Monitoring California Red-legged Frogs, *Rana draytonii*, on Cottonwood Creek Wildlife Area, 2010

California red-legged frog adult: Photo by Christina Sousa.

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Abstract

Habitat destruction, commercial harvest, pollution, and predation by non-native species may all have contributed to the decline of the California red-legged frog, *Rana draytonii*. This species is federally listed as Threatened and is considered a Species of Special Concern in the state of California. Since 2001, The California Department of Fish & Game has been conducting surveys for these frogs amongst foothill properties within the Los Baños Wildlife Area Complex. Between January and October of 2010, we performed frog monitoring surveys on Upper Cottonwood Creek Wildlife Area at a total of six sites, including one site that was incorporated as part of a new cattle-grazing exclusion area. We conducted two night surveys at the ungrazed location during winter, but the remainder of the season consisted of daytime visual surveys beginning in July. We were able to confirm California red-legged frog presence at all six survey sites on Upper Cottonwood Creek Wildlife Area, and that breeding took place at a minimum of three of these locations. In addition, we performed a one-time dip-netting survey on June 3 at Lower Cottonwood Creek Wildlife Area. We surveyed one pond and four water troughs by dip-netting at a time when larval amphibians were present but we did not observe any life stages of California red-legged frogs. Habitat quality, restoration possibilities, and frog health are key factors in our monitoring efforts.

Keywords: California red-legged frog, Rana draytonii, visual survey, frog call survey, grazing exclusion

Introduction

The California red-legged frog[1] (CRLF), *Rana 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). CRLF have been extirpated from approximately 70% of their historic range (U.S. Fish and Wildlife Service 2002) and 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). As CRLF numbers began to decline, bullfrogs (*Lithobates catesbeianus*) 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).

[1]The common and scientific names referred to in this report for all reptile and amphibian species were taken from the following: Collins, Joseph T. and Travis W. Taggart. 2009. *Standard Common and Current Scientific Names for North American Amphibians, Turtles, Reptiles, and Crocodilians. Sixth Edition.* Publication of The Center for North American Herpetology, Lawrence. iv + 44 pp.

Habitat for CRLF in the San Joaquin Valley has also undergone drastic changes due to the development of the agricultural industry and increasing urbanization. Agricultural reclamation efforts have reduced frog habitat by draining water from many locations, and levied flood control projects have disturbed many ephemeral pool ecosystems as well. Some areas that were once seasonally wet, typical of many CRLF breeding sites, have since been converted into permanent waterways and ponds, which are not ideal habitat. Water levels and flows often fluctuate drastically in order to support the irrigation and drainage needs of farmlands, and permanent water supports non-natives such as bullfrogs and red swamp crayfish, *Procambarus clarkii* (a highly aggressive species known to predate on amphibians eggs and larvae; Gamradt and Kats 1996).

Though they have been extirpated from the Central Valley, CRLF 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 the California Department of Fish and Game (CDFG) staff has been monitoring CRLF populations on multiple properties within the Los Baños Wildlife Area Complex. Long-term monitoring of CRLF and their habitat can provide important insight for the management of this species. Prior to 2006, only opportunistic surveying was completed when personnel were available. As of 2006 however, we adopted a new strategy to monitor the frog populations on these CDFG-owned lands by surveying at regular intervals with the use of our own standardized protocol. Continued monitoring of the health of CRLF populations has been a priority for the CDFG, as well as studying the effects that cattle presence may have on this species. Cattle grazing contracts at some study sites have played an important role in controlling non-native grasses and assist with fire prevention. During 2010, our surveys focused on two properties, which include the upper and lower units of Cottonwood Creek Wildlife Area (UCCWA and LCCWA respectively). These properties are both grazed by cattle for a few months of the year and are located in the eastern-most foothills of the Coast Range. They feature man-made stock ponds, springs, water troughs, and/or ephemeral pools and drainages.

We have regularly documented CRLF at UCCWA during past years and in 2010 we had two distinct goals for our surveys at this property. First we wished to continue to monitor a site known as County-line Pond, which CDFG fenced off from grazing for the

first time during 2010. Successful CRLF breeding and reproduction has been observed at this pond in past years (Dickert 2002 and Sousa 2003) but when grazing began on UCCWA, cattle often congregated at County-line Pond. Because of its shallow basin and easy access for cattle, the entire pond was often trampled and both the frogs and emergent vegetation became scarce (Sousa 2007). Second, we wanted to concurrently monitor several other sites that were not excluded from grazing, but were known to have a strong CRLF presence. We hoped this would allow us to compare breeding success and habitat quality between grazed and ungrazed ponds.

