Report for
Amphibian Management and Monitoring at
Palo Corona Regional Park,
Garland Ranch Regional Park,
and Frog Pond Wetland Preserve
Monterey County, CA
2013

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Summary:

In order to characterize the population status of pond-breeding amphibians at three Monterey Peninsula Regional Parks District (MPRPD) parks (Palo Corona Regional Park, Garland Ranch Regional Park, and Frog Pond Wetland Preserve), amphibian surveys were conducted from March 2013 through October 2013. These surveys provide information about the presence/absence, abundance, habitat use, and reproduction of pond-breeding amphibians in the three parks. These data will further the ability of MPRPD to manage for common, threatened, and endangered amphibian species, including Pacific Chorus Frogs (*Pseudacris regilla),* Western Toads (*Bufo boreas*), California Newts (*Taricha torosa*), California Red-legged Frog (*Rana draytonii*), and California Tiger Salamander (*Ambystoma californiense*). Taken together with data collected by previous surveys at Palo Corona Regional Park (Hemingway and D'Amore 2008), this robust data set allows for more sophisticated management strategies for these species as well as their impending threats (e.g. the invasive American Bullfrog, *Rana (Lithobates) catesbeiana*). This report will provide information and recommendations in furtherance of the Safe Harbor Agreement MPRPD holds with the US Fish and Wildlife Service for endangered species on park property (Monterey Peninsula Regional Park District & Ventura Fish and Wildlife Office, 2011).

Introduction/Background:

Amphibian Species Observed in 2013 Descriptions:

American Bullfrog (*Rana (Lithobates) catesbeiana)*:

Fig 1. Larval and adult forms of *R. catesbeiana*.

The American Bullfrog is the largest true frog currently inhabiting California, with adults reaching a snout-vent length (SVL) of up to 8 inches. Larvae are greenish yellow with small spots. Adults are light to dark green, with dark spots and blotches. They can be distinguished from other frogs by a lack of dorsolateral fold, the presence of the tympanic fold, and conspicuous tympanic membranes in males (Stebbins 1985).

As adults, bullfrogs are highly aquatic and rarely venture far from their preferred habitat (warm, sunny, open water), although they are capable of long-distance dispersal as juveniles (Suhre 2010). They eat anything they can swallow, including insects and small vertebrates, such as other frogs (Bury and Whelan 1984). Breeding begins in spring and continues through summer. In California, larvae overwinter until the end of their 2nd or sometimes 3rd summer, and therefore require permanent water year round (Stebbins 1985).

Bullfrogs are now regarded as one of the world's worst 100 invasive species (Lowe et al. 2000) due to their negative impacts on native amphibians worldwide (Moyle 1973). They were introduced to California in the early 1900s from their native range in the eastern US and are implicated in local declines of many native anuran species (Hayes and Jennings 1986). They thrive in the presence of introduced fish (Boone et al. 2007), which are detrimental to many amphibian species, and management strategies are often limited and/or costly (Adams and Pearl 2007).

California Newt (*Taricha torosa*):

Fig 2. Larval and adult forms of *T. torosa*.

The California Newt is a stocky, medium-sized salamander with rough, grainy skin, and can obtain a maximum length of 8 inches (including tail). Adults are brown above, and yellow to orange below. The eyes extend beyond the outline of the head when viewed from above, distinguishing it from similar species (Stebbins 1985). Larvae are light yellow with two dark vertical lines and external gills.

California newts are California endemics, found along the coast. They spend most of the year on land and return to breeding streams and ponds during winter rains (Gamradt and Kats 1996). While terrestrial, newts remain in moist habitats or under woody debris. Both larvae and adults are predatory, feeding on small invertebrates, as well as other amphibian eggs and larvae. The skin secretions of adults include the neurotoxic tetrodotoxin, sufficient quantities of which can cause death in many animals (including humans).

The subpopulation of *T. torosa* south of the Salinas River, including those found in Monterey County, is considered a California Species of Special Concern by the California Department of Fish and Wildlife. Their threats include habitat loss and degradation, as well as introduced fish. Many may be killed on roads during their breeding migrations (Jennings and Hayes 1994).

California Red-Legged Frog (*Rana draytonii*):

Fig 3. Larval and adult forms of *R. draytonii.*

The California Red-Legged Frog (CRLF) is California's largest native frog species, obtaining a maximum SVL of 5 inches. Adults are reddish-brown or brown, gray, or olive above, with black flecks and spots, and creamy underneath. The hind legs are red underneath, and in older frogs this red coloring can extend to the sides. Dorsolateral folds are prominent (Stebbins 1985). Larvae are brown above and iridescent white to yellow beneath, with small dark spots.

CRLF currently occupy pond and stream habitats along the Coast ranges and the Sierra foothills (a dramatic reduction from their historic range). Adults remain close to breeding ponds or streams year round, although they are known to forage in upland habitats including forests, pastures, and oak grasslands (Tatarian 2008). Breeding occurs during late winter, with larvae metamorphosing in late summer to fall. Adults feed on invertebrates and small vertebrates, including other frogs (Hayes and Tennant 1985).

Rana draytonii was federally listed as a Threatened species in 1996. Some of the most serious threats include loss of habitat and exposure to pesticides (Davidson et al. 2002). CRLF are also negatively impacted by the presence of introduced fish and bullfrogs (Kiesecker and Blaustein 1998). Some studies

have shown that CRLF larvae do not survive in the presence of reproducing bullfrogs (Lawler et al. 1999).

California Tiger Salamander (*Ambystoma californiense*):

Fig 4. Larval and adult forms of *A. californiense.*

The California Tiger Salamander (CTS) is a stout-bodied salamander with a short rounded head and blunt snout, reaching a length of 8 inches (including tail). In adults, skin is a lustrous black with large yellow spots above, and white to pale yellow underneath. Larvae are yellow to gray with broad caudal fins, broad flat heads, and bushy exterior gills (Stebbins 1985).

CTS occupy a range of suitable vernal pool and grassland habitat across central California (Trenham et al. 2000). Adults spend most of the year underground in small mammal burrows. Due to this secretive nature, very little is known about their terrestrial life. At the onset of winter rains, adults emerge and migrate to ephemeral pools for breeding. Metamorphs emerge from these drying pools and migrate to upland habitats by early summer (Riley et al. 2003). Both larvae and adults are presumed predatory on small invertebrates, with large larvae feeding on tadpoles of other amphibian species.

CTS are federally endangered: many of their populations have been eliminated, and individuals are rare across the landscape (Riley et al. 2003). This decline is due primarily to widespread loss and degradation of vernal pool breeding habitat (Trenham et al. 2000), and protection of large areas with multiple ponds will be essential to the long-term survival of this species. Like all amphibians, CTS has permeable skin that may increase its susceptibility to pesticide toxicity.

Pacific Chorus Frog (*Pseudacris regilla*):


Fig 5. Larval and adult forms of *P. regilla*.

The Pacific Chorus Frog is a small treefrog, attaining a maximum SVL of 2 inches. Body coloration is highly variable, although it is most often a shade of green or brown above with creamy to yellow underneath. Adults can be identified by a dark eyestripe which extends from the nostrils to the shoulders (Stebbins 1985). Larvae are dark brown and light below, with a bronze sheen.

Pacific Chorus Frogs are one of the most abundant amphibians in the western US, and occupy a range of habitats across California. They breed in bodies of water of any size and condition, beginning during the winter rains and continuing through late spring. Tadpoles metamorphose and move to upland foraging sites in late summer (Stebbins 1985). Adults primarily feed on insects and other arthropods.

