitored here is a large, deep reservoir stocked with fish. The property is managed by the California Department of Fish and Game, but is jointly owned by the Department of Water Resources and U.S. Bureau of Reclamation. Elevation ranges from 158 meters below the reservoir level to approximately 274 meters along some of the higher bluffs on the southern-most hills.

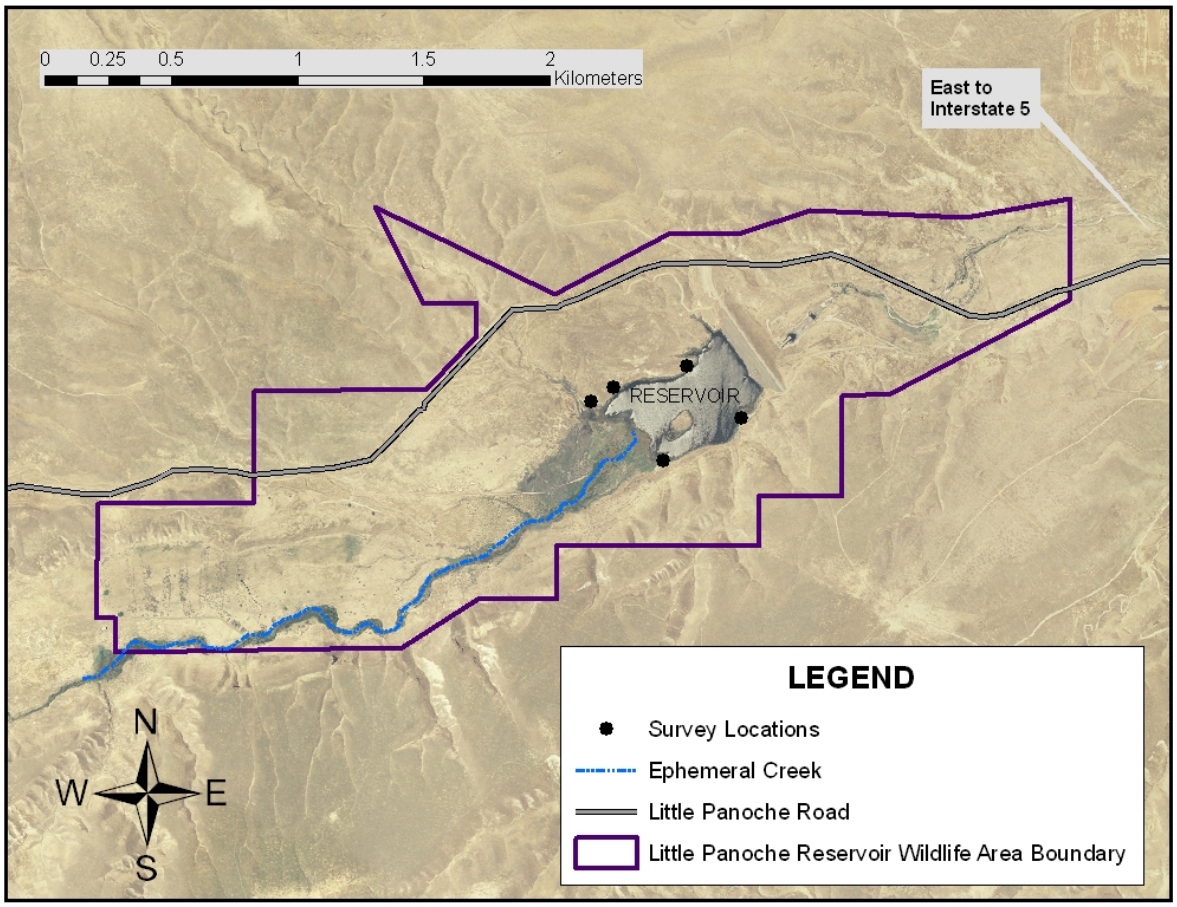

Figure 2. Night survey sites for California red-legged frog monitoring at Little Panoche Reservoir Wildlife Area, 2008.

LCCWA (869 ha) is located within Merced County along the eastern most edge of the Coast Range, and is owned and managed by the California Department of and Game (Figure 3). Two large bodies of water, the San Luis Reservoir and the O'Neill Forebay lie to the west and east of the wildlife area respectively. Riparian habitat on this property is limited to a single corridor, which runs along an ephemeral stream. One natural spring has been further developed and now may hold water year-round, and one ephemeral stock pond (fed by the ephemeral drainage) has been deepened and should now hold water later into the summer months. Unlike other properties we surveyed in 2008, this wildlife area is primarily lacking in shrubs or rocky habitat and consists almost entirely of annual grassland. The elevation at LCCWA ranges from approximately 90-390 meters.