LCCWA is separated from UCCWA by privately owned ranch land and is located close to the valley floor. Land between the two properties is continuous and stock ponds are present amongst the private lands as well. Although CRLF have never been observed at LCCWA, it may be in close proximity to sites that do support frog populations. The CDFG has been engaged in projects that include the restoration of springs and the development of water troughs at LCCWA. These not only provide more watering sources for cattle when on the property, but they provide all wildlife with additional water and some aquatic habitat as well. Though water sources are still limited, our goal was to continue to sample this property for the presence of CRLF in the event that they may one day become established. Due to limited staff and the unlikelihood of finding CRLF on this property, we chose to perform dip-netting surveys at a time when other larval amphibians were present rather than conduct repeated visual surveys. During 2010, we did not monitor as many sites, nor did we survey them as frequently compared to some previous years. However, we feel we were able to gain valuable information for both properties that may assist CDFG in directing the future management of these wildlife areas, including cattle grazing regimes. This should also yield information regarding the availability or provision of water sources and the possible effects that cattle grazing may have on potential CRLF populations, breeding, or their habitat.

Study Area

LCCWA and UCCWA are located approximately 24 kilometers (15 miles) west of the town of Los Baños along Highway 152 and west of Interstate 5 (Figure 1). Both

units are owned and managed by the CDFG for wildlife, public recreation, and hunting. These properties are a part of the Los Baños Wildlife Area Complex and vegetation associations are generally described as California annual grassland, however UCCWA also includes a blue oak habitat series (Sawyer and Keeler-Wolf 1995). Climate generally consists of hot, dry summers, and relatively short and cool winters with an average rainfall of 27 cm (10.5 in) per year (California Department of Fish and Game 2010).

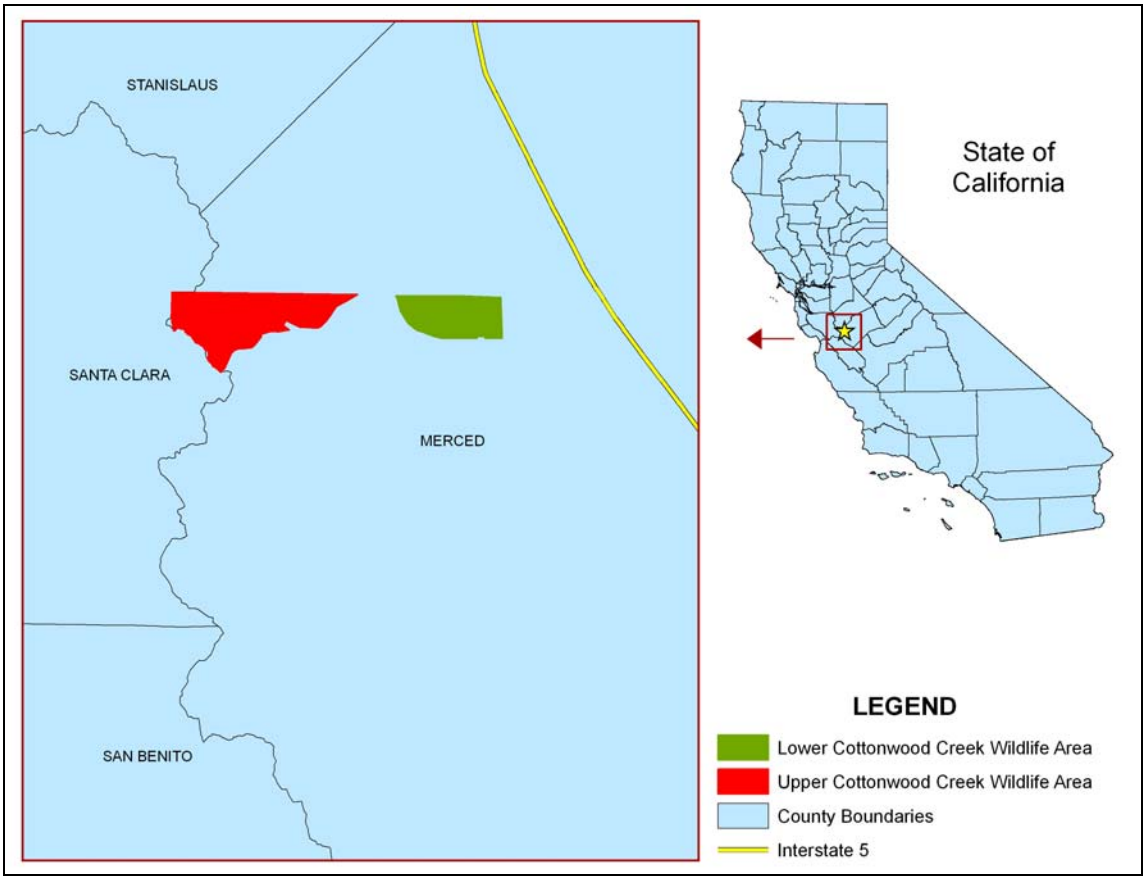

Figure 1. Locations of California Department of Fish and Game wildlife areas where California red-legged frog monitoring took place during 2010.