Pacific Chorus Frogs are considered a species of least concern. Although they are prey for many amphibian and reptile species, including the American Bullfrog, this predation does not appear to affect their overall numbers (Adams and Pearl 2007). Pacific Chorus Frogs are considered a keystone species because so many other species depend on their continued abundance as prey (Mills et al. 1993)

Western Toad (*Anaxyrus (Bufo) boreas*):

Fig 6. Larval and adult forms of *A. boreas*.

Western Toads are large and robust toads which achieve a maximum SVL of 5 inches. They have dry, warty skin that is often reddish brown or dusky gray with rusty warts set on dark blotches and a light stripe down the middle of the back, and pale underneath. They have oval paratoid glands behind the eye. Larvae are small and dark brown, with a distinct 'lollipop' shape (Stebbins 1985).

Western Toads are found throughout much of the western US, in a variety of habitats from marshes to woodlands and desert riparian areas. Adults migrate to breeding wetlands in the early spring, and larvae metamorphose between May and September. Adults remain near the water's edge for spring and summer, moving to more terrestrial habitats later in the year. Toads feed primarily on insects and other arthropods (Stebbins 1985).

Although *A. boreas* is fairly common, some high-elevation populations are in decline due to habitat degradation. Breeding adults may be killed on roadways in large numbers because they are slow moving. Western Toads seem to be largely unimpacted by introduced predators such as bullfrogs and fish (Preston et al. 2012), probably due to the unpalatability of eggs, larvae, and adults to many predators (Gunzburger and Travis 2005).

Park and Pond Descriptions:

Palo Corona Regional Park (PCRP):

PCRP is the newest acquisition of MPRPD, and represents one of the central California coast's most significant undeveloped open spaces. It is located south of Carmel, CA, on the northern end of the Santa Lucia Mountain Range.

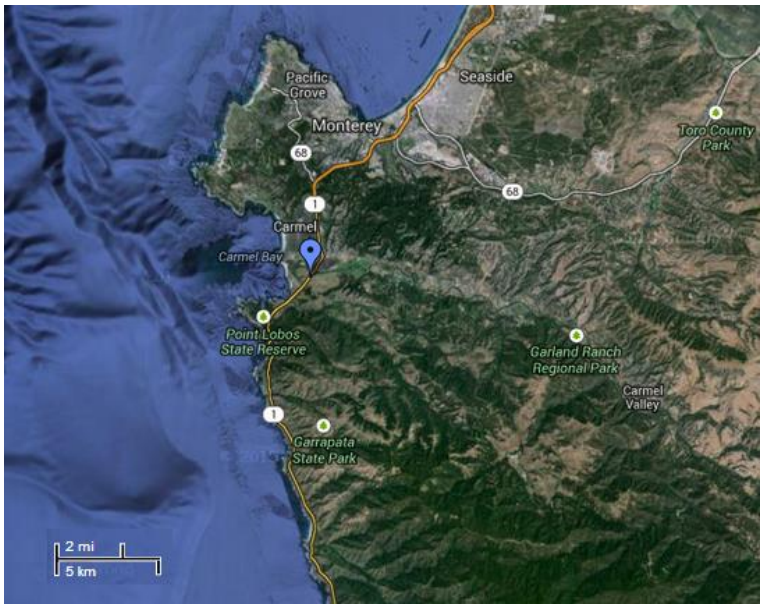

Fig 7. Map showing location of PCRP.

The park property stretches back from Highway 1 for nearly 7 miles, totalling about 4,300 acres. It crosses many habitat types, including pastures, coniferous forests, and oak grasslands. The largely undeveloped land provides a variety of upland and aquatic habitats for many native California species.

Ponds surveyed at PCRP:

Fig 8. Map showing locations of ponds surveyed at PCRP.

Entrance Pond is located near Highway 1, in a front portion of the park inaccessible to visitors. After winter rains, it achieves a maximum size of approximately 500 square meters, with a maximum depth of 4 feet. In 2013, the pond dried throughout the spring and summer until it was completely dry in late September. Previous reports indicate the pond as perennial, so it may be rare that it dries completely (Hemingway and D'Amore 2008). The Carmel River, north of the pond, may provide a source population for migrating bullfrogs. The pond is surrounded by grassy cattle pasture, but is fenced, so cattle are excluded from the pond.

Boundary Pond is also located in the front, inaccessible portion of the park. It is a small, shallow pond, reaching a maximum size of 350 square meters, with a maximum depth of 3 feet. In 2013, the pond was often very turbid, and dried completely by May. There is a cattle fence running through the center of the pond, and it is fenced to prevent intrusion by cattle. It is surrounded primarily by grassland, with chaparral habitat in the back third.

Animas Pond is located at the end of the public section of the main trail. The main portion of the pond achieves a maximum size of about 1000 square meters and a depth of 4 feet. The side channel currently runs across the road, under the footbridge, and into Animas Creek. Restoration was undertaken in late 2013 to make Animas Pond more suitable for CRLF and other species (see Appendix 1). The pond is surrounded in the back by overhanging willows and other wetland plants, and other upland habitats include grassland and oak woodland. This year, it was very densely vegetated with floating pennywort (*Hydrocotyle ranunculoides*) and other aquatic species, making surveying difficult.

Roadrunner Pond is located along the access road on the back on the front slopes of the park, away from the coast. It is a very small and turbid pond, drying completely by June 2013. Maximum size achieved this year was perhaps 100 square meters, with a maximum depth of 2-3 feet. It is fenced to prevent cattle intrusion, and the surrounding slopes are vegetated with coyote brush (*Baccharis pilularis*), French broom (*Genista monspessulana*), and native grasses. It is situated in a matrix of grassland and chaparral.

Dead Pig Pond is located farther back along the access road. It is a larger perennial pond, with a maximum surface area of 800 square meters and a maximum depth of >5 feet. It is fenced to prevent cattle intrusion, and is completely surrounded by thick vegetation, including French broom (*Genista monspessulana*), coast live oaks (*Quercus agrifolia*), and poison oak (*Toxicodendron diversilobum*). It is situated in an oak grassland and chaparral habitat.

Salamander Pond is the farthest back along the access road, on the edge of Santa Lucia Preserve property. There may be movement of amphibian individuals between the two properties. The pond is long and oval, with a maximum surface area of perhaps 2000 square meters, and a maximum depth of 5 feet. It is fenced for cattle exclusion. In 2013, nearly the entire edge of the pond, as well as much of its surface, was overgrown with tall rushes. This seems to be a drastic change from the status of the pond 5 years ago, when it was much more open (Hemingway and D'Amore 2008).

Garland Ranch Regional Park (GRRP):

GRRP is the oldest parkland of MPRPD, and this former ranchland encompasses many habitats. It is located between Carmel and Carmel Valley, on West Carmel Valley Road.