UCCWA (1708.5 ha) lies primarily within Merced County, and a small portion

also extends into eastern Santa Clara County (Figure 3). This property is owned and managed by the California Department of Fish and Game. Elevation ranges from approximately 200 meters near the reservoir to 610 meters along the northern ridges. UCCWA harbors a number of springs, ponds, and ephemeral streams. There are several streams on the property that feature pooled water for part of the year. Aside from natural ponds, there are also man-made stock ponds, which provide additional frog habitat and were created by the previous landowner as well as Department personnel.

SLRWA (365 ha) is located in western Merced County along the south side of Highway 152, and is adjacent to the San Luis Reservoir (Figure 3). This wildlife area is owned by the U. S. Bureau of Reclamation and is managed by the California Department of Fish and Game. Elevation ranges from approximately 183 to 460 meters. This property is relatively small and harbors only a few ponds and ephemeral streams.

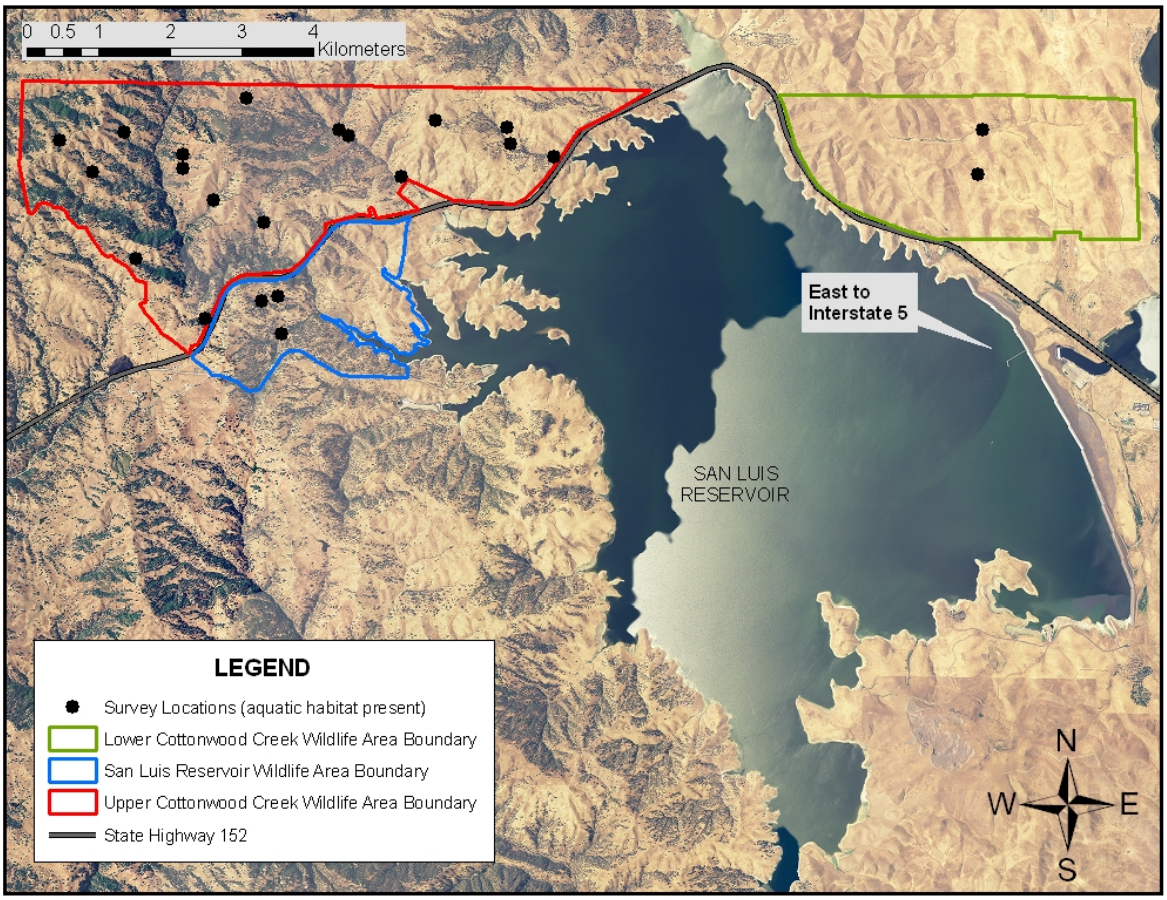

Figure 3. Survey sites for California red-legged frog monitoring at Lower Cottonwood Creek, Upper Cottonwood Creek, and San Luis Reservoir Wildlife Areas, 2008.