LCCWA (869 ha / 2,147 ac) is located within Merced County along the eastern most edge of the Coast Range. 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 m (295 ft) near the valley floor to 390 m (1,280 ft) on the western boundary. Two large bodies of water, the San Luis Reservoir and the O'Neill

Forebay, lie to the southwest and east of the wildlife area respectively. Riparian habitat on this property is limited to a single corridor, which runs along an ephemeral drainage. We dip-netted one spring-fed pond, which has been restored and maintained by the CDFG and now holds water year-round. We also visited four water troughs and one guzzler (Figure 2).

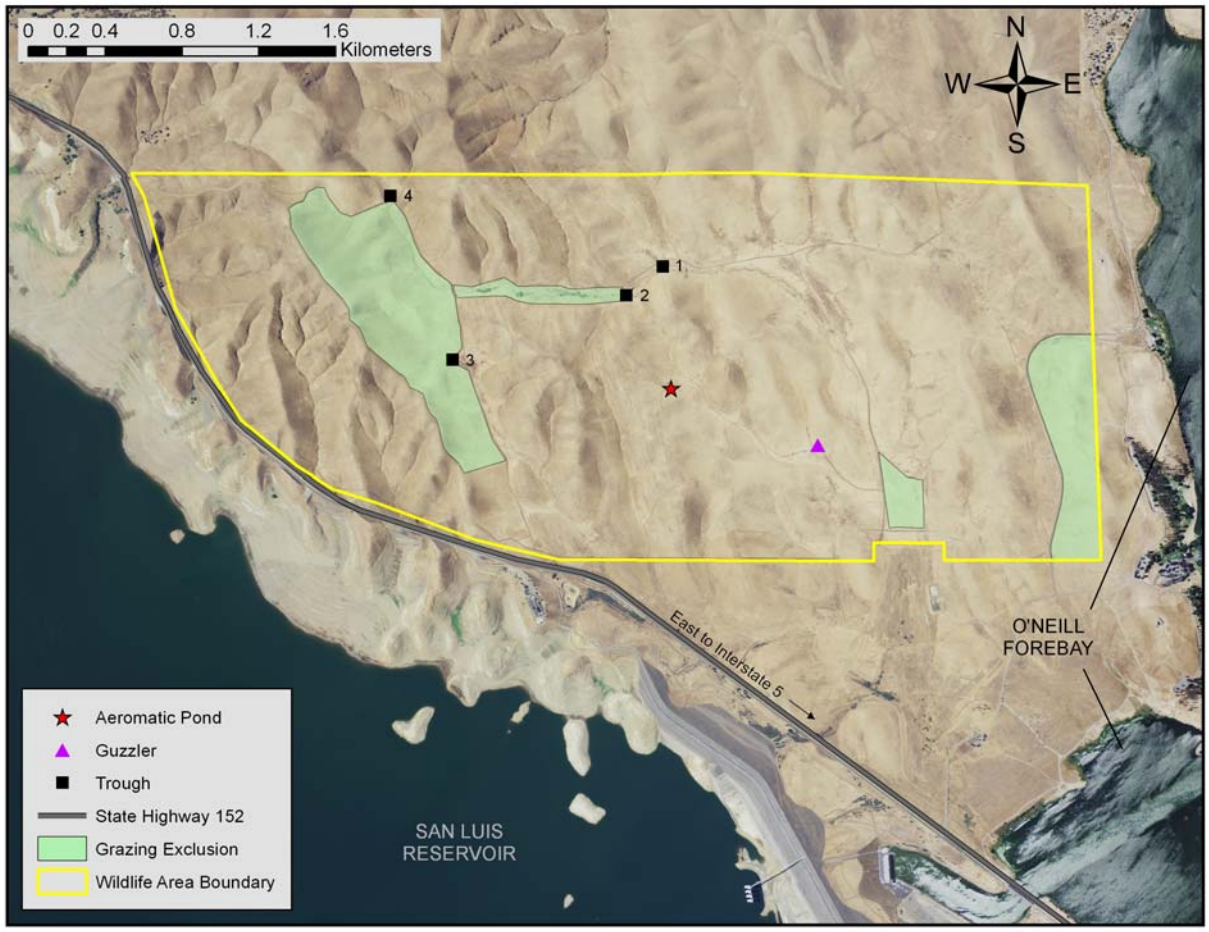

Figure 2. Dip-netting survey sites for California red-legged frogs at Lower Cottonwood Creek Wildlife Area, 2010.