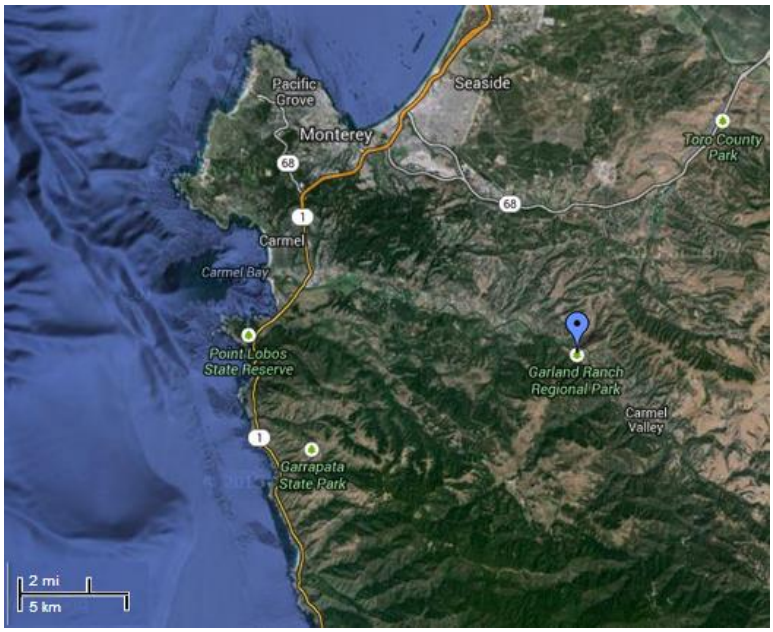

Fig 9. Map showing location of GRRP.

The property encompasses 4,462 acres of valuable central California coast and grassland habitat. Notable features include the Carmel River, Garzas Creek, Palo Corona peak, and a redwood canyon. The park is well-loved for hiking, horseback riding, and mountain biking.

Ponds Surveyed at GRRP:

Fig 10. Maps showing locations of ponds surveyed at GRRP.

Fern Pond is approximately one mile south of the GRRP visitors' center, where Fern trail intersects with other trails. It is a fairly small (~350 square meters), but reaches depths in excess of 5 feet in its deepest areas. It is perennial, possibly spring-fed, and remains fairly cool throughout the year. This is due in large part to abundant canopy cover, with oaks and maples shading 90% of the water surface. Although it is unfenced and located on a few popular trails, there does not seem to be much human impact on the pond.

Mesa Pond is located 1.6 miles away from the GRRP visitors' center, and can also be accessed from the Via Las Encinas gate, less than a mile to the southeast. It is a fairly large (~900 square meters), open, sunny, perennial water body with maximum depths exceeding 5 feet. Much of the shoreline is completely bare, although a coastal live oak overhangs one corner, which is also occupied by a large stand of rush. The pond is home to many introduced fish, including mosquito fish (*Gambusia*), bluegill (*Lepomis macrochirus*), and bass (*Micropterus*) which likely make the pond uninhabitable for many amphibian species, with the exception of bullfrogs (Boone and Semlitsch 2003, Segev et al. 2009, Buttermore et al. 2011).

Veeder Pond is a seasonal wetland located approximately 4 miles southeast of the visitors' center. This ephemeral pond fills each year during the winter rains when water collects in the saddle between two peaks. Thus, it is a fairly high elevation pond (~1524 feet). When filled, it is a fairly large (~700 square meters) pond that accumulates perhaps 4 feet of water. However, this pond rapidly begins to lose size and depth with the passing of spring and summer, and dried completely by July 2013. It experiences some human and dog traffic from the popular trails that lead past it.

Frog Pond Wetland Preserve:

Frog Pond Wetland Preserve is a 17-acre reserve located in Del Rey Oaks, allowing a unique opportunity to study a valuable wetland habitat embedded in an urban and suburban landscape.

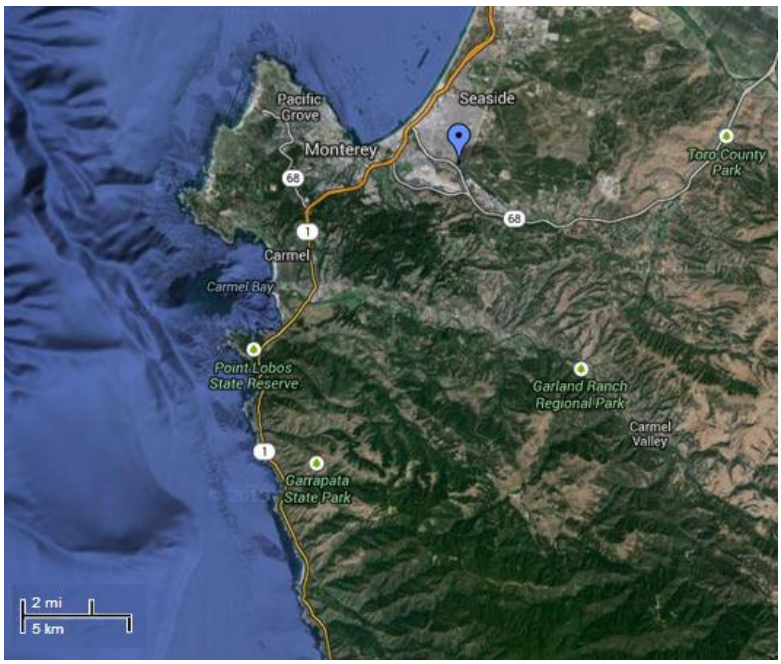

Fig 11. Map showing location of Frog Pond Wetland Preserve.

Frog Pond is located in close proximity to roads and suburban development, making reconciliation ecology a priority.

Ponds Surveyed at/near Frog Pond Wetland Preserve:

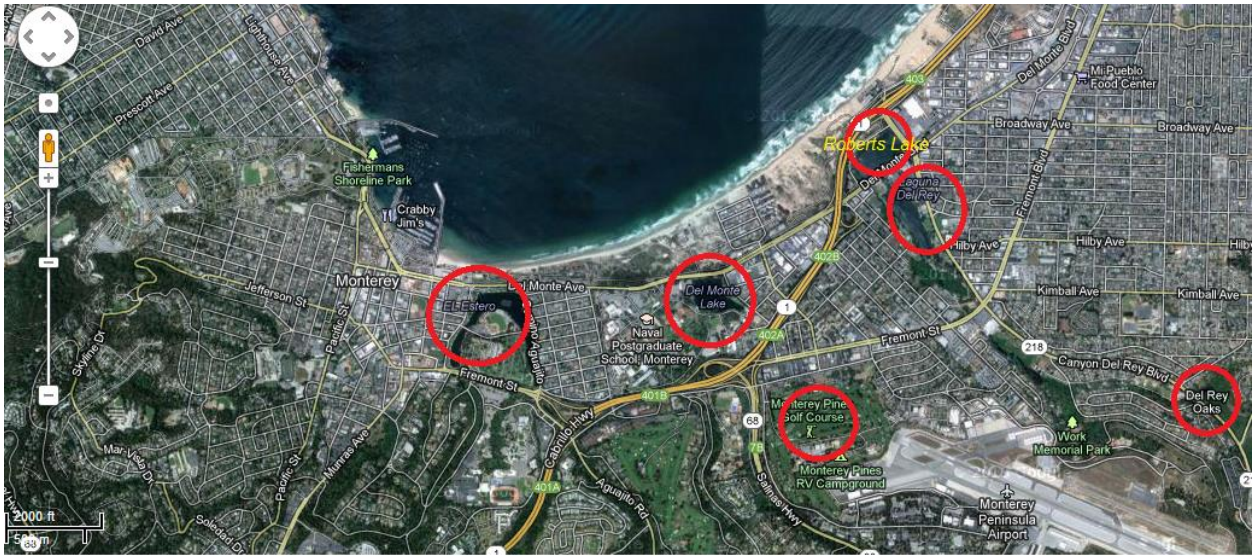

Fig 12. Map showing location of waterbodies surveyed near Frog Pond Wetland Preserve.

