AMPHIBIAN SURVEY REPORT

CONNOLLY RANCH

ALAMEDA COUNTY

MARCH 2018

Prepared for

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Section 1. INTRODUCTION

This report summarizes the results of focused amphibian surveys conducted in 2017 for the purpose of understanding habitat features important for California red-legged frog (*Rana draytonii*) populations within the Connolly Ranch Property. The surveys were authorized by U.S. Fish and Wildlife Service (Service) on May 24, 2017 (Service reference number 2017-TA-1844) and were completed based on the Amphibian Survey Plan submitted to the Service on April 20, 2017.

These surveys were conducted to gain additional knowledge of threatened species and their habitats in Alameda County. The baseline surveys included a combination of pond habitat assessments and surveys within the Connolly Ranch. Habitat assessments included an evaluation of pond habitat within Connolly Ranch for potential to support California red-legged frog (*Rana draytonii*, CRLF); and an evaluation of threats to this species or the integrity of their habitat. The surveys were funded by the Alameda County 2017 Fish and Wildlife Propagation Funds.

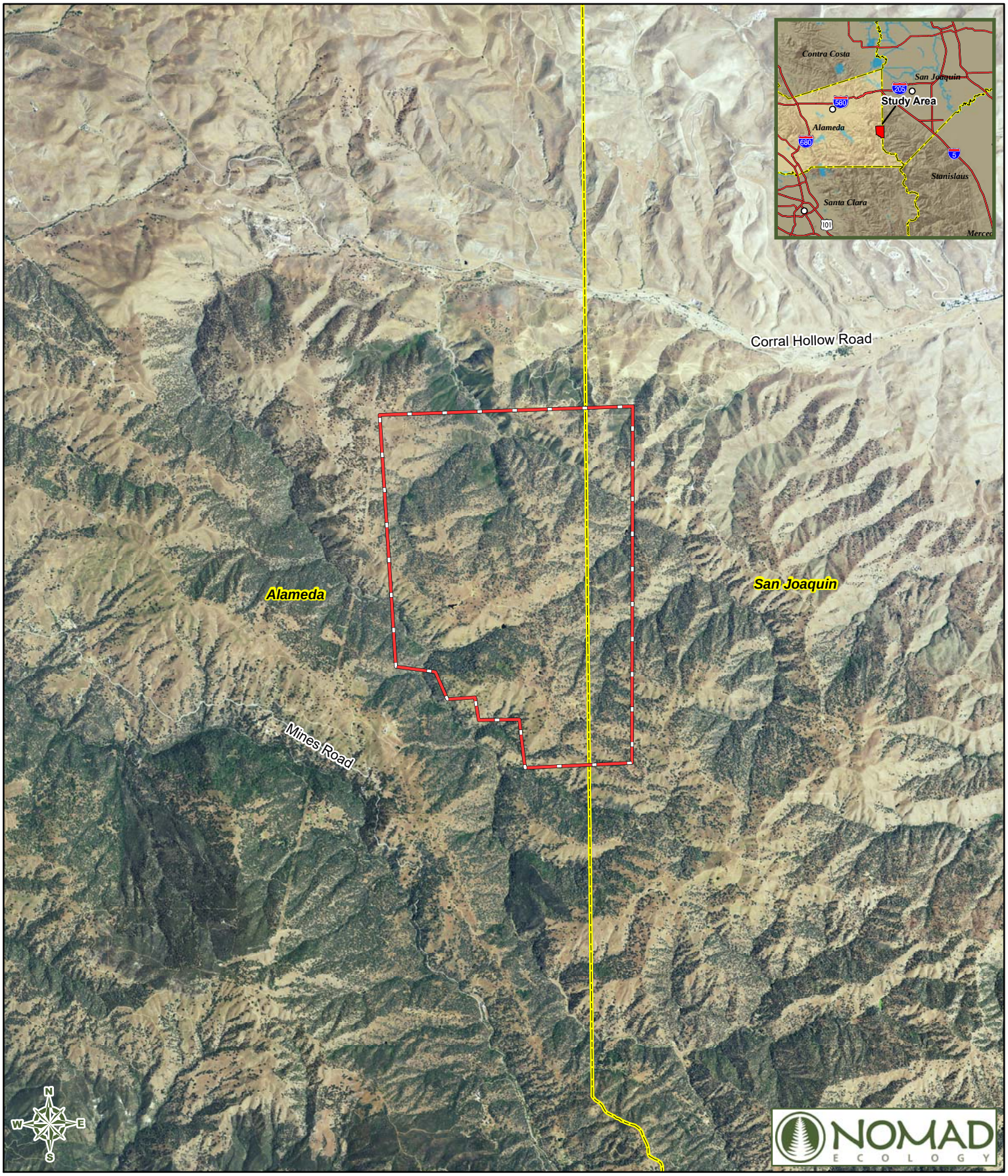
The study area is the Connolly Ranch, located in the eastern portion of Alameda County, California (Figure 1). Connolly Ranch is a private ranch that includes approximately 2,400 acres in eastern Alameda County, near Corral Hollow, and is within California red-legged frog Critical Habitat. Eight ponds were identified on the property to survey. This study area was chosen due to the property being within California red-legged frog Critical Habitat and the desire of the property owner to understand the special-status-species distribution on their property, to guide future land management decisions in order to enhance their populations.

1.1. SURVEY PURPOSE

Nomad's main objective of the amphibian surveys was to conduct habitat assessments and surveys for California red-legged frog, in the pond habitats of the Connolly Ranch property. In a larger context, our goal is to collect California red-legged frog habitat and population information and use these data in combination with previously collected data and data to be collected in the future to help draw correlations between specific habitat features and successful breeding populations in the San Francisco East Bay Area. More specifically, the main project goals include:

1. Collect detailed aquatic feature characteristic data important to California red-legged frog habitat, including but not limited to detailed vegetation data, pond depth, water quality data, and an assessment of threats potentially affecting California red-legged frog at these ponds. The primary threats to be assessed include invasive species (i.e. bullfrogs), vegetation management, lack of suitable egg mass substrate (e.g. emergent freshwater monocot vegetation), lack of proper hydrology for successful breeding, and recreation activities (e.g. trail proximity), among others; and
2. To locate aquatic features currently supporting and/or with the potential to support California red-legged frog populations within the Connolly Ranch Property in Alameda County to provide baseline survey data which can be used by Connolly Ranch Inc. for future land management decisions including long-term monitoring and stewardship of California red-legged frog populations and their habitat[1].

[1] Although not a focus of this study, aquatic features will simultaneously be surveyed for California tiger salamander, western pond turtle, and any other special-status species with potential to occur in the survey area.



January 2018

Amphibian Survey Report

Legend
Connolly Ranch Boundary
County Boundaries

Figure 1

Aerial Photo of Study Area

Connolly Ranch

Alameda County Fish and Wildlife Commission

1:63,360

0 0.5 1

Miles

Sources: USGS, California Spatial Information Library. Projection: NAD 83 UTM 10 North.