Methods

We conducted visual surveys based primarily on the techniques as described in Part B of the Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog (U.S. Fish & Wildlife Service 2005). These guidelines were created as an optimal method for detecting CRLF at designated project sites, which once under development, could pose threats to CRLF or their habitat. However, because our surveys are used to monitor only sites with protected habitat, we modified some portions of their protocol as necessary. The following list includes other modifications incorporated into our protocol:

- Surveys begin during late winter or early spring, as soon as property access is feasible.
- Each site is surveyed approximately once per month (weather permitting) through no later than October.
- Surveying may cease prior to October if: a) survey sites become dry, b) heavy winter rains begin to re-fill the survey sites, or c) CRLF life stages recorded are indicative of breeding; further surveys at these sites are not required (but are optional) for the remainder of the season.
- Dip-netting or other disturbance of CRLF and/or aquatic habitat is avoided unless necessary for identification purposes.

Our visual surveys are comprised of two parts, including an initial survey and a perimeter search, and are usually conducted by one to two surveyors. During the initial survey, we stop at a vantage point and scan the pond and surrounding habitat with binoculars and listen for frog calls. Though our surveys focus on CRLF, we record and tally the life stages of all identifiable herpetofauna (reptiles and amphibians). After our initial survey, we slowly approach the pond, paying careful attention to any fleeing animals, and begin to walk the perimeter. Though we follow standard guidelines for disinfecting footwear and dip nets to prevent the possibility of spreading of any diseases or agents which may harm CRLF populations, care is also taken in minimizing our contact with mud or water unless necessary. The perimeter search is treated as a separate survey so while walking, we stop and scan the water and banks, and again record and tally all herpetofauna life stages (including any animals which may have

already been tallied during our initial survey).

Prior to leaving the site, we also record information such as weather conditions, air and water temperature, and we make note on our data sheet (Appendix A) of any other incidentally observed animals or unique environmental conditions (e.g. recent fire, pollution, habitat destruction, etc.). Finally, we take a minimum of two photographs for each survey site from pre-determined photo points. These points have been marked with a global positioning system (GPS) and surveyors navigate to them while in the field. Therefore, photographs taken each time a site is surveyed may be easily compared for any habitat changes. Due to the remote nature of many of our monitoring sites, and the presence of cougars, we usually perform daytime surveys that can be replicated approximately once per month. However, if the opportunity exists to conduct night surveys during the CRLF breeding season, we also try to incorporate those surveys as well at select locations. LPRWA is easily accessible during the rainy season and this permitted us to conduct night surveys on two occasions during the breeding season. Due to the difficulty of reaching the water's edge or searching visually, these surveys primarily consist of listening for frog calls and only using spotlights near the water's edge when possible. Listening surveys were conducted at several sites around the reservoir and each was marked with a GPS unit. In addition, we conducted one night survey of County-line Pond at UCCWA. Road conditions this winter were fair and again allowed us to survey this single site during the breeding season. However, unlike LPRWA, the habitat does not prevent surveyors from approaching the water and this pond was able to be surveyed in a similar fashion as our daytime surveys. Though photos were not taken from photo points, we conducted an initial survey to listen for frog calls and then walked the perimeter. We used handheld spotlights (held at eye level to best detect frog eye-shine) in combination with binoculars during the perimeter search.

All of our raw data was entered into an Access database, and we reported all CRLF findings to the California Natural Diversity Database (CNDDB). Surveyors carried a GPS in the field to record coordinates for any incidental sightings of CRLF or other listed species, which we also report to the CNDDB. We use GIS (geographic information system) software to create and manage the coordinates of our survey sites, photo points, and significant incidental species observed while on the wildlife areas.

Results

During 2008, we visited 22 sites and completed a total of 110 surveys at four different wildlife areas. We noted CRLF presence at two properties, including LPRWA and UCCWA. While conducting our monitoring, we did not observe any amphibians that appeared to have obvious signs of disease or malformations. In addition to recording CRLF and other herpetofauna during our frog surveys, we also made note of any non-target wildlife species observed / identified on each property and present this data in Appendix B.

We visited LPRWA on two different nights during the CRLF breeding season in January and February of 2008. We stopped and listened for frogs at five separate locations around the reservoir during each visit and thus, completed a total of ten surveys. During past years, this frog species and signs indicative of breeding have been observed (auditory, visual, and tadpole) along the southern side of Little Panoche Reservoir and within the ephemeral creek, while Department personnel were conducting unrelated work on the wildlife area. During one night survey, we observed two CRLF individuals calling at a single site on the north-western side of the reservoir. Other herpetofauna observed at this property only include the Pacific chorus frog, *Psuedacris regilla*, which we heard during each visit and at each listening site. After reporting our findings of CRLF presence at LPRWA to the CNDDB, we ceased surveying at this property. Due to thick vegetation and the difficulty in conducting daytime visual surveys at this site, and because night surveys for calling frogs are often futile for this species outside of breeding season, we focused our efforts on the remaining three properties.