UCCWA (1,709 ha / 4,222 ac) lies primarily within Merced County, with a small portion extending into eastern Santa Clara County. Habitat is more varied at this site and includes oak woodland and multiple shrub communities. Elevation ranges from approximately 200 m (656 ft) near the San Luis Reservoir to 610 m (2,001 ft) along the property's northern and western ridges. UCCWA harbors a number of springs, ponds,

and ephemeral drainages, and 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 created by the previous landowner as well as CDFG personnel, which provide additional frog habitat. In recent years, the CDFG has also been proactive in the development of natural springs and the construction of water troughs to provide wildlife and cattle with additional water sources across the property. For the first time since grazing contracts began at UCCWA in 2004, an exclusion fence was erected during 2010 in an effort to protect County-line Pond and the surrounding upland habitat from cattle. We monitored this site, four other ponds outside of the grazing exclusion, and one location along a creek that is not large enough to support breeding but is en route to our other sites and often harbors frogs (Figure 3).

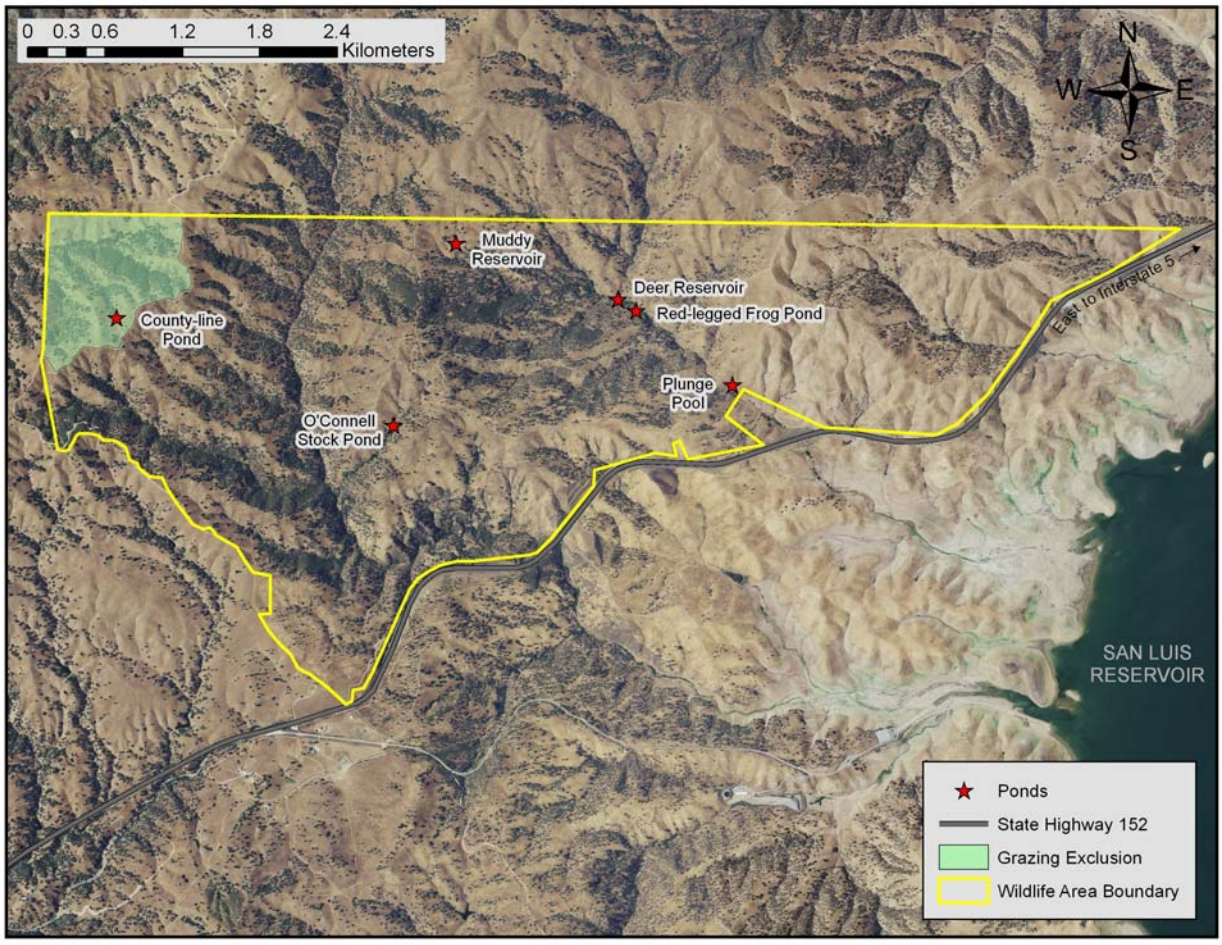

Figure 3. California red-legged frog survey sites at Upper Cottonwood Creek Wildlife Area, 2010.