Alameda County, California

1.2. STUDY BACKGROUND

The Connolly Ranch study is the beginning of an intended larger study to assess and survey pond habitat in the Bay Area for presence of special-status amphibians, and to gather water quality, species-specific vegetation, and threat information. The goal of our full study is to sample a wide variety of ponds (historically known to support or currently suspected to support California red-legged frog, California tiger salamander, and other amphibians; as well as ponds with no information at all) and gather water quality and species specific vegetation information to analyze for meaningful trends and correlations. If significant correlations are discovered, especially at the local level, this could aid future land management and monitoring decisions to help enhance special-status amphibian habitat and their populations within the Bay Area. In 2017 we gathered data at 8 ponds within Connolly Ranch and 30 ponds within the Vasco Hills / Byron Vernal Pools Management Plan Area in eastern Contra Costa County. These 30 ponds are on land managed in partnership between East Contra Costa County Habitat Conservancy and East Bay Regional Park District. The report summarizing the results of these surveys are in prep and will be published in 2018 (Nomad Ecology In Prep). The results of the Connolly Ranch surveys and habitat assessments are summarized in this report. Full data analysis to determine correlations between California tiger salamander (*Ambystoma californiense*) and/or California red-legged frog presence and different habitat parameters will be completed once more pond data is collected in the coming years. The locations for sampling each year will be dependent upon future funding sources.

1.3. LIFE HISTORIES OF TARGET SPECIES

The species of interest for this project was California red-legged frog, but the seine and dipnet surveys also focused on capturing California tiger salamander. We designed our study to maximize detection of these species and to be able to collect the habitat data all in one visit to each pond. We also recorded data about observations of other herpetofauna and special-status species. Understanding the life-history of the target species is critical to effectively managing their habitat; a brief summary of relevant life history information is provided below.

1.3.1 CALIFORNIA RED-LEGGED FROG

The California red-legged frog is a federally listed threatened species and a California Species of Special Concern. The California red-legged frog is one of two species of red-legged frog endemic to the Pacific Coast. Historically it occurred from Riverside County to Mendocino County along the Coast Range; from Calaveras County to Butte County in the Sierra Nevada; and in Baja California, Mexico (USFWS 2017a). California red-legged frogs are still locally abundant within portions of the San Francisco Bay area and the central coast (USFWS 2017a). Within the remaining distribution of the species, only isolated populations have been documented in the Sierra Nevada, northern Coast, and northern Transverse ranges (USFWS 2017a). This species is believed to be extinct from the southern Transverse and Peninsular ranges, but is still present in Baja California, Mexico (USFWS 2017a).

California red-legged frogs predominately inhabit permanent and seasonal water sources such as streams, lakes, marshes, natural and man-made ponds, and ephemeral drainages in valley bottoms and foothills up to 1,500 meters (4,921 feet) in elevation (Jennings and Hayes 1994, Bulger et al. 2003). Adults breed in a variety of aquatic habitats, while larvae and metamorphs use streams, deep pools, backwaters of streams and creeks, ponds, marshes, sag ponds, dune ponds, and lagoons. Stock ponds are frequently used for breeding when they provide a suitable hydroperiod, pond structure, and vegetative cover, and when they are managed to control non-native predators such as American bullfrogs (*Lithobates catesbeianus*, bullfrog) and exotic fish. Red-legged frog breeding occurs between November and April within still or slow-moving water with light to dense, riparian or emergent vegetation, such as cattails (*Typha* spp.),

tules (*Scirpus* spp.) or overhanging willows (*Salix* spp.) (Hayes and Jennings 1988). Egg masses are attached to vegetation below the surface and hatch after 6 to 14 days (Storer 1925, Jennings and Hayes 1994). Larvae undergo metamorphosis 3.5 to 7 months following hatching and reach sexual maturity at 2 to 3 years of age (Jennings and Hayes 1994).

Some California red-legged frogs remain at breeding sites during the non-breeding season, whereas others disperse into adjacent upland habitat or to other aquatic sites (Fellers 2005, Fellers and Kleeman 2007, Tatarian 2008). Tatarian (2008) reported that 57% of frogs fitted with radio transmitters in Round Valley of eastern Contra Costa County stayed at their breeding pools, whereas 43% moved into adjacent upland habitat or to other aquatic sites. The distance red-legged frogs will travel from breeding sites is site dependent. Fellers and Kleeman (2007) reported that only a few of frogs, of the 123 studied in Marin County, moved farther than the nearest suitable non-breeding habitat. In this study, the furthest distance traveled was 1.4 kilometers (0.9-mile) and most dispersing frogs moved through grazed pastures to reach the nearest riparian habitat (Fellers and Kleeman 2007). In general, terrestrial habitats used by California red-legged frogs have abundant cover (e.g., burrows, woody debris, and vegetation), and those terrestrial habitats are relatively close to water (USFWS 2002, Fellers and Kleeman 2007, Tatarian 2008). A California red-legged frog diet is dependent on prey availability at each site but consists mostly of terrestrial invertebrates (Bishop et al. 2014).

The USFWS (2010) has identified the following "Primary Constituent Elements" (PCEs) essential to the conservation of the California red-legged frog:

1. *Aquatic Breeding Habitat (PCE-1)*. Standing bodies of fresh water (with salinities less than 7.0 ppt), including: natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years.

2. *Non-Breeding Aquatic Habitat (PCE-2)*. Freshwater and wetted riparian habitats, as described above, that may not hold water long enough for the species to hatch and complete its aquatic life cycle, but that provide shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these elements include, but are not limited to: plunge pools within intermittent creeks; seeps; quiet water refugia during high water flows; and springs of sufficient flow to withstand the summer dry period.

3. *Upland Habitat (PCE-3)*. Upland areas adjacent to or surrounding breeding and non-breeding aquatic and riparian habitat, up to a distance of 1.6 kilometer (1 mile) in most cases, and comprised of various vegetation types such as grasslands, woodlands, wetland, or riparian plant species that provides the frog shelter, forage, and predator avoidance. Upland features are also essential in that they are needed to maintain the hydrologic, geographic, topographic, ecological, and edaphic features that support and surround the wetland or riparian habitat. These upland features contribute to the filling and drying of the wetland or riparian habitat and are responsible for maintaining suitable periods of pool inundation for larval frogs and their food sources. They also provide breeding, non-breeding, feeding, and sheltering habitat for juvenile and adult frogs (e.g., shelter, shade, moisture, cooler temperatures, a prey base, foraging opportunities, and areas for predator avoidance). Upland habitat should include structural features such as boulders, rocks and organic debris (e.g., downed trees, logs), as well as small mammal burrows and moist leaf litter.

4. *Dispersal Habitat (PCE-4)*. Accessible upland or riparian dispersal habitat within designated units and between occupied locations within a minimum of 1.6 kilometer (1 mile) of each other, and that allow for movement between such sites. Dispersal habitat includes various natural

habitats and altered habitats such as agricultural fields, which do not contain barriers (e.g., heavily traveled road without bridges or culverts) to dispersal. Dispersal habitat does not include moderate- to high-density urban or industrial developments with large expanses of asphalt or concrete, nor does it include large reservoirs over 50 acres in size, or other areas that do not contain those features identified in primary constituent elements 1, 2, or 3 as essential to the conservation of the subspecies.