During February, we performed a one-time night survey of County-line Pond at UCCWA. This pond has been used by CRLF for breeding, however no evidence of this has been observed there in the past few years. Our night survey consisted of both listening for calls, as well as a perimeter search of the pond. During this survey we observed a few juvenile CRLF, Pacific chorus frogs and egg masses, and some California newts (*Taricha torosa t.*). No breeding activity was noted at this site during any of our surveys in 2008.

Standard daytime surveys at LCCWA, SLRWA, and UCCWA began in March

and we continued approximately once per month through July. We ceased surveying prior to July only if ponds became dry or once life stages indicative of CRLF breeding had been observed. No CRLF have ever been found at LCCWA, however it does have connectivity to other lands which support this species. Both ponds at LCCWA were scheduled for restoration work this year. Silt removal and installation of a new water control structure was done at Aeromatic Pond, the only spring-sourced pond on the property, so we conducted our surveys before and after the work was completed in May. This year, almost no pooled water existed prior to the restoration and the pond was thickly vegetated with cattail (Figure 4). When Aeromatic Pond is not fully silted, it can overflow during winter months into a shallower pond further below. The lower site was dry upon our first visit in March and thus we did not include it as part of our surveys this year. Restoration work also began at San Luis Pond during May in order to deepen it and to install a water control structure (Figure 5). This site was dry by May so we surveyed during March and April, and restoration work to deepen it began after all water had evaporated. At LCCWA, we conducted a total of seven surveys at these two ponds and did not find CRLF to be present.

Figure 4. Aeromatic Pond at Lower Cottonwood Creek Wildlife Area prior to restoration during March 2008 (left), and during July 2008 (right), after restoration work was completed.

Figure 5. San Luis Pond at Lower Cottonwood Creek Wildlife Area during dry conditions prior to restoration work (left), and after work was completed in May of 2008 (right) for deepening and berm improvements.

At SLRWA, we completed a total of 14 surveys at three ponds and did not observe any CRLF. This species has been noted at one site during past years. However, the pond washed out during a heavy winter in 2005 and is now thick with vegetation so it no longer holds significant water (Figure 6). Since the washout, one frog has been observed at this site during a 2006 survey. We performed a total of 68 surveys at 16 different locations at UCCWA, and several sites did yield CRLF (Table 1). Life stages of this frog species showing proof of breeding activity were found at two locations on UCCWA during our 2008 monitoring effort. During our surveys at each of these three wildlife areas, we recorded all other herpetofauna observed for each survey and present those results in Appendix C.

Figure 6. Photographs taken from the same angle of Lost Pond at San Luis Reservoir Wildlife Area prior to washout during May 2005 (left) and after washout during May of 2008 (right) when water is no longer visible.

Table 1. California red-legged frog presence found during surveys at Upper Cottonwood Creek Wildlife Area, 2008. (y = frog presence; -- = survey conducted, no frog presence.)

Survey Sites	*Monthly Surveys*				
	Mar	**Apr**	**May**	**Jun**	**Jul**
Alfredo Sink	y	y	--	y	--
Barefoot Pond	--	--	y	y	--
County-line Pond	--	y	--	--	--
Deer Reservoir	--	--	y	y[b]	y
Fabled Fountain		--			
Fin Dome Pond	--	--	--	--	
Imaginary Pond	--				
Justin Pond	--	--	--	y	y
Muddy Reservoir	y[b]				
O'Connell Stock Pond	y	y	y	y	y
Plunge Pool	--	--	y	--	y
Red-legged Frog Pond	y	y	y	y	y
Scissor-kick Pond	--	--	--	--	
Secret Pond	y	--	y	y	y
Steer Spittle Pool		--	--		
Upper East Pond	--	--	--	--	--

[b] = life stage(s) confirm breeding

Discussion

From our monitoring efforts in 2008, we discovered that CRLF are present at both LPRWA and UCCWA. Visual observations of eggs and tadpoles confirm breeding activity at UCCWA. Because a CRLF tadpole has been found at LPRWA in the past, and due to the fact that we heard adult frogs calling during breeding season this year, we suspect this area is currently being utilized by the frogs for reproduction as well. During past monitoring efforts, we directed our surveying primarily toward SLRWA and UCCWA, for which we now have compiled several years of data. Due to the number of surveys already conducted there, as well as changes with current projects, priorities, and available personnel, we feel that temporarily halting our CRLF monitoring efforts at those two wildlife areas may be justified at this time.

Observing frogs during the day at LPRWA is difficult due to the vegetation and expanse of water, thus we recommend continued night surveys every one to two years in an effort to simply confirm CRLF presence. Accessing the property by vehicle and then on foot is feasible during the rainy winter months, and we feel that night surveys during

breeding season provide the best chance to observe adult frogs calling.