Frog Pond is a large, fairly shallow wooded wetland area. There is a natural spring in one corner that remains wet year round, while the main water body dries every year. In 2013 it had dried completely by the end of July. The pond varies from shallow to deep, with some shaded and some open water. There are some vegetation 'islands' that add habitat complexity. Although ultimately surrounded by urban habitat, the upland habitats include wet forests as well as oak grasslands. The preserve has been successfully maintained for the use of songbirds, and provides excellent public space.

Because Frog Pond does not currently support populations of any large-bodied frogs (i.e. CRLF or BF), nearby waterbodies were also surveyed to determine if they could serve as a source population for either of these species. These included **Roberts Lake**, **Laguna Del Rey**, two ponds at **Monterey Pines Golf Course, Del Monte Lake** (at the Naval Postgraduate School), and **Lake El Estero**. All of these water bodies are fairly large, permanent, highly modified habitats surrounded by urban features including parking lots, etc. Many, if not all, of them contain game fish species, and are therefore unsuitable habitat for CRLF. BF are known to survive in the presence of game fish due to the unpalatability of their larvae to fish predators (Szuroczki and Richardson 2011), and there have been reports of BF at some of these lakes, but none were observed or heard calling during multiple visits to these sites.

Survey Methods:

Amphibian Survey Methods:

Amphibian surveys were conducted using several standard methods, as outlined in "Measuring and Monitoring Biological Diversity: Standard Methods for Amphibians" (Heyer 1994). These methods include audio surveys, visual encounter surveys, and dipnet sampling. This combination of methods provides a powerful tool for quantifying population sizes of adult and larval CRLF and BF, while minimizing harassment to the animals.

Surveys began in February, during the breeding season of CRLF, and continued until September, (or until ponds dried), to observe the breeding and metamorphosis of BF. Each site was visited once every three weeks for a day and night survey, usually completed on the same date.

For both day and night surveys, audio surveys were conducted to identify species of calling male frogs. The pond was approached quietly (when at night, after sunset and without the use of flashlights). The observer stood 2-3 meters from the bank, listened for approximately ten minutes, and noted species and approximate density calling (i.e. single individual, discernible individuals, or a full chorus). This method provides a measure of breeding activity and a very rough estimate of relative abundance, but cannot give good estimates of true numbers.

After the audio survey was complete, relevant abiotic factors are recorded. Any cloud cover or precipitation was noted, and a LaCrosse anemometer was used to measure wind speed and air temperature. An Oakton PCSTestr 35 Waterproof Multiparameter Tester was used to measure water pH, conductivity, TDS, salinity and temperature. Water color was noted, and turbidity was estimated from 1 (completely clear) to 5 (completely turbid).

Visual encounter surveys, a non-invasive survey method, were used to record all amphibian individuals observed, including species and life stage. VES were performed both during the daytime and nighttime along the shores of ponds. Visual day surveys are the best method for finding and identifying amphibian egg masses and metamorphs, while night surveys may provide the most accurate count of adults. The survey was performed by scanning along the bank and on the surface of the water with and without binoculars. Any amphibian individual, or amphibian predator, was identified to species and life stage. After using binoculars to scan and identify individuals up to 15 m ahead, the surveyor began walking slowly, while visually searching the banks, water surface, and water bottom (if possible). After walking 10 meters, the observer stopped and scanned ahead with binoculars, and recorded the species, number, and habitat of individuals seen, before proceeding farther. During day surveys, binocular scanning was alternated with dip netting (see below). During night surveys, headlamps were used to first locate amphibians by eye shine and then move closer for identification with the aid of binoculars. If capture is possible, adult frogs were sexed, weighed using a Pesola scale, and SVL was measured. This measure of body weight may provide an indication of the strength of food competition and its impacts on potential reproductive output at each pond.

Larval Amphibian Survey Methods:

Larval amphibians and aquatic invertebrates were sampled using a standard dipnet procedure. A D-shaped dipnet with 1.8-meter handle length was swept perpendicular to the bank, from deep to shallow, beginning about 5 feet out. If not blocked by dense vegetation, the bottom of the pond was swept with each pass of the net. To best characterize the biota of a pond, standard net samples were taken from the entire perimeter, with 10 meters between sweeps. A minimum of 3 and a maximum of 10 sweeps were

taken. After each pass through the water, the contents of the net were checked. For amphibian species, the species, life stage and number of individuals is recorded. For future field seasons, Gosner stage will be recorded, in order to infer age and rate of development within ponds. When larval numbers exceeded 50, an estimate was recorded.

Aquatic Invertebrate Survey Methods:

For aquatic invertebrates, presence/absence data were recorded for many species, although exact numbers were recorded for species likely to be significant tadpole predators. Taxa likely to predate on tadpoles include predatory beetles (families Dysticidae and Hydrophilidae), predatory beetle larvae (Dysticisdae), giant water bugs (family Belastomatidae), and dragonfly larvae (order Anisoptera). Lesser predators include backswimmers and water boatmen (families Notonectidae and Corixidae), water scorpions (family Nepidae), leeches (subclass Hirudinea), and water striders (family Gerridae). Herbivorous invertebrates that serve as indicators of water quality, or may compete with amphibian larvae for shared algal resources, include mayfly larvae (order Ephemeroptera), damselfly larvae (order Zygoptera), scuds (order Amphipoda), snails (class Gastropoda), and clam shrimp (class Branchiopoda).

Results

Amphibian Survey Results

Palo Corona Regional Park:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Entrance	Y	N	Y	N	Y	N
Boundary	Y	N	N	N	Y	N
Animas	N	N	Y	N	Y	N
Roadrunner	N	N	N	Y	Y	N
Dead Pig	N	Y	Y	N	Y	N
Salamander	N	N	Y	N	Y	N

Garland Ranch Regional Park:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Fern	Y	Y	Y	N	N	Y
Mesa	Y	Y	N	N	N	Y
Veeder	N	Y	Y	N	Y	N

Frog Pond Wetland Preserve:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Frog Pond	Y	N	N	N	Y	N

Larval Amphibian Survey Results

Palo Corona Regional Park:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Entrance	N	N	Y	N	Y	N
Boundary	N	N	N	N	Y	N
Animas	N	N	Y	N	Y	N
Roadrunner	N	N	N	Y	Y	N
Dead Pig	N	Y	Y	N	Y	N
Salamander	N	N	Y	N	Y	N

Garland Ranch Regional Park:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Fern	N	Y	Y	N	N	N
Mesa	Y	N	N	N	N	N
Veeder	N	Y	Y	N	Y	N

Frog Pond Wetland Preserve:

	Detected in any 2013 Survey?					
	American Bullfrog	California Newt	California Red-legged Frog	California Tiger Salamander	Pacific Chorus Frog	Western Toad
Frog Pond	N	N	N	N	Y	N

Aquatic Invertebrate Survey Results

Palo Corona Regional Park:

	Detected in any 2013 Survey?												
	Predatory Beetles (Dytiscidae, Hydrophilidae)	Predatory Beetle Larvae (Dytiscidae)	Giant Water Bugs (Belastomatidae)	Dragonfly Larvae (Anisoptera)	Backswimmers/ Water Boatmen (Notonectidae/ Corixidae)	Water Scorpions (Nepidae)	Leeches (Hirudinea)	Water Striders (Gerridae)	Mayfly Larvae (Ephemeroptera)	Damselfly Larvae (Zygoptera)	Scuds (Amphipoda)	Snails (Gastropoda)	Clam Shrimp (Branchiopoda)
Entrance	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y	Y
Boundary	N	N	N	N	Y	N	N	N	N	N	N	N	N
Animas	Y	N	N	N	Y	N	N	N	N	N	Y	N	Y
Roadrunner	N	N	N	N	Y	N	N	N	N	N	N	N	Y
Dead Pig	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N
Salamander	Y	N	Y	Y	Y	N	Y	Y	Y	N	N	Y	N