California red-legged frogs are currently threatened by loss of habitat from the growth of cities and suburbs, mining, overgrazing by cattle, invasion of non-native plants, impoundments, water diversions, stream maintenance for flood control, degraded water quality, and introduced predators, such as bullfrogs (USFWS 2017a). The fragmentation of existing habitat and the continued colonization of existing habitat by non-native species may represent the most significant threat (USFWS 2017a). Although a positive correlation exists between the absence of California red-legged frogs and the presence of bullfrogs, these two species are known to coexist in some environments (Doubledee et al. 2003, Cook and Currylow 2014).

California red-legged frog adult.

1.3.2 CALIFORNIA TIGER SALAMANDER

The Central California Distinct Population Segment (DPS) of California tiger salamander (Central California tiger salamander) is state and federally listed as threatened. The Central California tiger salamander is restricted to the Central Valley and Inner Coast Range from Tulare and San Luis Obispo Counties in the south, to Sacramento and Yolo Counties in the north (USFWS 2014). Within this area, the species is known from sites on the Central Valley floor near sea level, up to a maximum elevation of roughly 3,940 feet (1,200 meters) in the Coast Ranges and 1,640 feet (500 meters) in the Sierra Nevada foothills (USFWS 2014, 2017b).

The California tiger salamander has an obligate biphasic life cycle which allows this species to utilize both aquatic and terrestrial habitat (USFWS 2017b). Although salamander larvae develop in the vernal pools and ponds in which they were born, once a metamorph leaves its natal pond and enters a burrow, it will then spend a vast majority of its life underground (Trenham et al. 2001). Adult Central California tiger salamanders engage in mass migrations during a few rainy nights per year, typically from November through April, although migrating adults have been observed as early as October and as late as May (USFWS 2017b). During these rain events, adults leave their underground burrows and return to breeding ponds to mate and will then return to their underground burrows. Upland habitats surrounding known

Central California tiger salamander breeding pools are usually dominated by grassland, oak savanna, or oak woodland (USFWS 2017b).

Breeding sites are typically fish-free ephemeral ponds that fill during winter and dry by summer (USFWS 2014). Historically, California tiger salamanders utilized vernal pools as breeding sites, but the species now also commonly breeds in livestock ponds (USFWS 2014, 2017b). Vernal pools and ephemeral ponds are better able to support California tiger salamanders than wetlands that hold water year-round because perennial ponds are more likely to support breeding populations of predatory species and typically have higher numbers of hybrid tiger salamanders in areas where hybrids co-occur (USFWS 2014).

California tiger salamanders have been reported to travel distances up to 1.6 km (1.0-mile) (Austin and Shaffer 1992), but Trenham and Shaffer (2005) estimate that optimal upland habitat is within 630 m (2,067 feet) of breeding ponds. Eggs are laid singly or in small clusters on the pond bottom or attached to individual strands of vegetation (Storer 1925, Barry and Shaffer 1994, Jennings and Hayes 1994). The larval stage of the Central California tiger salamander usually lasts 3 to 6 months, with metamorphosis beginning in late spring or early summer (Petranka 1998). Once metamorphosis occurs, juveniles typically depart their natal ponds at night and enter terrestrial habitat in search of underground burrows (Petranka 1998). Peak periods for metamorphs to leave their natal ponds have been reported from May to July; however, peak timing of migration may vary based on locality, environmental conditions, and degree of hybridization with non-native barred tiger salamanders (USFWS 2017b).

The following are the primary constituent elements essential to the conservation of the California tiger salamander (USFWS 2005):

5. *Breeding habitat (PCE-1).* Standing bodies of fresh water (including natural and manmade (e.g., stock)) ponds, vernal pools, and other ephemeral or permanent water bodies that typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall.

6. *Upland habitat (PCE-2).* Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat that California tiger salamander depend upon for food, shelter, and protection from the elements and predation.

7. *Dispersal habitat (PCE-3).* Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

Multiple factors have contributed to population declines of this species, including habitat loss and fragmentation; predation from, and competition with, invasive species; hybridization with non-native barred tiger salamanders (*Ambystoma tigrinum*); mortality from road crossings; contaminants; and small mammal burrow control efforts (USFWS 2017b). Potential threats include introduction of diseases such as ranaviruses and chytrid fungi, and also climate change (USFWS 2017b).

California tiger salamander larvae close to full metamorphosis.

Section 2. METHODS

2.1. DATA RESOURCES AND BACKGROUND RESEARCH

Background information for special-status amphibian species this project focused on was compiled through a review of the following resources:

- California Department of Fish and Wildlife California Natural Diversity Database (CNDDB) Query for Connolly Ranch and a one mile buffer (CNDDB 2018)
- Species and habitat (ponds) data and other information (boundaries, previous habitat assessment and survey data, etc.) provided by Mark Connolly in the form of pdf maps

Ms. Bishop, analyzed this data and in discussion with Mark Connolly, determined the survey locations and developed a survey plan to conduct baseline habitat assessments and surveys targeting covered herpetofauna species. This survey plan was submitted to U.S. Fish and Wildlife Service on April 20, 2017 and approved on May 24, 2017.

2.2. PERSONNEL AND FIELD INVESTIGATIONS

Nomad Ecology's Senior Wildlife Biologist Meghan Bishop (MB) conducted the surveys for this project and has the required permits for the research. Ms. Bishop currently holds a U.S. Fish and Wildlife Service Section 10(a)1(A) permit to conduct independent surveys for adult and larval California red-legged frog and California tiger salamander (Permit #75275B, exp. 4/24/21), a Scientific Collecting Permit (Permit #011581, exp. 1/3/21) from California Department of Fish and Wildlife, and a Memorandum of Understanding to conduct research on California tiger salamander from California Department of Fish and Wildlife (agreement signed Jun 21, 2016, exp. 4/24/21). Field assistants that worked under the supervision of Ms. Bishop included Nomad wildlife biologists Erick Mahood (EWM) and Elyse DeFranco. Pond habitat assessments and surveys were conducted in June. The specific dates for each pond habitat assessment and survey are included below in Table 2.

Table 1. Pond Survey Dates

DATE	POND ID	PERSONNEL
6/15/17	Rock Pond, Steep Canyon Pond	MB and ED
6/19/17	Frog Pond, Section 6 Pond	MB and EWM
6/20/17	Foxtail Pond, Deerian Pond	MB and EWM
6/27/17	Stuart Pond, Unnamed Pond	MB and EWM

2.3. HABITAT ASSESSMENT AND SURVEY METHODS

In late June of 2017, one visit was made to each of the 8 ponds. These visits were seasonally timed to optimize identification of pond vegetation and the breeding seasons of the target covered species. The ponds that were known to dry earliest were visited first, and the ponds that are known to hold water the longest were surveyed last. During each visit, data was collected for pond characteristics and surveys were conducted for California red-legged frog, California tiger salamander, and western pond turtle (*Actinemys marmorata*). The data forms used to collect data include the U.S. Fish and Wildlife Service

California red-legged frog habitat assessment form, Nomad Ecology's pond data sheet to collect additional detailed pond characteristic data, and U.S. Fish and Wildlife Service California red-legged frog survey form.