Though no CRLF have ever been observed at LCCWA, it is in close proximity to lands which do support frog populations. It is unknown if CRLF utilize the O'Neill Forebay or surrounding habitats, which is also in very close proximity to LCCWA. This property has relatively little aquatic habitat, and the remainder consists almost entirely of annual grassland. Managers of the wildlife area have begun restoration projects to benefit wildlife by increasing the available water and riparian habitat. It is possible that this type of restoration work could draw in nearby CRLF, which makes this property an excellent candidate for future frog surveys. Grazing regimes are also utilized at LCCWA, and thus add to the importance of regular CRLF monitoring to determine if frogs are present and to see if cattle need to be provided with additional sources of water. We recommend this property be fully incorporated into the Department's regular frog monitoring activities. We also feel that continued monitoring at regular intervals every season, as well as photographing sites from set locations during each survey, will allow us to better identify trends in both the use and health of CRLF habitat. By trying to conduct surveys on a monthly basis, we will be better able to monitor changes in habitat (negative and positive), both seasonally and from year to year.

SLRWA has only a few aquatic sites and we have surveyed them for several years now. In past years, surveying efforts at SLRWA have yielded CRLF adults at Lost Pond, which appeared to use it as an over-summering site and for feeding habitat. We have yet to observe CRLF at any other site on this property. Since the firebreak that helped to create this aquatic habitat washed out during 2005, Lost Pond no longer holds any significant amount of water (Figure 7). Since the washout, we have only observed one frog here, which was during 2006. Lost Pond has been filling in with thick vegetation, and very little water is now available to frogs or other wildlife. The ephemeral drainage that feeds this site is one of the only locations on the wildlife area that contains flowing water into the summer months. We recommend that restoration work be completed at this pond, including berm improvements and vegetation removal. The firebreak itself has not been maintained for some time and at a minimum, repairing that section in order to re-dam Lost Pond could be very beneficial for continuing to have CRLF present on this wildlife area. In addition, installation of a culvert might help prevent future washouts during heavy winter

months. If such work takes place, we suggest that at least several surveys be conducted at Lost Pond, both before and after any restoration is completed in order to determine if CRLF may return to this site. However, if no restoration takes place, we feel that monitoring efforts at this wildlife area can cease for the time being and could be resumed at a later time.

Figure 7. San Luis Reservoir Wildlife Area firebreak at Lost Pond during early stages of erosion (at left, 2005) and after completely washed out with pond no longer dammed (at right, 2006).

Another property we have compiled several years of data for is UCCWA. This wildlife area is the largest we survey, has diverse habitat with multiple aquatic sites, and we have consistently found frogs and breeding activity on this property. One of the Department's goals has been to watch the interaction between cattle grazing on UCCWA and the effect it has on CRLF and their habitat. Cattle are not only an important tool in keeping non-native grasses in check and reducing fire hazard amongst grasslands, but it has also been suggested that grazing may be an effective tool in the management of CRLF habitat. Grazing can reduce the buildup of emergent vegetation and algae along the pond edges, which may benefit tadpole development (Scott and Rathbun 2002). However, too much trampling by cattle can cause an excessive amount of silt, which could potentially harm eggs or tadpoles. A cattle grazing contract was not allowed this year due to less rainfall and insufficient growth of grasses. However, cattle have grazed during past years and while monitoring frog populations at those times, we found that CRLF still continued to show a strong presence on the property as a whole. During 2005, Department personnel

were only able to conduct a few CRLF surveys at UCCWA, but found no frogs at a site which often contained many and was known from previous years as a breeding pond. It was also noted that prior to those 2005 surveys, when cattle were placed on the property, they were all deposited near this site (County-line Pond) and trampled it heavily. Rainfall during 2005 was heavier than average and thus we are unsure if the lack of frogs at this site was simply due to more aquatic habitat being available that year. However, CRLF have also been scarce at this site in the years that followed and breeding activity appears to have ceased. Since 2006, ranchers have been instructed to spread the cattle more evenly across the property and now do an effective job. This year cattle were absent and we observed a few juvenile CRLF at County-line Pond during both night and day surveys, but only on a few occasions. Because wildlife populations naturally peak and crash, we are unable to determine if cattle directly caused the lack in frog numbers and breeding activity at this site, or if it was simply a natural occurrence. However, this pond dries completely by late summer and it may be possible to construct a fence that partially encloses some of the aquatic and upland habitat. Such a fence could still allow cattle and other wildlife access to part of the pond and yet protect other areas for CRLF habitat. Feral pigs are also present on the wildlife area and have been observed at this site on numerous occasions. These animals can be very destructive of the surrounding habitat, therefore fencing off a portion of the pond may prevent adult pigs or other wildlife from trampling here as well. If a fence is constructed, we recommend occasionally surveying County-line Pond in the future to see if CRLF will return, and that photographs be taken of the fence to document any changes between grazed and ungrazed habitat. If possible, surveys for frogs should be done before, during, and after cattle have grazed on the wildlife area. County-line Pond is sometimes accessible during the rainy season, depending on road conditions, and thus night surveys could be incorporated as well in an effort to see if breeding activity is taking place. Eggs of this species can be hard to find if they are in deeper or murky water, where as adult frogs calling at night could provide an easy indication of breeding behavior.