Garland Ranch Regional Park:

	Detected in any 2013 Survey?												
	Predatory Beetles (Dytiscidae, Hydrophilidae)	Predatory Beetle Larvae (Dytiscidae)	Giant Water Bugs (Belastomatidae)	Dragonfly Larvae (Anisoptera)	Backswimmers/ Water Boatmen (Notonectidae/ Corixidae)	Water Scorpions (Nepidae)	Leeches (Hirudinea)	Water Striders (Gerridae)	Mayfly Larvae (Ephemeroptera)	Damselfly Larvae (Zygoptera)	Scuds (Amphipoda)	Snails (Gastropoda)	Clam Shrimp (Branchiopoda)
Fern	N	N	N	N	Y	N	N	Y	N	N	N	Y	N
Mesa	N	N	N	N	N	N	N	Y	N	Y	Y	Y	N
Veeder	N	N	N	Y	Y	N	N	Y	N	N	N	Y	Y

Frog Pond Wetland Preserve:

	Detected in any 2013 Survey?												
	Predatory Beetles (Dytiscidae, Hydrophilidae)	Predatory Beetle Larvae (Dytiscidae)	Giant Water Bugs (Belastomatidae)	Dragonfly Larvae (Anisoptera)	Backswimmers/ Water Boatmen (Notonectidae/ Corixidae)	Water Scorpions (Nepidae)	Leeches (Hirudinea)	Water Striders (Gerridae)	Mayfly Larvae (Ephemeroptera)	Damselfly Larvae (Zygoptera)	Scuds (Amphipoda)	Snails (Gastropoda)	Clam Shrimp (Branchiopoda)
Frog Pond	Y	Y	N	N	Y	N	Y	N	N	Y	Y	Y	N

Other Species Observed

Palo Corona Regional Park:

	Detected in any 2013 Survey?							
	Reptiles			Fish Predators		Other Predators		
	Western Fence Lizard (*Sceloporus occidentalis*)	Gopher Snake (*Pituophis catenifer*)	Garter Snake (*Thamnophis sirtalis*)	Mosquitofish (*Gambusia*)	Game Fish (*Lepomis* or *Micropterus*)	Raccoon (*Procyon lotor*)	Wading Birds (Ardeidae)	Coyote (*Canis latrans*)
Entrance	N	N	Y	N	N	N	N	N
Boundary	N	N	N	N	N	N	N	N
Animas	Y	N	Y	N	N	N	N	N
Roadrunner	N	N	N	N	N	N	Y	N
Dead Pig	Y	N	Y	N	N	N	N	N
Salamander	Y	N	Y	N	N	Y	Y	Y

Garland Ranch Regional Park:

	Detected in any 2013 Survey?							
	Reptiles			Fish Predators		Other Predators		
	Western Fence Lizard (*Sceloporus occidentalis*)	Gopher Snake (*Pituophis catenifer*)	Garter Snake (*Thamnophis sirtalis*)	Mosquitofish (*Gambusia*)	Game Fish (*Lepomis* or *Micropterus*)	Raccoon (*Procyon lotor*)	Wading Birds (Ardeidae)	Coyote (*Canis latrans*)
Fern	N	N	N	N	N	N	N	N
Mesa	Y	Y	N	Y	Y	N	Y	N
Veeder	Y	Y	N	N	N	N	N	N

Frog Pond Wetland Preserve:

	Detected in any 2013 Survey?							
	Reptiles			Fish Predators		Other Predators		
	Western Fence Lizard (*Sceloporus occidentalis*)	Gopher Snake (*Pituophis catenifer*)	Garter Snake (*Thamnophis sirtalis*)	Mosquitofish (*Gambusia*)	Game Fish (*Lepomis* or *Micropterus*)	Raccoon (*Procyon lotor*)	Wading Birds (Ardeidae)	Coyote (*Canis latrans*)
Frog Pond	N	N	Y	N	N	Y	Y	N

Recommendations:

Pond-specific Recommendations:

Palo Corona Regional Park:

Entrance Pond currently represents valuable breeding and residential habitat for California Red-legged Frogs. There is a large and thriving population of CRLF here (as many as 15 adults observed during any given survey). Successful reproduction occurred here, and metamorphs were observed in large numbers around the pond beginning in June 2013. Occasional bullfrog adults were observed early (February/March) and late (September), but no bullfrog reproduction was observed. California Tiger Salamanders have never been observed here, so recommendations will include only those actions which may have a benefit to CRLF.

- Maintain the fence around Entrance Pond to exclude cattle and human visitors. This will help to maintain water quality for CRLF eggs and larvae.
- Maintain vegetation and drying regime as they currently exist. The current status of vegetation ensures adequate habitat complexity for different life stages of CRLF without choking the water. Pond drydown in September was sufficiently late to allow all CRLF larvae to metamorphose and leave the water, but would prevent bullfrog reproduction.
- If bullfrogs are observed in February/March of 2014, it may be worthwhile to consider bullfrog removal efforts. These should be undertaken only under the supervision of a permitted individual, as bullfrogs can be difficult to distinguish from CRLF. However, bullfrogs may be crossing Highway 1 and/or making use of the Carmel River as permanent habitat, so removal of a few individuals may have little impact. The most critical period for observation and removal is July-September, when CRLF are metamorphosing. Predation pressures from introduced bullfrogs could take a heavy toll on CRLF recruitment during this time (D'Amore et al. 2009).
- If time and budget permits, it would be interesting to establish feasibility of building a new ephemeral pond in the vicinity of Entrance and Boundary ponds. This would allow more movement across the landscape by CRLF, potentially increasing their survival (Amfibie and Nederland 2010). The ephemeral nature of the pond will prevent reproductive use by bullfrogs, whose larvae require a full year of permanent water (Tattersall and Ultsch 2008).
- This work could be bolstered by a study tracking habitat use of CRLF via mark-recapture methods. If CRLF are shown to remain at their natal ponds in PCRP, building additional habitat may be less effective. However, if CRLF move between pond habitats, or between the Carmel River and between habitats, then additional ponds may provide them additional resources and increase their numbers.

Boundary Pond is currently an underused but improvable resource for pond-breeding amphibians at PCRP. The only species observed breeding there during 2013 (and during earlier surveys (Hemingway and D'Amore 2008)) was the Pacific Chorus Frog, which breeds in almost any body of water, regardless of quality (Stebbins 1985). Very high turbidity and early drying (by April 2013) likely prevent reproduction by any other species. Transient bullfrog individuals were observed. This pond has the potential to serve as a resource for CRLF, but use by CTS is unlikely because they have never been observed in this area.

- Maintain the fence around Boundary Pond to limit intrusion by humans and cattle. This will help to minimize turbidity, which can smother amphibian egg masses.
- Increase the depth of Boundary Pond by 2-3 feet such that it holds water until later in the season (at least August). CRLF metamorphs may be able to emerge as soon as June, but it is impossible for them to emerge by April, when the pond currently dries. This increased hydroperiod will allow for species such as CRLF to reproduce here, while the ephemeral nature prevents bullfrog reproduction.
- Plant a stand of native rush in the center of the pond. This will increase habitat complexity, which encourages growth and survival of CRLF larvae, while serving to decrease turbidity.
- If bullfrogs are observed in February/March of 2014, it may be worthwhile to consider bullfrog removal efforts (see above for details).
- Construction of a new ephemeral pond in the same habitat of Boundary and Entrance ponds should be considered (see above).