The data collected during the habitat assessment included size of aquatic features, water quality, maximum depth recorded, emergent, submerged, and overhanging species-specific vegetation information, weather data, species observed, and any other notable information (such as threats observed). The maximum depth of ponds was measured using the Deeper Fish Finder depth meter, by throwing the meter while attached to a long rope, to several locations within the pond to find the deepest measurement. The weather data was collected using a Kestrel weather meter. Percent cover of emergent, submerged, and overhanging vegetation was estimated in the field using the California Native Plant Society Cover Diagrams. Plant species were identified in the field whenever possible. If species identifications were unknown parts of plants were collected and identified by botanists in the lab using the Jepson Manual (Baldwin et al. 2012). The water quality measurements were taken with a YSI ProDSS meter which recorded conductivity (SPC), dissolved oxygen (mg/L), turbidity (NTU), salinity (PPT), nitrates (mg/L), pH, and total dissolved solids (mg/L).

Methods used for California red-legged frog, California tiger salamander, and western pond turtle surveys were daytime visual encounter surveys for adults and juveniles and dipnet/seine surveys for California red-legged frog tadpoles and California tiger salamander larvae. Survey techniques closely adhered to the October 2003 *Interim Guidance on Site Assessment and Field Surveys for Determining Presence or a Negative Finding of the California Tiger Salamander* and the USFWS *Revised Guidance on Site Assessments and Field Surveys for the California Red-legged Frog.* However, due to time limitations, each pond was only surveyed once for presence of larval amphibians to establish baseline pond data and does not prove absence of these species if they were not observed.

Visual encounter surveys involved a thorough visual search with binoculars of the banks, floating and emergent vegetation, water, woody debris, and exposed rocks with the aim of locating California red-legged frog individuals and any other special-status species. The larval survey effort consisted of the following:

- Sampling ceased after 50 dipnet sweeps if positive identification of California red-legged frog tadpoles was made to minimize disturbance of pool flora and fauna.
- Ponds were initially sampled using D-shaped or similar, long-handled dipnets with 1/8th inch (3.2mm) or finer mesh. If California red-legged frog tadpoles were not captured in the first 50 dipnet sweeps, covering representative portions of the aquatic feature, seines were used if practical.
- If dipnetting was unsuccessful, a seine was used to sample up to 100% of the surface area of pond. One eighth inch (3.2 mm) or finer mesh minnow seines with weights along the bottom and floats along the top edge were used. Whenever possible, the seine was pulled from one edge of the pond to the other. If seine use was not practical, and it was deemed appropriate, additional dipnet sweeps were performed.

A survey data sheet was completed and included all amphibian species observed, number of individuals observed or heard, life stages, size class, and certainty of identification. All other wildlife observed during the survey were included on the data sheet. If more than 100 individuals of a non-covered or non-native amphibian species were observed, the numbers were conservatively estimated to the nearest 100 (i.e. if estimated to be 160 larvae, the number observed was 100+; if it was estimated to be 250 the number observed was 200+). The numbers were estimated by counting the number of larvae observed in the first few dipnets and then averaging this to determine larvae observed per dipnet and multiplying by

the number of dipnets performed. Surveyors followed agency approved guidance (Declining Amphibian Population Task Force's Code 2005) for disinfecting equipment and clothing after surveying aquatic features.

2.4. LIMITATIONS

Although survey timing and intensity was optimized to detect the California red-legged frog and California tiger salamander, it is not possible to rule out the presence of these species where they were not detected. The surveys prove presence where species were detected, but negative findings do not indicate absence since the field surveys did not conform to species-specific agency approved protocols. Protocol survey requirements differ for each species but are much more time intensive and were not realistic to conduct to meet the goals of this project. Deep depths of the ponds made it difficult to survey and therefore capture all larval amphibian species present, especially if they were only present in low numbers. Additionally, California tiger salamander breeding often does not occur every year in a known breeding pond (USFWS 2017b). Often California tiger salamander are observed one year but not the next, in a study by Jeff Alvarez of 90 ponds in Contra Costa County, there was an average gap of three years between breeding events for each pond (J. Alvarez pers. comm. as cited in USFWS 2017b).

Deerian Pond on June 20, 2017.

Section 3. HABITAT ASSESSMENT AND SURVEY RESULTS

3.1. KNOWN OCCURRENCES IN THE VICINITY OF THE STUDY AREA

Prior to this current study, amphibian surveys were conducted by Vollmar Natural Lands Consulting in 2009 on the Connolly Ranch property. This data within the Connolly Ranch and all other survey data in the nearby vicinity that was reported to California Natural Diversity Database (CNDDB 2018) was used to determine where the nearest known breeding populations or species sightings have been recorded to help identify locations that might be the most impactful for habitat management activities.

Several occurrences of California tiger salamander and California red-legged frog occur within and/or in the vicinity of Connolly Ranch (CNDDB 2018, data from Mark Connolly). Table 2 summarizes the known occurrences within one mile of the study area. Figure 2 shows the locations of these occurrences. There are three California red-legged frog occurrences reported from Connolly Ranch in 2009, at Frog Pond, Deerian Pond, and Stuart Pond. There are two California tiger salamander occurrences reported from Connolly Ranch in 2009, at Frog Pond and Steep Canyon Pond. As discussed in the limitations section above, California tiger salamanders often don't breed in ponds every year. Therefore, ponds that had previous occurrences of California tiger salamander breeding, but California tiger salamander larvae were not observed during the 2017 surveys, should still be assumed to currently support breeding California tiger salamander populations. There are nine additional California red-legged frog occurrences and 11 additional California tiger salamander occurrences reported within one mile of the Connolly Ranch property.

Frog pond June 19, 2017. California red-legged frog and California tiger salamander were detected in Frog Pond in 2009.