A separate site at UCCWA that may be of continued interest is Muddy Reservoir. Even if regular monthly surveys at most sites are temporarily suspended at UCCWA, this site has continually supported frogs and breeding activity. Depending on road conditions, it can sometimes be driven to as well, which makes it an excellent location for future training

of personnel who need to learn frog identification skills. CRLF tadpoles are often seen here, as well as other native herpetofauna of varying life stages, and future visits to this site could also provide us with information on any changes to the habitat or possible threats to frog populations. One site that we no longer plan to survey on a permanent basis is Lower East Pond. Though CRLF have been observed here a few times during past years, this pond is heavily infested with red swamp crayfish (*Procambarus clarkii*). When the San Luis Reservoir is full, it floods onto UCCWA via a culvert that runs underneath Highway 152 and is located next to Lower East Pond. The crayfish then make their way into the pond and are a highly aggressive and invasive species that are known to predate on amphibians (Fidalgo et al. 2001, Gamradt and Kats 1996, Gamradt et al. 1997, Gil-Sánchez and Alba-Tercedor 2002). No frogs have been observed at this site for a few years and moderate numbers of crayfish are consistently found. Though we no longer survey this site, we do stress the importance of watching for crayfish at other ponds and along drainages, as they may pose a serious threat to the health of CRLF populations.

Overall, we feel that fully incorporating monthly CRLF surveys at LCCWA is important at this time, and that continued knowledge of CRLF presence and habitat use will allow us to change and improve upon land management practices in the future if necessary. We highly recommend the continuation of standardized disinfection procedures in order to minimize the spread of any potential diseases, though we did not observe any sign of disease during this year's monitoring efforts. At this time, we feel that monitoring of the remaining properties does not need to be done with the same level of intensity. However, if any earth-moving or restoration projects are in development at any wildlife areas, personnel should survey for CRLF prior to any disturbance. Follow-up monitoring of restored aquatic sites should also be conducted so that we may try to determine if frogs are being affected.

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APPENDIX A. California red-legged frog survey data form.

*Survey Personnel:*_____ *Date:*_____*Time:*_____

Study Area		Air Temp @ Pond	°C / °F
Pond / Site		Water Temp	°C / °F
		Weather Code	

 # Photos Taken
Photo Point 1
Photo Point 2

INITIAL ANIMAL COUNT

Spp. Code	*Lifestage*	*Tally*	*Notes*

PERIMETER COUNT

Spp. Code	*Lifestage*	*Tally*	*Notes*

Weather Codes: 1= Sunny and Clear; 2=Less than 50% cloud cover; 3=Greater than 50% cloud cover; 4=Rain

NOTES / COMMENTS

APPENDIX B. Non-target wildlife species observed at Little Panoche Reservoir Wildlife Area, Lower Cottonwood Creek Wildlife Area, San Luis Reservoir Wildlife Area, and Upper Cottonwood Creek Wildlife Area, 2008.

LITTLE PANOCHE RESERVOIR WILDLIFE AREA

Birds:	American Bittern, *Botaurus lentiginosus*	Killdeer, *Charadrius vociferous*	Sora, *Porzana carolina*
	American Coot, *Fulica americana*	Mallard, *Anas platyrhynchos*	White-crowned Sparrow, *Zonotrichia leucophrys*
Mammals:	Coyote, *Canis latrans*		

LOWER COTTONWOOD CREEK WILDLIFE AREA

Birds:	Common Raven, *Corvus corax*	Red-winged Blackbird, *Agelaius phoeniceus*	Turkey Vulture, *Cathartes aura*
	Mallard, *Anas platyrhynchos*	Savannah Sparrow, *Passerculus sandwichensis*	
Mammals:	Feral Pig, *Sus scrofa*	Mule Deer, *Ococoileus hemionus*	Tule Elk, *Cervus elaphus nannodes*

SAN LUIS RESERVOIR WILDLIFE AREA

Birds:	American Goldfinch, *Carduelis tristis*	Oregon Junco, *Junco hyemalis oregonus*	Ruby-crowned Kinglet, *Regulus calendula*
	Audubon's Warbler, *Dendroica coronata auduboni*	Oak Titmouse, *Baeolophus inornatus*	Western Bluebird, *Sialia mexicana*
	Cedar Waxwing, *Bombycilla cedrorum*	Red-shafted Flicker, *Colaptes auratus cafer*	Western Scrub-jay, *Aphelocoma californica*

APPENDIX B continued. Non-target wildlife species observed at Little Panoche Reservoir Wildlife Area, Lower Cottonwood Creek Wildlife Area, San Luis Reservoir Wildlife Area, and Upper Cottonwood Creek Wildlife Area, 2008.