Animas Pond currently serves as a reproductive pond for CRLF and Pacific Chorus Frogs. It is functional but could be improved. Many of these improvements are already completed, or are underway as of October 2013 (see Appendix 1). No bullfrog individuals have ever been observed in the vicinity of Animas Pond.

- Positive changes to vegetation level, depth, and road maintenance are already under way (Appendix 1). These will improve habitat for CRLF larvae and adults, as well as for other species. Active management and monitoring should be undertaken to ensure that these changes are indeed benefiting CRLF populations.
- The pond should be monitored during bullfrog breeding season (June 2014) to ensure that bullfrog intrusion into PCRP has not proceeded to Animas Pond. Bullfrogs were absent from PCRP during the period 2005-2008 (Hemingway and D'Amore 2008), but they have become established in the most westerly, public sections of the park (likely arising from populations in or near the Carmel River). Animas Pond is therefore likeliest to be invaded next, should the front continue. If bullfrogs are observed, removal efforts should be considered.
- The willow wetland habitat on the far/east side of Animas Pond should be maintained to allow for foraging and non-aquatic shelter of CRLF and other amphibian adults.
- Cows should continue to be excluded from the Animas pond habitat. Every attempt should be made to reduce pig use of the habitat. Pigs create troughs and wallows, increasing turbidity and destroying aquatic vegetation.
- Given that this pond is directly on the trail, and therefore exposed to human influence, the pond should either be fenced off, or signs should discourage visitors from negatively affecting the habitat (e.g. wading, leaving food or trash that would attract predators). Wording could be something like: "Sensitive environment for an endangered species—please be careful not to affect the ecological balance!" Emphasis on the uniqueness of CRLF to California, and on the importance of Carmel Valley as habitat, could be helpful.

Roadrunner Pond serves as breeding habitat for California Tiger Salamander. It is a very shallow, turbid, and fast-drying pond. It is the only pond in which CTS were found in the 2013 season, as compared to two ponds in 2008 (Hemingway and D'Amore 2008). Therefore, any management action taken should err on the side of caution, so as not to cause any negative impacts for this endangered

species. The only other amphibian species found here in 2013 was a breeding population Pacific Chorus Frog. Chorus Frog larvae likely serve as a food source for CTS larvae.

- No change should be made to the pond itself unless conditions change. Although it dried quickly this year (June 2013), larval CTS grew to adequate size, presumably metamorphosing and leaving the pond for upland habitat. The conditions of 2013 (low rainfall contributing to shorter hydroperiod) are likely to be the most extreme seen in the near future. In other words, this is close to the worst case scenario, but CTS reproduced successfully. If the pond dries sooner than late May (the earliest known metamorphosis date for CTS (Searcy and Shaffer 2011)) in 2014 and CTS recruitment is made impossible, the pond should be deepened in fall 2014.
- The fence around Roadrunner Pond should be maintained to prevent intrusion by cattle into this fragile system. If this area of the park is opened to the public, the fence around the pond should be maintained, and signs should discourage visitors from disturbing an endangered species.
- The habitat around Roadrunner Pond should be mowed to maintain a low height of broom and other tall invasive species. Lower vegetation cover is preferred by CTS. Cattle grazing is likely to be ineffective for control of broom. If broom or other plant removal occurs within 3 meters of the pond, these species should be pulled by hand to avoid direct impacts of mowers on amphibian individuals. Perhaps volunteers could be recruited to manually remove broom in exchange for a rare view of the back half of PCRP. Soil disturbance should be minimized to limit the spread of broom and other invasives. Any vegetation removal efforts should be conducted after Roadrunner pond has dried, and before the first heavy winter rains, to avoid impacts on CTS.
- Herbicides should not be applied to remove broom or other invasive plant species. Most, if not all, commercial herbicides have been shown to have negative effects on amphibians, including Ambystomatids. Atrazine exposure in *Ambystoma barbouri* has been linked to nervous system malfunction and reduced immune function, contributing to the spread of ranavirus (Rohr and Palmer 2005, Forson and Storfer 2006). Both atrazine and carbaryl have been shown to reduce larval survival and growth rates, and increase limb deformities in *Ambystoma* (Larson et al. 1998, Rohr et al. 2003). Endosulfan, octylphenol, acteochlor, and paraquat have shown similar effects, including reduced larval survival and growth rates (Rohr et al. 2003, Mann et al. 2009). Even products purported to be safe for use near amphibian habitat, such as glyphosate, make have relatively high impacts due to the surfactant incorporated into most of these products (Mann et al. 2009, Brodman et al. 2010). Many of these impacts have been proven to occur in *Ambystoma tigrinum*, the sister taxon of, and frequent hybrid with, *Ambystoma californiense*, and at least one study suggested that *A. californiense* is even more susceptible to these toxic effects than *A. tigrinum* (Ryan et al. 2012).
- Unlike many pond-breeding amphibians, CTS make extensive use (>95% of their lives) of upland habitat (Searcy et al. 2013). They are known to migrate up to 2000m, with an average distance of 500m (Searcy and Shaffer 2011). Potential effects on the CTS population should therefore be considered in any management decision affecting a buffer of 2000m around Roadrunner Pond.
- If any change is to be made to this pond or to the upland habitat, a CTS expert should be consulted.
- Feasbility of the creation of another ephemeral pond in this area should be evaluated. CTS populations may benefit from the creation of another breeding pond.

Dead Pig Pond is currently an excellent reproductive habitat for CRLF, and is used by California Newts and Pacific Chorus Frogs as well. All three species make use of the spacious, predator-free, complex habitat found here. It may retain water year round.

- No changes to the depth, hydroperiod, or vegetation of the pond should be made at this time. The pond currently functions as a strong reproductive site for CRLF (a threatened species) and for California Newts (a species of special concern in California). No threats to these populations currently exist. The same management for this pond should be continued to ensure that these populations continue to thrive.
- The fence around the pond that excludes cattle should be maintained to avoid degradation of water quality. If this area of the park is opened to the public, the fence around the pond should be maintained, and signs should discourage visitors from disturbing an endangered species.
- Mowing should be continued around Dead Pig pond to reduce height and extent of broom and other tall invasive species.

Salamander Pond is an excellent breeding pond for CRLF and for Pacific Chorus Frogs. It has previously been used by California Newts, but none were observed here during the 2013 field season. Since the 2008 field season, a stand of rush has expanded to occupy much of the open water at Salamander Pond (Hemingway and D'Amore 2008). In 2013, the pond dried completely by October.

- No changes should be made to the depth or hydroperiod of Salamander Pond. It holds water long enough for all pond-breeding amphibian larvae (other than bullfrogs) to metamorphose successfully.
- If rush continues to overtake the surface of the pond, removal efforts should take place to re-establish open water. This will benefit amphibian larvae by increasing water temperature and algal growth, and benefit populations by creating habitat heterogeneity.
- The fence around the pond that excludes cattle should be maintained to avoid degradation of water quality. If this area of the park is opened to the public, the fence around the pond should be maintained, and signs should discourage visitors from disturbing an endangered species.
- Mowing should be continued around Salamander pond to reduce height and extent of broom and other tall invasive species.
- Because this site borders ponds on the Santa Lucia Preserve, management strategies for this population should include joint efforts by MPRPD and SLP. The nearest SLP pond is 0.7 km from Salamander Pond, a distance easily traveled by migrating CRLF and other amphibian species (Tatarian 2008). To support joint efforts, it may prove interesting and/or fruitful to undertake a mark-recapture study in both parks in order to quantify the extent of movement between the two.