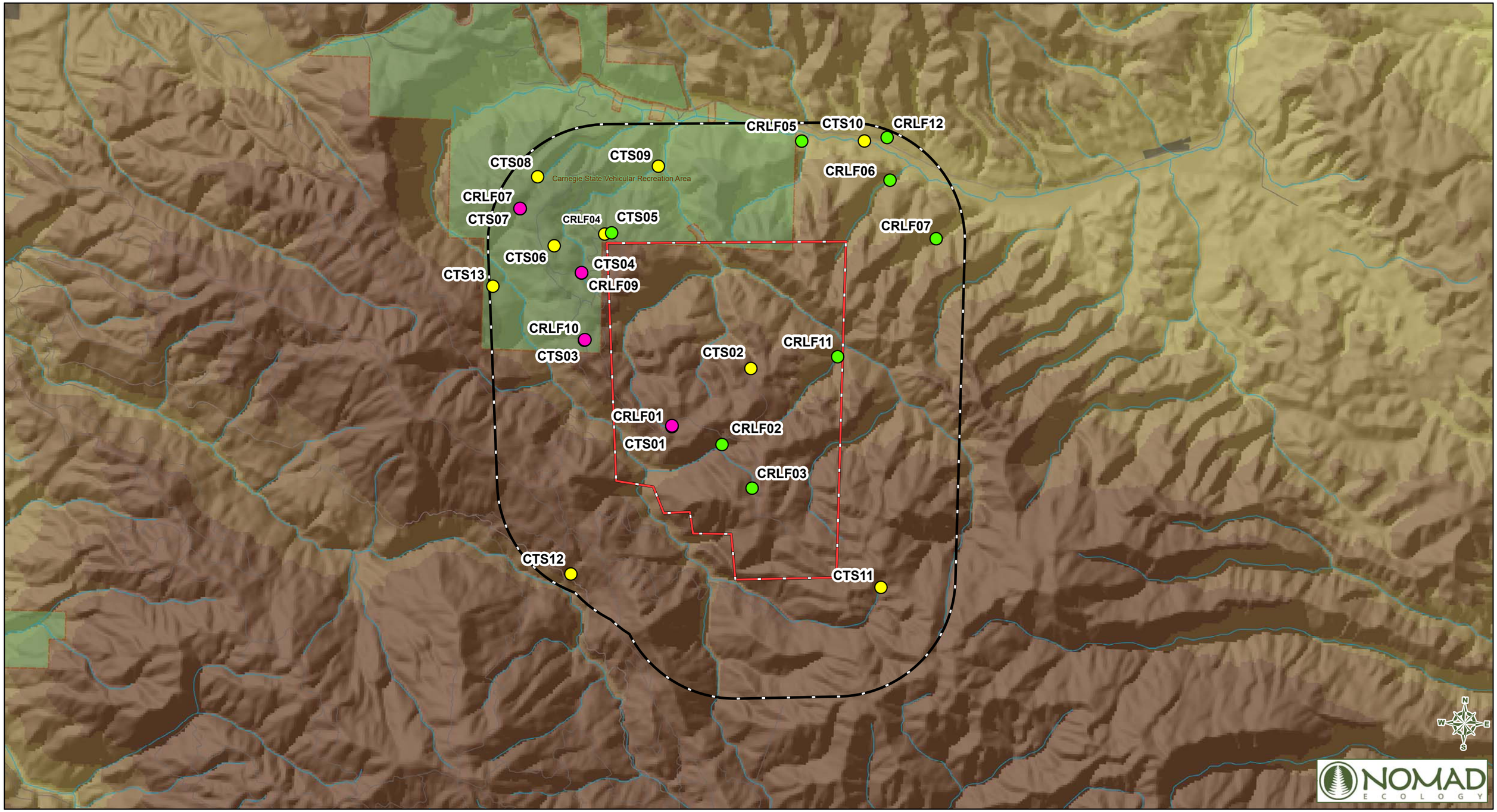
Table 2. Target Covered Species Occurrences within one mile

Species	Label on Figure 2	Element Occurrence Index # (CNDDB EONDX #)	Year(s)	Location Observed	General Species Information
Within Connolly Ranch[2]					
California tiger salamander	CTS-1	97463	2009	Frog Pond	One larva detected in May 2009; unknown number detected in June 2009. California red-legged frog and California newt also observed during survey.
California tiger salamander	CTS-2	97464	2009	Steep Canyon Pond	Detected during surveys in May 2009 and June 2009.
California red-legged frog	CRLF-1	97528	2009	Frog Pond	Detected during dipnet surveys in May 2009 and June 2009. California tiger salamander and California newt also observed during survey.
California red-legged frog	CRLF-2	97527	2009	Deerian Pond	Detected during dipnet surveys in May 2009 and June 2009.
California red-legged frog	CRLF-3	97526	2009	Stuart Pond	Detected during dipnet surveys in May 2009 and June 2009.
Nearby Connolly Ranch					
California tiger salamander	CTS-3	55981	1998, 2008, 2015	A rainfall-fed stock pond referred to as "Carnegie SVRA Pond #10 (Refrigerator Pond)" ~1,000 feet west of the Connolly Ranch property and ~1.2 miles SW of Mitchell Shaft.	Breeding documented here in 1998. 10 larvae observed in May 2008. Vollmar Natural Land Consulting (VNLC) detected species during 2015 surveys.
California tiger salamander	CTS-4	55980	1998, 2007, 2008	A spring-fed large pond referred to as "Carnegie SVRA Pond #9 (Hidden Pond)" ~1,000 feet west of the NW corner of the Connolly Ranch property and ~1.6 miles SSE of the Tesla site.	Breeding reported in 1998; 10 egg masses observed in March 2007; 1 larva observed in May 2008, VNLC detected species during 2015 surveys
California tiger salamander	CTS-5	55976	1998, 1999, 2009, 2015	Pools referred to as "Carnegie SVRA Ponds #6 and #7 (Lone Oak and Trough Pond)" ~400 feet NNW of the NW corner of the Connolly Ranch property and ~1 mile WNW of Mitchell Shaft.	Breeding documented here in 1998 and 1999. Three larvae found in 2006, and 12 observed in 2009. VNLC observed the species here during 2015 surveys.

[2] The survey area for this project only included the Connolly Ranch ponds within Alameda County. Part of the Connolly Ranch property is located within San Joaquin County. One CRLF occurrence was from a pond within Connolly Ranch Property in San Joaquin County and was included in the 'Nearby Connolly Ranch' section since it did not occur in the survey area (CRLF-11).

Species	Label on Figure 2	Element Occurrence Index # (CNDDB EONDX #)	Year(s)	Location Observed	General Species Information
California tiger salamander	CTS-6	55979	1998, 2008	Water feature referred to as "Carnegie SVRA Pond #8" located ~0.5 miles west of the NW corner of the Connolly Ranch property and ~1.3 miles WNW of Mitchell Shaft.	Breeding documented here in 1998. 10 larvae observed in May 2008. VNLC detected species during 2015 surveys.
California tiger salamander	CTS-7	55972	2008	Water features referred to as "Carnegie SVRA Ponds #1A and 1B" located ~0.8 miles WNW of the NW corner of the Connolly Ranch property and ~1.7 miles WNW of Mitchell Shaft.	Breeding documented here in 1998. 3 larvae observed in May 2008. VNLC detected species during 2015 surveys.
California tiger salamander	CTS-8	55973	1998, 2007	Sediment pond referred to as "Carnegie SVRA Pond #4 (Lucky Find Pond)" located ~0.8 miles NW of the NW corner of the Connolly Ranch property and ~1.25 miles north of Hetch Hetchy Aqueduct.	Breeding documented here in 1998. One breeding adult found in March 2007. VNLC detected species during 2015 surveys.
California tiger salamander	CTS-9	55975	2008	Water feature referred to as "Carnegie SVRA Pond #5" located ~0.6 miles north of the Connolly Ranch property and just west of Mitchell Ravine.	Breeding documented here in 1998. 12 larvae observed in May 2008. VNLC detected species during 2015 surveys.
California tiger salamander	CTS-10	9778	1982, 1983, 1987, 1989, 1990, 1992, 1995, 1998, 2002, 2006, 2008	Ephemeral pool along Tesla and Corral Hollow Road located ~0.8 miles NNE of the NE corner of the Connolly Ranch property.	Detections made by driving road on rainy nights. Specimens collected in 1982, 1983, 1987, 1990, 1998, and 2002. Ten adults observed in 1989, 5 observed in 1992, 4 observed in 1995, 1 observed in 2006, and 5 observed in 2008.
California tiger salamander	CTS-11	97460	2009	Man-made perennial pools in Sulphur Spring Canyon located ~0.35 miles east of the SE corner of the Connolly Ranch property.	Observed in June 2009; California red-legged frog also observed at the site.
California tiger salamander	CTS-12	97459	2010, 2013	Along Mines Road located ~0.85 miles SW of the Connolly Ranch property.	One adult found dead on road in January 2010, and a second adult found dead in November 2013.
California tiger salamander	CTS-13	55982	1998	Pond 11 within Carnegie SVRA, 0.4 miles north of Hetch Hetchy Aqueduct and 0.2 miles west of Corral Hollow Creek. Located 1.0 miles NE of Connolly Ranch property.	CTS documented breeding here in 1998, no other information given.
California red-legged frog	CRLF-4	75940	2008, 2014	Pools referred to as "Carnegie SVRA Pond #7 (Trough Pond)" ~400 feet NNW of the NW corner of the Connolly Ranch property and ~1 mile ENE of Mitchell Shaft.	10 larvae observed in May 2008. VNLC detected species during 2015 surveys