Methods

Dip-netting Surveys

During 2010 this survey method was employed only at LCCWA, which is a property where we have never observed CRLF and access during breeding season is difficult. We followed standard disinfection guidelines for footwear, waders, dip nets, and thermometers to prevent the possibility of spreading any diseases or agents which may harm CRLF populations. For sampling larval amphibians, we chose 16" x 12" flat-bottom, steel-hoop dip nets with a 1/8" mesh size. One spring-fed pond at LCCWA held water during 2010 and due to its depth, we entered the pond with waders and used a total of two surveyors. While starting at the same time and in the same location, we worked at an equal pace and sampled from one end of the pond to the other, zig-zagging back and forth from the edge of the pond out to the center as we progressed. While sampling, we swept dip nets along the water's surface, throughout the water column, and "bumped" the flat edge along the bottom of the pond across vegetation; an effort was made to minimize disturbance of the substrate or vegetative habitat. When necessary for identification, we hand captured non-larval amphibians seen swimming in the water or perched along the bank. In addition to sampling a pond, we also sampled water troughs with one to two dip nets until we felt they had been thoroughly checked. For all dip-netting surveys, we recorded the start and end times, air and water temperatures, and made note of all amphibian species and life stages found (but did not tally individuals).

Visual Surveys

Though we followed disinfection procedures for visual surveys, we attempted to minimize our contact with mud or water unless necessary. 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. This year we chose to monitor only a select number of sites that were

known to have a strong CRLF presence and due to staffing limitations, we were unable to conduct surveys between March and June. The following list includes modifications we've incorporated into our protocol versus the federal guidelines:

- 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, which we usually conduct with one to two surveyors. During the initial survey we stop at a vantage point, 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 along the water's edge. 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 of other animals observed incidentally or unique environmental conditions (e.g. recent fire, pollution, habitat degradation, 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 only daytime surveys that can be replicated approximately once per month. However, we were able to opportunistically incorporate a few night surveys during the CRLF breeding season (winter) at County-line Pond. With the exception of not being able to take photos of the pond at night, we conducted these surveys in a similar fashion as daytime visual surveys, which included an initial survey and a perimeter search. During the initial survey, we walked towards the pond and then sat silently in the dark for a minimum of five to ten minutes to listen for frog calls. Along with binoculars, we used handheld spotlights (held at eye level to best detect frog eye-shine) during the perimeter search and spotlighted along the bank and out into the water.

We reported all CRLF findings to the California Natural Diversity Database (CNDDB) and entered all of our raw data into an Excel spreadsheet. Surveyors carried GPS units and digital cameras in the field so that anything else of significance could be marked and / or photographed while on the wildlife areas. We used GIS (geographic information system) software to create and manage the coordinates of our survey sites and pond photo points.

Results

Dip-netting Surveys

On June 3, 2010 we surveyed all aquatic sites in existence at LCCWA for amphibians. After dip-netting one pond and a total of three water troughs, we did not locate CRLF but found two other species of amphibians present on the property (Table 1). A fourth trough located on the property was found to be functioning improperly, contained an extremely low amount of water, and was thick with algae. Using disposable gloves, we removed a dead loggerhead shrike (*Lanius ludovicianus*) from the trough and observed that the water was warm and stagnant; we chose not to dip-net that trough and it has since been restored to working order. One guzzler also exists on LCCWA, which is a partially buried reservoir that collects rainwater and / or is filled with water by CDFG staff, and has a narrow opening to provide water for game birds or other small wildlife. The design of this particular guzzler allows light to shine through the top of the tank and we were able to easily view the inside. The water was extremely clear

and after observing it for several minutes, we were able to clearly determine that nothing living was present and chose not to dip-net the guzzler.

Table 1. Amphibian dip-netting surveys at Lower Cottonwood Creek Wildlife Area, 2010. (-- = survey conducted, no species present)

Site Name	Species Name	Lifestages Present[a]
Aeromatic Pond	Pacific Chorus Frog	L, M, J, A
	California Toad	L
Trough 1	Pacific Chorus Frog	L, M
Trough 2	Pacific Chorus Frog	L, M, J, A
Trough 3[b]		
Trough 4	--	--

[a] L = larva, M = metamorph, J = juvenile, A = adult.
[b] Trough not sampled due to stagnant water; no life present.