Garland Ranch Regional Park

Fern Pond is home to a small but thriving population of CRLF, as well as a large reproductive population of California Newts. Although newts are known to be CRLF egg predators, CRLF larval density is fairly high at Fern Pond, indicating impacts on CRLF from newts may be minimal. Additionally, this subspecies of *T. torosa* is considered a species of special concern by the California Department of Fish and Wildlife, and therefore no effort should be made to remove the newts. Bullfrogs have been observed at Fern Pond, but no more than 2 individuals have been observed per survey, and no reproduction has been observed.

- No changes to the depth, hydroperiod, or vegetation level of Fern Pond should be made. This pond represents a valuable habitat for CRLF and California Newts.
- If bullfrog removal is undertaken, utmost care should be taken to ensure that CRLF are not injured. The ratio of bullfrog individuals to CRLF individuals is very low, it may be difficult to correctly identify a bullfrog for removal.
- Surveys should continue to ensure that further bullfrog encroachment does not occur—if bullfrogs are observed to be moving from nearby Mesa Pond to Fern Pond, more active removal will need to be undertaken.

Mesa Pond is currently overrun with introduced species, including a reproductive population of bullfrogs, as well as hundreds of mosquitofish as well as game fish species, including bluegill and bass. Adult California Newts and Western Toads were occasionally observed near this pond. The pond is large and sunny, with plenty of aquatic plant growth, but very few aquatic invertebrates were ever observed. This is probably due to high predation pressure by the hundreds of fish present. Previous reports indicate that CRLF may have been heard calling in the wet upland area, but no indication of any CRLF presence was observed in 2012.

- In order to make Mesa Pond hospitable to CRLF, a large and costly removal effort would have to take place. Current conditions would likely make survival of CRLF eggs and larvae impossible (i.e. they would be consumed by fish, and outcompeted by bullfrog larvae). Removal efforts for fish and bullfrogs would require draining the pond to remove all bullfrog larvae and fish present, as well as active bullfrog shooting efforts to prevent dispersal of adults.
- This type of removal effort would likely be prohibitively costly in terms of time and money, and perhaps more importantly, be unpopular with park guests. Catch-and-release fishing in the pond is a popular activity, and if fish were removed, visitors would likely reintroduce them. Permanent water bodies such as Mesa Pond are unlikely to be valuable breeding habitat for CRLF.
- The pond should be maintained as is in terms of depth, hydroperiod, and vegetation level. It provides a valuable resource to park visitors. The only risk from this type of management is that of migrating bullfrog adults continuing to invade nearby Fern Pond. However, Fern Pond is fairly distant, across a dry habitat matrix, and bullfrog recruitment from Mesa Pond is likely to be low, due to the presence of fish which may consume bullfrog tadpoles.

Veeder Pond is valuable seasonal habitat for several amphibian species. It contains a thriving population of CRLF, with as many as 10 adult individuals observed on any given survey, and reproduction has been observed, including calling adults, egg masses, larvae, and metamorphs. The California Newt coast range subspecies is also found reproducing here. Although newts are known to be egg predators, the high abundance of CRLF larvae indicates impacts of newts on CRLF may be minimal. No evidence of any bullfrog individuals has been observed here.

- No change should be made to the depth, hydroperiod, or vegetation of Veeder Pond. Even in a dry year like 2013, the pond holds water through July, allowing adequate time for larvae of CRLF and California Newts to metamorphose and leave the water. Successful metamorphosis of both of these species was observed this year. There is adequate habitat heterogeneity in the form of wetland and aquatic vegetation to allow for survival of different life stages of these two species.

- The pond also supports a breeding population of Pacific Chorus Frogs, as well as a thriving aquatic invertebrate community. Aside from indicating environmental quality, the presence of these two groups serves as a good source of prey for the two threatened species here.
- The only threat to CRLF or California Newts at Veeder may be the early drying of the pond, which increases turbidity and lowers available oxygen in the water. This could negatively impact larvae before metamorphosis. In particularly dry years like 2013, it may be helpful to restrict access by humans and dogs to the pond to reduce turbidity and water loss. This could be accomplished by placing signs discouraging visitors from stepping into, or allowing their dogs to swim/walk in, the pond.

Frog Pond Wetland Preserve

Frog Pond Wetland Preserve is valuable habitat in an urban matrix for many bird species as well as for Pacific Chorus Frogs. Although it is embedded in an urban and suburban landscape, in proximity to roads and development, it serves as seasonal and reproductive habitat for many species of passerine birds, as well as for waterfowl. It is comprised of perhaps one acre of wetland habitat that includes several land 'islands', allowing for successful waterfowl reproduction in the presence of raccoon and other predators. The wetland is surrounded by dense tree cover includes willow species, and the greater watershed includes oak grasslands. The wetland achieves a maximum depth of 3-4 feet but dries rapidly, drying completely as early as July or August. Very few amphibian species are found here, including Pacific Chorus Frogs and an occasional bullfrog migrant.

- The current management strategy should be maintained for Frog Pond Wetland Preserve. The habitat is more than suitable for passerine and waterfowl species. It is unlikely that CRLF will colonize the pond. Source populations seem to be too distant to allow for migration:

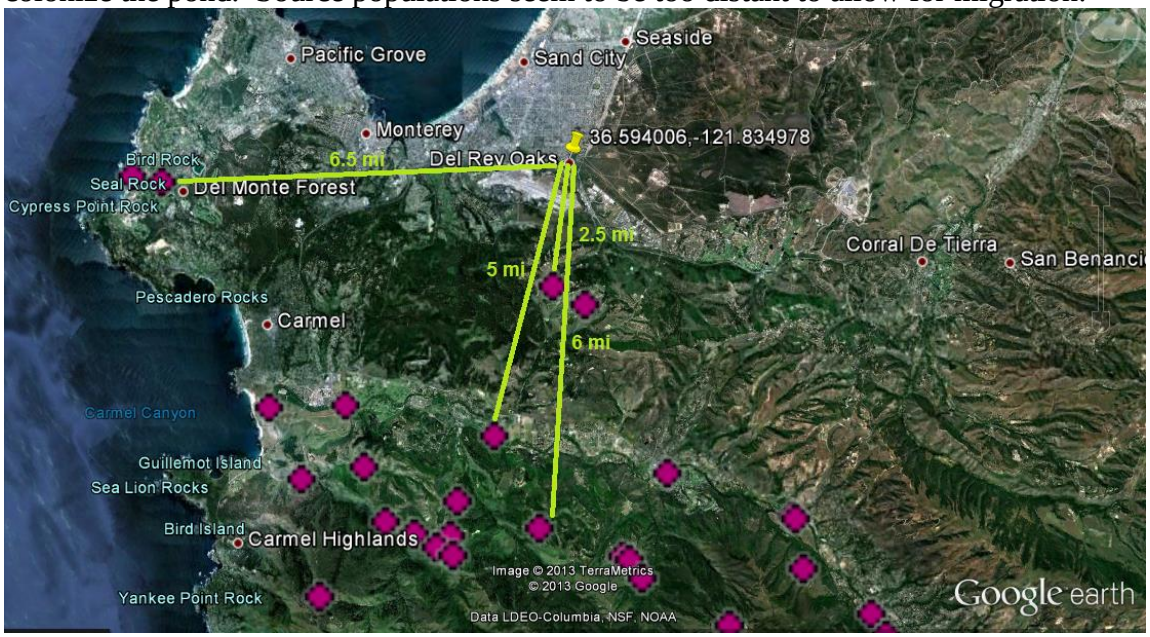

Fig 13. Nearest CRLF source populations (purple dots) to Frog Pond Wetland Preserve (yellow thumbtack). Shortest distances are marked with yellow lines and distances in miles are indicated.