Species	Label on Figure 2	Element Occurrence Index # (CNDDB EONDX #)	Year(s)	Location Observed	General Species Information
California red-legged frog	CRLF-5	5673	1975, 1989, 2001, 2014	Site known as "Tyson's Basin" located ~0.8 miles north of the Connolly Ranch property in the roadway and catchment basin in the OHV park.	1 collected in February 1975, many observed in May 1989, 1 observed on roadway in March 2001, and detected in April 2014.
California red-legged frog	CRLF-6	5672	1989, 1994, 1998, 2001, 2002, 2014	Seasonal ponds and catchment basins north of Corral Hollow Road located ~0.6 miles NE of the NE corner of the Connolly Ranch property.	Many observed in May 1989, 100's of all life stages observed in March 1994, 15 adults observed in May 1998, 75 adults observed in March 2001, 80 adults observed in February 2002, 12 adults observed April 2014, and 3 adults and 4 juveniles observed in May 2014.
California red-legged frog	CRLF-7	97524	2014	Pool is the flooded mouth of an old mine adjacent to a drainage flowing to Corral Hollow creek, located ~0.75 miles east of the NE corner of the Connolly Ranch property.	Four adults observed in April and May of 2014. VNLC detected species during 2015 surveys.
California red-legged frog	CRLF-8	35438	1998, 2006, 2008, 2014	Water features referred to as "Carnegie SVRA Ponds #1A" located ~0.8 miles WNW of the NW corner of the Connolly Ranch property and ~1.7 miles WNW of Mitchell Shaft.	Two adults and many juveniles observed in September 1998, five adults and 20 larvae observed in May 2006. 5 adults and 12 larvae observed in May 2008, all life stages observed in April and May 2014. VNLC detected species during 2015 surveys.
California red-legged frog	CRLF-9	75939	2007, 2008, 2014	A spring-fed large pond referred to as "Carnegie SVRA Pond #9 (Hidden Pond)" ~1,000 feet west of the NW corner of the Connolly Ranch property and ~1.6 miles SSE of the Tesla site.	Two egg masses observed in March 2007, 4 adults and 13 larvae observed in May 2008, all life stages observed in April 2014, and adults were observed in May 2014. VNLC detected species during 2015 surveys.
California red-legged frog	CRLF-10	97579	2014, 2015	A rainfall-fed stock pond referred to as "Carnegie SVRA Pond #10 (Refrigerator Pond)" ~1,000 feet west of the Connolly Ranch property and ~1.2 miles SW of Mitchell Shaft.	One adult observed in April 2014. VNLC detected species during 2015 surveys.
California red-legged frog	CRLF-11	97525	2009	Stock pond (CON-02), within the Connolly Ranch property but on the San Joaquin County side.	Unknown number dip-netted and released on June 4, 2009.
California red-legged frog	CRLF-12	75455	1994	Lawrence Livermore National Laboratory Site 300, located 0.95 miles NE of Connolly Ranch property boundary.	One adult observed in a groundwater seep.



January 2018

Amphibian Survey Report

Legend

Connolly Ranch

1 Mile Buffer

Special-Status Amphibians

California red-legged frog

California tiger salamander

California red-legged frog and California tiger salamander

1:48,000

0 2,000 4,000

Feet

Figure 2

Special-Status Amphibian Species in the Vicinity of Connolly Ranch

Alameda County Fish and Game Commission

Sources: ESRI, California Spatial Information Library, Bay Area Open Space Council, California Department of Fish and Wildlife. Projection: NAD 83 UTM 10 North.

Alameda County, California

3.2. POND HABITAT ASSESSMENT DATA

Habitat assessments were conducted once at each pond surveyed within the Connolly Ranch in June. Data collected included depth, size, species information and percent cover of vegetation at the ponds, water quality data, and threats observed. A summary of the data collected is included in Tables 5 and 6. Photos of the ponds are included in Appendix A.

All eight ponds were over four feet in depth when visited in late June (Table 3). The property owner, Mark Connolly, reported that Steep Canyon Pond holds water approximately 8 months per year, but the other ponds generally hold water year-round except during severe drought lasting three years or more (pers. com. Mark Connolly 1/3/17). All ponds support a sufficient hydroperiod to be able to support breeding California tiger salamander and/or California red-legged frog.

All ponds had floating and/or submerged vegetation. Only one pond had emergent vegetation, the lack of emergent vegetation is likely related to cattle use of the ponds which reduces vegetation around the ponds' edges. Four of the eight ponds contained some overhanging vegetation, Connolly Ranch is mostly covered with blue oak woodland vegetation type. Submerged vegetation within the ponds consisted mostly of four different taxa (*Chara zeylanica* [Native], *Stuckenia pectinata* [Native], *Ruppia cirrhosa* [Native], and *Nitella sp*. [Native][3]). Submerged vegetation likely provides important cover and egg mass substrate for breeding amphibians. All three ponds where California red-legged frog or California tiger salamander were observed contained different species of submerged vegetation and had low levels of submerged vegetative cover (3% at California red-legged frog ponds and 1% at the California tiger salamander pond) and no emergent vegetation. Previous research has shown that California red-legged frogs and California tiger salamanders can breed in breeding ponds with none to very high levels of emergent vegetation but have been shown to prefer less than 40% and less than 5% emergent vegetative cover, respectively (Ford et al. 2013). Little research has been done on preferred levels or the importance of submerged and floating vegetation for these species. No research has been done on the specific submerged plant species that are present in ponds utilized by these amphibians.