UPPER COTTONWOOD CREEK WILDLIFE AREA

Birds:

Acorn Woodpecker, *Melanerpes formicivorus*
American Coot, *Fulica americana*
American Crow, *Corvus brachyrhynchos*
American Wigeon, *Anas americana*
Anna's Hummingbird, *Calypte anna*
Audubon's Warbler, *Dendroica coronata auduboni*
Barn Owl, *Tyto alba*
Black Phoebe, *Sayornis nigricans*
Brown-headed Cowbird, *Molothrus ater*
Bufflehead, *Bucephala albeola*
Bullock's Oriole, *Icterus bullockii*
Bushtit, *Psaltriparus minimus*
California Quail, *Callipepla californica*
Cedar Waxwing, *Bombycilla cedrorum*
Common Raven, *Corvus corax*
Golden Eagle, *Aquila chrysaetos*
Golden-crowned Sparrow, *Zonotrichia atricapilla*
Great Blue Heron, *Ardea herodias*
Lark Sparrow, *Chondestes grammacus*
Lesser Goldfinch, *Carduelis psaltria*
Lincoln's Sparrow, *Melospiza licolnii*
Loggerhead Shrike, *Lanius ludovicianus*
Mallard, *Anas platyrhynchos*
Mourning Dove, *Zenaida macroura*
Nuttall's Woodpecker, *Picoides nuttallii*
Oak Titmouse, *Baeolophus inornatus*
Oregon Junco, *Junco hyemalis oregonus*
Osprey, *Pandion haliaetus*
Phainopepla, *Phainopepla nitens*
Red-shafted Flicker, *Colaptes auratus cafer*
Red-tailed Hawk, *Buteo jamaicensis*
Red-winged Blackbird, *Agelaius phoeniceus*
Ring-necked Duck, *Aythya collaris*
Ruby-crowned Kinglet, *Regulus calendula*
Rufus-crowned Sparrow, *Aimophila ruficeps*
Say's Phoebe, *Saynoris saya*
Song Sparrow, *Melospiza melodia*
Tree Swallow, *Tachycineta bicolor*
Turkey Vulture, *Cathartes aura*
Violet-green Swallow, *Tachycineta bicolor*
Western Bluebird, *Sialia mexicana*
Western Kingbird, *Tyrannus verticalis*
Western Meadowlark, *Sturnella neglecta*
Western Scrub-jay, *Aphelocoma californica*
Western Screech Owl, *Otus kennicottii*
Western Wood-pewee, *Contopus sordidulus*
White-breasted Nuthatch, *Sitta carolinensis*
White-crowned Sparrow, *Zonotrichia leucophrys*
Wild Turkey, *Meleagris gallopavo*
Wilson's Warbler, *Wilsonia pusilla*
Yellow Warbler, *Dendroica petechia*

APPENDIX B continued. Non-target wildlife species observed at Little Panoche Reservoir Wildlife Area, Lower Cottonwood Creek Wildlife Area, San Luis Reservoir Wildlife Area, and Upper Cottonwood Creek Wildlife Area, 2008.

UPPER COTTONWOOD CREEK WILDLIFE AREA continued…

Mammals:	Coyote, *Canis latrans*	Feral Pig, *Sus scrofa*	Mule Deer, *Ococoileus hemionus*
	Deer Mouse, *Peromyscus maniculatus*	Gray Fox, *Urocyon cinereoargenteus*	

APPENDIX C. All other herpetofauna observed during monthly California red-legged frog monitoring of aquatic sites at Lower Cottonwood Creek Wildlife Area, San Luis Reservoir Wildlife Area, and Upper Cottonwood Creek Wildlife Area, 2008. (-- = survey conducted with no observations; ACMA = Western pond turtle, *Actinemys marmorata*; COCM = Western yellow-bellied racer, *Coluber constrictor mormon*; CRVO = Northern Pacific rattlesnake, *Crotalus viridis oreganos*; PICC = Pacific gopher snake, *Pituophis catenifer c.*; PSRE = Pacific chorus frog, *Pseudacris regilla*; SCOC = Western fence lizard, *Sceloporus occidentalis*; TATT = Coast Range newt, *Taricha torosa t.*; THAA = Santa Cruz garter snake, *Thamnophis atratus a.*)