Visual Surveys

During 2010, we visited six sites at UCCWA and completed a total of 18 surveys. We did confirm the presence of CRLF on the property and identified the location of multiple breeding sites. While conducting our monitoring we observed one dead, large CRLF adult and two dead Diablo garter snake (*Thamnophis atratus zaxanthus*) neonates. Muddy Reservoir, the location where we found these animals, had developed a thick algae bloom (Figure 4) but we were unable to determine if this was the cause of death. We did not observe any animals during 2010 that appeared to have signs of disease or malformations. In addition to recording CRLF and other herpetofauna during our daytime visual surveys at UCCWA, we also made note of any non-target wildlife species observed and present these data in Appendix A.

Figure 4. Algae bloom photographed September 2, 2010 at Muddy Reservoir, Upper Cottonwood Creek Wildlife Area.

During January and February, we performed a total of two night surveys at County-line Pond on UCCWA. Grazing contracts were in place from January 1st through March 1st during 2010, and although cattle were present at the time of our night surveys, this year marks the first time that electrified fencing was placed around County-line Pond, excluding cattle from both the aquatic and surrounding upland habitat. For both surveys combined, we observed adult California newts (*Taricha torosa*), one adult California toad (*Anaxyrus bufo halophilus*; the first recorded at this pond since surveys began in 2003), adults and egg masses of Pacific chorus frogs (*Pseudacris regilla*), and one juvenile CRLF.

Due to staffing limitations, standard daytime monitoring at UCCWA did not begin until July, after which we surveyed approximately once per month through October. We completed a total of 16 surveys and ceased prior to October only if ponds became dry. This year we also reduced monitoring to a select number of sites that were known to have a strong CRLF presence in the past, which included County-line Pond, Deer Reservoir, Muddy Reservoir, O'Connell Stock Pond, Plunge Pool, and Red-legged Frog Pond. With the exception of Plunge Pool and Deer Reservoir, which dried prior to our final visit, all sites were surveyed a total of three times. We observed CRLF at every site we surveyed, and life stages indicative of breeding were recorded at three locations (Table 2). All other herpetofauna species recorded during our surveys at UCCWA are presented in Appendix B.

Table 2. Presence of California red-legged frogs, *Rana draytonii*, found during surveys at Upper Cottonwood Creek Wildlife Area, 2010. (y = species present; -- = survey conducted, no species present)

Survey Sites	*Monthly Surveys*			
	Jul	**Aug**	**Sep**	**Oct**
County-line Pond	y		--	y
Deer Reservoir	y[b]	y		(dry)
Muddy Reservoir	y[b]		y[b]	y[b]
O'Connell Stock Pond	y		y	y[b]
Plunge Pool	y	--		(dry)
Red-legged Frog Pond	y	y		y

[b] = life stage(s) confirm breeding

Discussion

Though funding and personnel constraints reduced the amount of surveys we conducted during 2010, we were able to confirm CRLF presence at UCCWA. We also made visual observations of tadpoles and metamorphs, which confirmed breeding activity at that property. Our dip-netting surveys at LCCWA did not yield CRLF, but we did find amphibians breeding in the pond we sampled, as well as within a few of the troughs located on site.

We have been conducting surveys at UCCWA, the largest property we monitor, for multiple years and have collected CRLF data showing that the frogs use this property both for breeding as well as an over-summering site. Because grazing is utilized here (usually between January and March), we wished to learn if cattle may be positively or negatively affecting CRLF populations. Grazing is not only an important tool in reducing non-native grasses and reducing fire hazard amongst grasslands, but it has also been suggested as 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 actually 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. County-line Pond was once noted as a strong CRLF breeding location but after we witnessed cattle congregating at the site in 2005 (Sousa 2007), we haven't observed breeding activity since. Because wildlife populations naturally fluctuate, we are unable to determine if cattle directly caused the lack in both frog numbers and breeding activity at this site, or if it was simply a natural

occurrence. CDFG chose to take a proactive role and fenced this site from grazing beginning in January of 2010. In addition, CDFG has worked with ranchers to make sure that cattle were distributed more evenly across the property instead of being deposited in a concentrated location. During our surveys this year we did not observe signs of CRLF reproduction at County-line Pond, but did find one or more juveniles during most surveys, which is an increase from previous years. CDFG plans to keep it fenced from grazing during upcoming years in hopes of seeing if this species might repopulate the pond. Emergent vegetation has already begun to return around the perimeter of the pond and we plan to continue surveying there in the future.