Aquatic garter snakes (*Thamnophis atratus*) were observed at three of the ponds, and are native predators that are assumed to be feeding on amphibians of all life stages at these ponds. A study completed by EBRPD (2007) determined there was a negative association between predacious aquatic hexapods [giant water bug (*Belostomatidae)*, predacious diving beetle (*Dytiscidae)*, waterscorpion (*Nepidae)*, and dragonfly nymphs (*Anisoptera)*] and California tiger salamanders. One pond (Stuart Pond) had dragonfly larvae present. Invasive wild pigs (*Sus scrofa*) were observed during the survey at Steep Canyon Pond, the population size of wild pig and the effects this invasive species has on the pond flora and fauna at Connolly Ranch are unknown. Other threats, including native and non-native predators, observed at each pond are summarized in Table 3.

Water quality measurements for each pond are included in Table 4. The average and range of water quality values for ponds with California red-legged frog and California tiger salamander present are included in Table 5.

The water quality measurements between all ponds surveyed did not vary considerably, with nitrates, turbidity, and salinity levels being low at all ponds. The range of values for pH (7.7 to 10), conductivity (156 to 261 SPC), and total dissolved solids (102 to 170 ppm) also did not vary greatly between the eight

[3] *Chara sp.* and *Nitella sp.* are algae species that are native to North America. More specific information on their status in California is not available. *Stuckenia pectinata* and *Ruppia cirrhosa* are plants native to California.

ponds. Research has shown that California red-legged frogs prefer ponds with low turbidity where California tiger salamander can be present in ponds with a great range of turbidity, including ponds that are very turbid (EBRPD 2007, Ford et al. 2013). The eight ponds within this study all had relatively low turbidity measurements (2.9 to 23.6 NTU), and therefore we did not observed this pattern.

Table 3. Pond Habitat Assessment Results

Pond ID	Dates Surveyed	Size (feet)	Maximum Depth (feet)	Vegetation (Emergent, Floating, Submerged, Overhanging species)	Threats Observed
Rock Pond	6/15/17	90x75	4.3	Floating: Algae (2% cover) Overhanging: Pine spp. (2% cover)	None
Steep Canyon Pond	6/15/17	150x80	4.4	Floating: Algae Submerged: *Ruppia cirrhosa* (1% cover), *Nitella sp*. (1% cover), unknown submerged vegetation (1% cover)	Aquatic garter snakes, wild boar, egret, and heron
Frog Pond	6/19/17	530x140	11	Emergent: *Eleocharis macrostachya* (3% cover) Floating: Algae (3% cover) Submerged: *Nitella sp*. (15% cover), *Ruppia cirrhosa* (25% cover)	None
Section 6 Pond	6/19/17	270x100	8.4	Floating: Algae (1% cover) Submerged: *Stuckenia pectinata* (1% cover)	None
Foxtail Pond	6/20/17	430x80	13.9	Floating: Algae (1% cover) Submerged: *Chara zeylanica* (10% cover), *Ruppia cirrhosa* (25% cover), *Nitella sp*. (10% cover), unknown submerged vegetation (1% cover) Overhanging: Blue oak (2% cover)	Aquatic garter snakes
Deerian Pond	6/20/17	320x200	15.4	Submerged: *Chara zeylanica* (3% cover) Overhanging: Blue oak (2% cover)	Aquatic garter snakes
Stuart Pond	6/27/17	200x120	13	Submerged: *Stuckenia pectinata* (20% cover), *Potamogeton nodosus* (1% cover)	Predacious aquatic hexapods (dragonfly larvae)
Unnamed Pond	6/27/17	240x80	12	Submerged: *Potamogeton nodosus* (2% cover), *Chara zeylanica* (5% cover), *Stuckenia pectinata* (25% cover), *Lemna minor* (1% cover)	None

Table 4. Summary of Water Quality Results and Special-Status Species Present

Pond ID	Special-Status Species Present	Water Temperature (Fahrenheit)[4]	Conductivity (SPC)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Nitrates (mg/L)	pH	Total Dissolved Solids (ppm)
Rock Pond	No	73	235.0	0.11	5.9	22.7	0.52	7.7	153.0
Steep Canyon Pond	Yes – CRLF	70	215.2	0.10	20.2	23.6	0.41	10.0	138.0
Frog Pond	No	81	188.3	0.09	9.6	9.3	0.72	9.8	122.4
Section 6 Pond	Yes – CTS	78	198.7	0.09	8.0	16.3	1.18	8.7	129.1
Foxtail Pond	No	78	174.0	0.08	12.7	7.4	0.41	10.0	113.1
Deerian Pond	Yes – CRLF	78	205.6	0.10	5.1	10.0	0.37	9.3	133.4
Stuart Pond	No	69	156.2	0.08	3.4	10.6	0.45	8.5	101.5
Unnamed Pond	No	70	261.0	0.12	6.5	2.9	0.90	9.6	169.9

Table 5. Water Quality Values for ponds with California Red-Legged Frog or California Tiger Salamander Present

Category	CRLF Present – Average	CRLF Present – Range	CTS Present[5]
Water Temperature (°F)	74	70-78	78
Conductivity (SPC)	210.4	205.6-215.2	198.7
Salinity (ppt)	0.10	0.10-0.10	0.09
Dissolved Oxygen (mg/L)	12.7	5.1-20.2	7.98
Turbidity (NTU)	16.8	10.0-23.6	16.3
Nitrates (mg/L)	0.39	0.37-0.41	1.18
pH (1-14)	9.65	9.3-10.0	8.69
Total Dissolved Solids (ppm)	135.7	133.4-138.0	129.1

[4] On June 19 and 20, 2017 the air temperature reached over 100 degrees Fahrenheit, which likely contributed to the high water temperatures recorded in the ponds surveyed on those days (Frog Pond, Section 6 Pond, Foxtail Pond, Deerian Pond).

[5] Only one pond contained CTS, so there are no average or range values

3.3. POND SURVEY DATA

This section summarizes the survey data of the ponds surveyed within the Connolly Ranch in late June, 2017.

California tiger salamander larvae were observed at one pond (Section 6 Pond). Over 200 larvae were captured at the pond and some of the individuals were very close to full metamorphosis (Photos 7-9, Appendix A). The pond is deep and large and likely supports a large breeding population of California tiger salamanders.

No western pond turtles or bullfrogs were observed during the surveys. California newt larvae and/or adults were observed at all eight ponds surveyed. California newt adults can prey on amphibian eggs and larvae (Nafis 2018). They could be a potential threat to California red-legged frog and California tiger salamander breeding, but due to the lack of research in this area, predator-prey dynamics of different life stages in shared breeding ponds with these three species is poorly understood.

California red-legged frogs were observed at two of the ponds (Steep Canyon Pond and Deerian Pond). Only one California red-legged frog adult was observed on the edge of Steep Canyon Pond. It was observed for a brief moment before entering the water and no photo of the individual was obtained. It appeared that an occasional large tadpole surfaced at the deep area of the pond, which could have been California red-legged frog tadpoles. However, the deep portion of the pond could not be fully surveyed because of the depth. So, although breeding was not confirmed at this pond, it is thought that it is possible that California red-legged frogs are breeding in this pond and tadpoles were present in very low numbers.