- Frog Pond should not be managed for potential CRLF presence for the following two reasons: No large neighboring waterbody surveyed (Roberts Lake, Laguna Del Rey, two ponds at

Monterey Pines Golf Course, Del Monte Lake (at the Naval Postgraduate School), and Lake El Estero) had any CRLF presence, probably due to the presence of introduced fish.

- Adult CRLF are nearly always associated with bodies of water. Most frogs remain resident at breeding sites all year while others disperse (typically < 0.5 km, up to 2-3 km). CRLF source populations are more distant than this from Frog Pond. Additionally, these movements are typically along riparian corridors, and rarely through inhospitable habitats (e.g. roads and urban areas) (Gray 2009). CRLF are therefore very unlikely to colonize Frog Pond.
- The occasional bullfrog may make use of Frog Pond, but its ephemeral nature makes bullfrog reproduction here impossible. Bullfrog larvae require permanent water in which to overwinter, or they do not survive. Frog Pond management should therefore not focus on excluding bullfrogs.
- The current habitat and hydroperiod is suitable for the current use of Frog Pond.

General Recommendations

- Continue with yearly monitoring and active management of ponds and amphibian populations. Surveys conducted piecemeal or occasionally can only provide 'snapshots' of the status of amphibian populations, with very limited information about population trends. To ensure that current management strategies are effective, surveys for pond-breeding amphibians must be undertaken each year. This is especially important for the endangered and threatened species present in the park system: if decline begins to occur, it can be observed and counteracted immediately.
- These surveys should be conducted, at minimum, on a monthly basis from January through August. This will allow for the observation of each life stage of pond-breeding amphibians. This will include day and night surveys of each pond, with visual, audio, and dipnet surveys. This type of survey regime will provide the most information about breeding adult populations, larval densities, and metamorph emergence.
- The hydroperiod at each pond should be monitored, to ensure the health of amphibian populations. Ideally, ephemeral ponds will dry no earlier than August in an average year. If a pond is observed to dry earlier than this for 3 sequential years, then it should be deepened. Perennial ponds should be drained completely every 3-5 years to discourage the establishment of invasive bullfrogs and fish. This draining should occur in September-November, when the fewest other amphibians are likely to be present.
- The extent of vegetation at each pond should be monitored as well, and maintained if necessary. Ponds have a natural range of variation in terms of extent of aquatic vegetation, but certain extremes are unfavorable for amphibian species. A mix of open water and complex plant habitat is best. If a pond is completely choked with vegetation, algal resources may limit larval survival and movement of adults. If the pond has 100% open water, larvae and adults suffer from a lack of shelter, as well as the ability to partition habitat.
- A disease assessment should be conducted in order to determine the potential extent and severity of amphibian diseases, including ranavirus and chytrid fungus (*Batrachochytrium dendrobatidis*). If either disease is present at ponds within the parks, then extra care should be taken to encourage surveyors and visitors to avoid spreading it to uninfected areas. For researchers, this will involve disinfecting equipment between sites. The best way to avoid having visitors spread amphibian diseases may be to exclude them from ponds (e.g. with fences).
- Conservation efforts within the parks would be bolstered by an education campaign informing visitors about the presence of endangered amphibians. The Monterey area is critical habitat for CRLF, CTS, and California Newts, and this cultural heritage should be a source of pride for park visitors. Informational signs that show pictures of, and give information about, these organisms should be placed near ponds where they are present. These signs could give visitors suggestions on how to do their part in conserving these valuable species and habitats while in the parks (e.g. keep a safe distance from pond edges, watch for amphibians on the move).
- Finally, MPRPD should work with adjacent landowners and organizations in a coordinated effort to benefit amphibian populations. Amphibians may be protected on MPRPD land, but adults are known to frequently move over land, sometimes great distances. If individuals move into areas contaminated with biological or chemical pollutants, the efforts at MRPRD may do little to bolster populations of these species. PCRP, in particular, is embedded in a matrix of protected lands, and coordination between the management of these parks and protected areas could help ensure a thriving metacommunity of amphibians in this area.

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Appendices

Appendix 1: Animas Pond Restoration Project, October 2013

On October 12, 2013, work was begun on a habitat restoration project to improve conditions at Animas Pond at Palo Corona Regional Park. The pond had become choked with aquatic vegetation and mud, which required removal. The side channel leading to a drainage into Animas Creek had become heavily degraded. The weir had been damaged or removed, causing excessive water loss. A pedestrian footbridge allowed park visitors to cross this side channel, but the location of the access road required park vehicles to drive through the side channel/drainage.

Objectives of the restoration included:

- Deepening the main pond area by removing mud and vegetation, including floating pennywort (*Hydrocotyle ranunculoides*), rushes, and other species. This increased open water at the pond from nearly 0% to ~60%.

Extent of vegetation at Animas Pond before removal was undertaken.

- Maintaining a sizeable (3x3 m) 'island' of wetland vegetation, including rushes and others, in the center of the pond in order to increase habitat heterogeneity for the benefit of CRLF and other pond-breeding amphibians.
- Deepening some other pond areas, including the side channel and levee edge in order to create more deep and open water in these areas, which were previously shallow and/or choked with mud and vegetation.

Deepening the main pond and edge next to the road/levee. Pink tape indicates the vegetation 'island'.

- Adding height to the levee on which the access road is located, in order to increase water retention during the summer and prevent flow-over of water and sediment during winter rains.
- Maintaining a perimeter of rushes and other native vegetation around the pond edges, as well as planting additional rushes or other vegetation along the newly-deepened levee edge.
- Building a bridge for automobile access over the pond drainage/side channel to keep the pond clear of the effects of traffic, including endangering individuals, increasing turbidity in Animas Pond, and causing runoff into Animas Creek.

Former location of the access road, indicated by tire tracks, passing through the side channel. A bridge will eliminate this source of pond damage and degradation.

- Reconstruction and relocation of the weir, now to be located under the access road bridge, to increase water retention through the breeding season of CRLF and other species.
- Reducing overshadowing willow branches on the far side of the pond, where they overhang the water. Otherwise, maintaining this upland willow wetland habitat for upland use by amphibian terrestrial stages.

Before restoration efforts were undertaken, the pond and a 3 m upland buffer were visually surveyed, and open water dipnetted, to determine the likely impact to amphibian species. Around the pond's edge, 3 Pacific Chorus Frog (*Psuedacris regilla*) metamorphs were observed. These individuals were probably the last remaining around the pond from the 2013 breeding season. No adults or larvae were observed, so negative impacts of the work were likely to be minimal on this common amphibian species. Additionally, 2 young Common Garter Snakes (*Thamnophis sirtalis*) were observed in the terrestrial buffer. Negative effects are likely to be minimal to this common reptile species. Dipnetting of open water revealed several skimmer dragonfly (Libellulidae) larvae, scuds (Amphipoda), some small diving beetles (Dysticidae), and a few leeches (Hirudinea). Populations of these invertebrates at Animas Pond are unlikely to be affected by pond drainage and restoration.


Young Common Garter Snake observed at Animas Pond.

No other species were observed during this survey. Although CRLF were observed breeding here earlier during 2013, there was no evidence of presence of any life stage. Adults and metamorphs use ponds seasonally and have likely moved to upland habitats by October. They are unlikely to be harmed by the restoration project.