Muddy Reservoir, also located at UCCWA, has consistently been used by CRLF for breeding and seems to yield a high number of tadpoles and metamorphs each year. The pond is quite large and usually contains floating vegetation towards the center, which frogs and snakes often float on. Though CRLF have seemed to thrive at Muddy Reservoir for many years, there is very little emergent aquatic vegetation. In addition, the pond shallows out toward the edges and there are wide expanses of mud with little upland vegetative cover near the water. During 2010, CDFG worked with local ranchers to have this site fenced off from grazing as well. Because it is such a strong breeding location, we hope that protecting this pond from grazing will allow emergent vegetation to redevelop and prevent possible trampling of egg masses during breeding season. Cattle will be excluded from Muddy Reservoir beginning in January 2011 and we plan to continue to monitor the frog habitat and population in the future. During 2010 we found a few dead animals at this pond and witnessed a great deal of algae present late in the season. We are unsure that the algae caused any mortalities and observed many healthy CRLF adults, tadpoles, and metamorphs during our visits. However, upon review of photos taken in previous years, we noticed that similar algae blooms have occurred more than once. While designing the new exclusion fencing around Muddy Reservoir, CDFG made an effort to not only exclude cattle from the pond itself but to also fence off areas where runoff might drain directly into the pond. We plan to continue to photograph and survey this site for CRLF, and hope that excluding cattle will improve habitat, may help prevent or reduce future algae blooms, and simply improve overall water quality.

Although we did not find CRLF present at LCCWA, it is in close proximity to lands that do support frog populations. We do not know if the frogs utilize the O'Neill Forebay or surrounding habitats, which are also near LCCWA. Because this property has relatively little aquatic habitat and consists almost entirely of annual grassland, managers of the wildlife area initiated restoration projects in past years to increase the available water and riparian habitat. This type of restoration work could potentially draw in nearby CRLF so we believe this property is an excellent candidate for future sampling. Grazing regimes are also utilized at LCCWA, and thus add to the importance of CRLF monitoring to determine if frogs are present and to see if cattle need to be provided with additional sources of water. Years ago, the CDFG built several cattle exclusion sites so we have also incorporated photo points across LCCWA (not only at aquatic sites), which we take at regular intervals to monitor grazing effects and changes to habitat. This year we came across a cattle trough at LCCWA that had not been functioning properly, and water levels were extremely low and stagnant (with a dead bird located inside). CDFG personnel have also reported finding dead squirrels in this trough (R. Sawyer pers. comm. June 4, 2010). We recommended providing ramps within these steep-walled troughs to allow fallen animals a method of escape. One such ramp was built this year and additional structures are planned for the remaining sites. We recommend LCCWA be sampled in future years in the event that CRLF ever inhabit the property.

By studying these CRLF populations, we are able to gain valuable knowledge that can be incorporated into CDFG management practices to help further protect these areas. Regular monitoring helps us learn which sites are favored by frogs or are used for breeding. The CDFG can see to it that these sites are protected or may choose to develop natural springs (or restore degraded ponds) that are in close proximity to favored breeding habitat. Through the act of repeatedly surveying the same sites throughout a season, we are provided with a tool that allows us to witness any new or drastic changes in habitat or species composition relatively close to when they occur. Because we report all of our findings to the CNDDB, lands nearby that may be planning development must consider how their projects will affect neighboring habitat and CRLF populations (if our sites fall within the required buffer distance to their project area). Our

primary goal while studying CRLF on these wildlife areas is to minimize disturbance to the aquatic habitat during our surveys, and to visit sites frequently enough to make detections when numbers may be low. Some studies utilize radio telemetry to gain more knowledge about upland habitat use by CRLF, and although improvements have been made to methodologies for attaching radio transmitters, frog mortality is still often associated with this type of study (Rathbun and Murphy 1996). Without a specific research or development project in mind, we feel that telemetry is unwarranted at these wildlife areas. We conduct night surveys during the breeding season but are limited to one or two sites because access is not possible to remote sites during winter. Fellers and Kleeman (2007) performed nocturnal surveys during the non-breeding season as well, and yielded more CRLF than during day surveys. Though not statistically significant, they also found large differences in the numbers of unidentified frogs between day versus night surveys; frogs were less skittish at night and thus fewer went unidentified. As seen in Appendix B, we usually record several unknown animals each season due to them diving into the water before we are able to determine a species. Though some sites will still be too remote, we may be able to incorporate night surveys at some of our sites during the non-breeding season when firebreaks are dry and we can drive within close proximity. We hope this will reduce the number of unidentified animals as well increase detection of CRLF in areas where they are sparse.