Survey Sites	*Monthly Surveys*				
	Mar	**Apr**	**May**	**Jun**	**Jul**
Lower Cottonwood Creek					
Aeromatic Pond	PSRE	PSRE	COCM PICC PSRE	PSRE[b]	PSRE[b]
San Luis Pond	SCOC	PSRE[b] TATT[b]			
San Luis Reservoir					
Guitar Pick Pond	--	TATT[b]	PSRE[b] TATT[b]	PSRE[b] TATT[b]	TATT[b]
Lizard Pond	TATT[b]	PSRE[b] TATT[b]	PSRE[b] SCOC TATT[b] THAA	PSRE[b] THAA	PSRE[b] SCOC
Lost Pond	TATT[b]	THAA	SCOC	SCOC	
Upper Cottonwood Creek					
Alfredo Sink	PSRE[b] TATT[b]	PSRE[b] SCOC TATT[b] THAA	PSRE[b] SCOC TATT[b] THAA	PSRE[b] SCOC TATT[b] THAA	PSRE[b] TATT[b] THAA
Barefoot Pond	PSRE SCOC TATT	PSRE[b] SCOC THAA	PSRE[b] SCOC TATT[b] THAA	PSRE[b] TATT[b] THAA	PSRE[b] SCOC THAA
County-line Pond	PSRE TATT	PICC PSRE[b] TATT THAA	PSRE[b] THAA	PSRE[b] THAA	PSRE[b] THAA
Deer Reservoir	SCOC TATT THAA	TATT[b] THAA	PSRE[b] TATT[b] THAA	PSRE[b] TATT[b] THAA	TATT[b] THAA
Fabled Fountain		SCOC THAA			

[a] = auditory observation; [b] = life stage(s) confirm breeding

APPENDIX C continued. All other herpetofauna observed during monthly California red-legged frog monitoring of aquatic sites at Lower Cottonwood Creek Wildlife Area, San Luis Reservoir Wildlife Area, and Upper Cottonwood Creek Wildlife Area, 2008. (-- = survey conducted with no observations; ACMA = Western pond turtle, *Actinemmys marmorata*; BUBH = California toad, *Bufo boreas halphilus*; COCM = Western yellow-bellied racer, *Coluber constrictor mormon*; CRVO = Northern Pacific rattlesnake, *Crotalus viridis oreganos*; PICC = Pacific gopher snake, *Pituophis catenifer c.*; PSRE = Pacific chorus frog, *Pseudacris regilla*; SCOC = Western fence lizard, *Sceloporus occidentalis*; TATT = Coast Range newt, *Taricha torosa t.*; THAA = Santa Cruz garter snake, *Thamnophis atratus a.*)

Survey Sites	*Monthly Surveys*				
	Mar	**Apr**	**May**	**Jun**	**Jul**
Upper Cottonwood Creek					
Fin Dome Pond	PSRE	PSRE[b] TATT[b] THAA	PSRE[b] THAA	PSRE[b] THAA	
Imaginary Pond	PSRE[b]				
Justin Pond	PSRE[b] TATT	PSRE[b] THAA	PSRE[b] SCOC TATT[b] THAA	PSRE[b] THAA	SCOC TATT[b] THAA
Muddy Reservoir	BUBH[a] PSRE[a] TATT[b]				
O'Connell Stock Pond	TATT[b]	ACMA PSRE[b] SCOC TATT[b] THAA	PSRE[b] SCOC TATT[b] THAA	ACMA PSRE[b] TATT[b] THAA	THAA
Plunge Pool	PSRE TATT[b]	PSRE[b] TATT[b]	PSRE[b] SCOC TATT[b] THAA	PSRE[b] THAA	COCM PSRE[b] SCOC TATT[b]
Red-legged Frog Pond	TATT THAA	--	PICC TATT[b] THAA	THAA	--
Scissor-kick Pond	TATT	PSRE[b] SCOC TATT[b]	PSRE[b] TATT THAA	PSRE[b] THAA	
Secret Pond	TATT[b]	PSRE[b] SCOC TATT[b]	PSRE[b] TATT[b] THAA	PSRE[b] TATT[b] THAA	PSRE[b] SCOC TATT[b] THAA
Steer Spittle Pool		--	CRVO PSRE[b]		
Upper East Pond	PSRE TATT	PSRE[b] TATT[b] THAA	PSRE[b] SCOC TATT[b] THAA	PSRE[b] TATT[b] THAA	PSRE[b] TATT[b] THAA

[a] = auditory observation; [b] = life stage(s) confirm breeding