If funding permits, we do recommend ponds be monitored for the entire season (April or May through October at our sites) to increase the chances of observing frogs. In addition, we feel that incorporating night surveys when possible has been beneficial in the past and should possibly be continued through the summer months. During 2011 CDFG has learned that a proposed project may involve widening of Highway 152, which borders the southwest side of UCCWA. Because we have ponds located very close to the highway, we also recommend making it a priority to monitor those sites beginning in 2011 to learn if frogs are present and to report those findings to the CNDDB. Both County-line Pond and Muddy Reservoir are of importance since they now have cattle exclusion fences surrounding them while grazing contracts are in place. We suggest these ponds, as well as some grazed sites, continue to be monitored for frog presence as well as habitat changes over time. Though we did not locate any CRLF larvae while

dip-netting at LCCWA, we feel that incorporating night surveys during summer could inform as to whether adults may be temporarily using over-summering habitat. We also feel that dip-netting was a justified method of sampling at that property since most water sources are troughs with poor visibility. Finally, if we incorporate night surveys in future years at any property, we believe that frogs are less likely to become startled when there is less ambient light. As with Fellers and Kleeman (2007), we feel night surveys should not be conducted within a certain number of days of a full moon (they recommended not within five days) and hope that adding night surveys during summer will increase our number of CRLF detections. Continued monitoring at regular intervals every season, as well as photographing sites from set locations during each day survey, will allow us to better identify trends in both the use and health of CRLF habitat. 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 positively or negatively affected.

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APPENDIX A. Non-target wildlife species observed at Upper Cottonwood Creek Wildlife Area while monitoring California red-legged frogs, 2010.

BIRDS:	Acorn Woodpecker, *Melanerpes formicivorus*	Mallard, *Anas platyrhynchos*	Spotted Towhee *Pipilo maculatus*
	American Goldfinch, *Spinus tristis*	Mourning Dove, *Zenaida macroura*	Turkey Vulture, *Cathartes aura*
	American White Pelican[1], *Pelecanus erythrorhynchos*	Nuttall's Woodpecker, *Picoides nuttallii*	Western Bluebird, *Sialia mexicana*
	Greater Roadrunner, *Geococcyx californianus*	Oak Titmouse, *Baeolophus inornatus*	Western Kingbird, *Tyrannus verticalis*
	Greater Yellowlegs, *Tringa melanoleuca*	Dark-eyed Junco, *Junco hyemalis*	Western Meadowlark, *Sturnella neglecta*
	House Finch, *Carpodacus mexicanus*	Red-shafted Flicker, *Colaptes auratus cafer*	Western Scrub-Jay *Aphelocoma californica*
	House Wren, *Troglodytes aedon*	Red-tailed Hawk, *Buteo jamaicensis*	Western Tanager, *Piranga ludoviciana*
	Lesser Goldfinch, *Spinus psaltria*	Ruby-crowned Kinglet, *Regulus calendula*	Yellow-billed Magpie, *Pica nuttalli*
HERPS:	Racer[2], *Coluber mormon*		
MAMMALS:	California Ground Squirrel, *Citellus beecheyi*	Feline Tracks, Unknown sp.[3]	Mule Deer tracks, *Odocoileus hemionus*
	Canine tracks, *Canis* sp.	Feral Pig tracks, *Sus scrofa*	

[1]Large flocked observed flying over property.
[2]Shed skin found approximately 100 meters from one of the aquatic survey sites.
[3]Size suggests adult bobcat (*Lynx rufus*) or young mountain lion (*Felis concolor*).

APPENDIX B. Other herpetofauna observed during monthly California red-legged frog monitoring at Upper Cottonwood Creek Wildlife Area, 2010. (-- = no survey conducted; ASTM = California whiptail, *Aspidoscelis tigris munda*; CROR = Northern Pacific rattlesnake, *Crotalus oreganus*; PSRE = Pacific chorus frog, *Pseudacris regilla*; SCOC = western fence lizard, *Sceloporus occidentalis*; TATO = California newt, *Taricha torosa*; THAZ = Diablo garter snake, *Thamnophis atratus zaxanthus*; THSF = valley garter snake, *Thamnophis sirtalis fitchi*; UNKN = unknown species.)

Survey Sites	*Monthly Surveys*			
	Jul	**Aug**	**Sep**	**Oct**
County-line Pond	PSRE[1] THAZ	--	PSRE[1] THAZ UNKN	PSRE[1] THAZ
Deer Reservoir	PSRE[1] TATO[1] THAZ	PSRE[1] SCOC TATO[1] THAZ THSF	--	-- (dry)
Muddy Reservoir	PSRE[1] THAZ	--	ASTM THAZ	TATO THAZ UNKN
O'Connell Stock Pond	PSRE[1] THAZ UNKN	--	ASTM CROR TATO[1] THAZ	SCOC TATO THAZ
Plunge Pool	SCOC THAZ	SCOC THAZ	--	-- (dry)
Red-legged Frog Pond	PSRE[1] THAZ THSF	PSRE[1] THAZ	--	PSRE[1] UNKN

[1] = life stage(s) confirm breeding