Deerian pond is a very large and deep pond and several large adults and many tadpoles were observed at this pond, therefore this pond is expected to support a large breeding population of California red-legged frogs. This pond was very deep and therefore was difficult to capture tadpoles via dipnet during the survey. Although only six tadpoles were captured during dipnetting, many more tadpoles were observed visually as they would come to the surface of the water.

Figure 3 shows all surveyed features and special-status species presence. More detailed survey data, including abundance of each species observed during the surveys, including non-listed native and non-native amphibians and reptiles, are included in Table 6. Photos of the special-status species and other wildlife observed during the pond surveys are included in Appendix A.

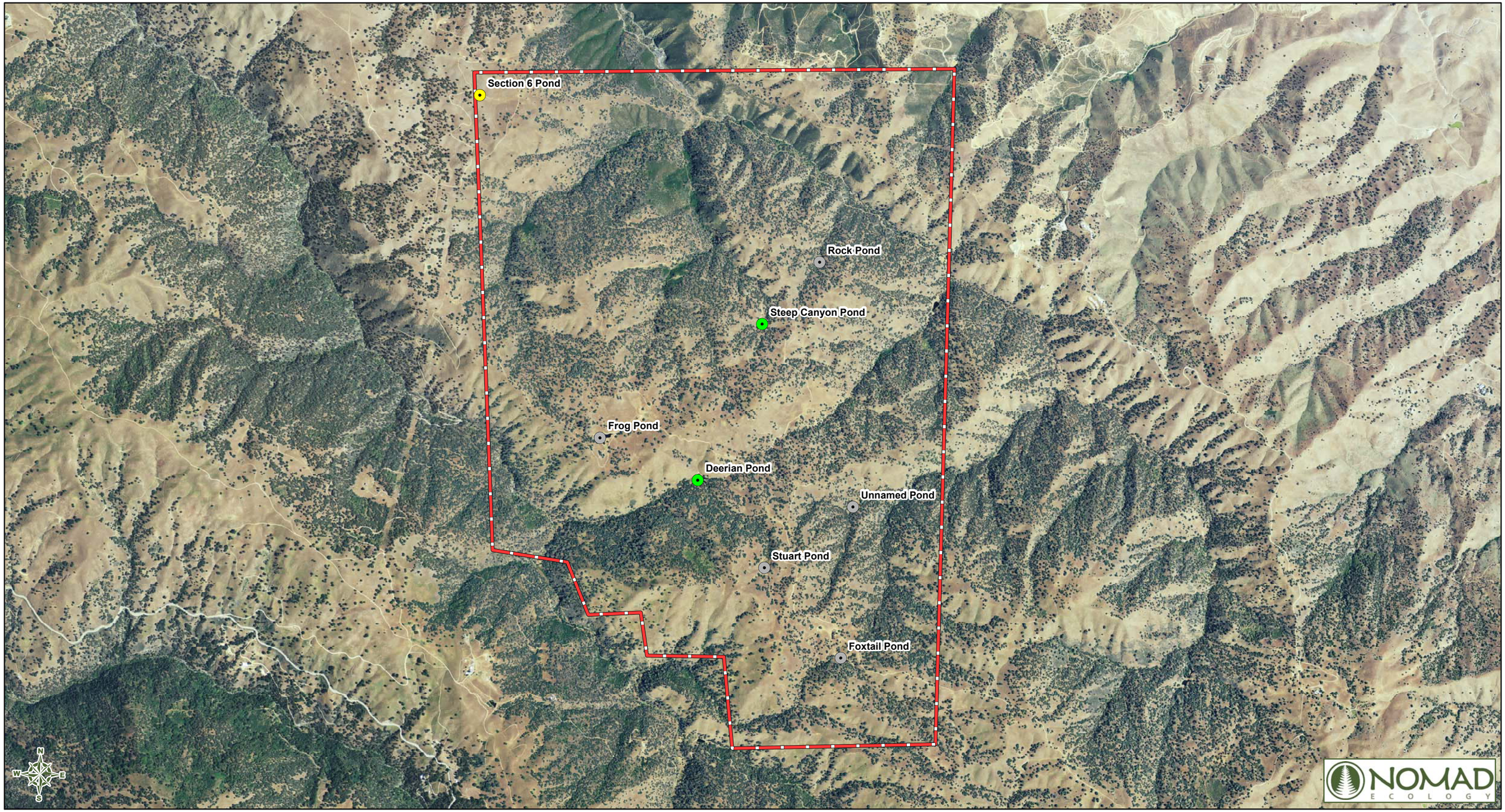
Section 6 pond on June 19, 2017

Table 6. Amphibian Species and Numbers Observed during Pond Surveys

Pond ID	Dates Surveyed	Sierran Chorus Frog	California Toad	California Red-legged Frog	California Tiger Salamander	California Newt	Other Species Observed
Rock Pond	6/15/17	--	--	--	--	100+ L, A[6]	--
Steep Canyon Pond	6/15/17	100+ T	100+ M	1 A	--	500+ L	Aquatic garter snake (2), great egret
Frog Pond	6/19/17	8 T	--	1 A	--	23 L, A	--
Section 6 Pond	6/19/17	--	--	--	236 L	29 L, A	--
Foxtail Pond	6/20/17	8 T	2 A	--	--	200+ L, A	Aquatic garter snake (12)
Deerian Pond	6/20/17	--	1 M	11 T, A[7]	--	200+ L, A	Aquatic garter snake (3)
Stuart Pond	6/27/17	8 T, M	5 M	--	--	300+ L, M, A	--
Unnamed Pond	6/27/17	2 M	--	--	--	64 L, A	--

[6] E=Egg mass, T=Tadpole (Frogs), L=Larvae (Salamanders), M=Metamorph, A=Adult

[7] Many more tadpoles were observed visually, but only six individual tadpoles were captured during dipnetting



January 2018

Amphibian Survey Report

Legend

Connolly Ranch Pond Survey Results

- California Red-Legged Frog
- California Tiger Salamander
- No Special-Status Amphibians

1:24,000

0 1,000 2,000

Feet

Figure 3

2017 Pond Survey Data

Connolly Ranch

Alameda County Fish and Wildlife Commission

Sources: ESRI, California Spatial Information Library, Bay Area Open Space Council, California Department of Fish and Wildlife. Projection: NAD 83 UTM 10 North.

Alameda County, California

Section 4. DISCUSSION AND RECOMMENDATIONS

4.1. DISCUSSION

Our main goals of this project were (1) to collect detailed aquatic feature characteristic data important to California red-legged frog habitat and (2) to locate aquatic features with potential to support California red-legged frog and California tiger salamander populations within the Connolly Ranch Property. All eight ponds surveyed provide potential habitat for California red-legged frog and California tiger salamander. California tiger salamander larvae were observed at one pond (Section 6 Pond). California red-legged frogs were observed at two ponds (Steep Canyon Pond and Deerian Pond). No bullfrogs or western pond turtles were observed.

Detailed vegetation and water quality data and the population numbers of amphibian species at each pond is included in the results section above. All three ponds where California red-legged frog or California tiger salamander were observed contained different species of submerged vegetation and had low levels of submerged vegetative cover (3% at California red-legged frog ponds and 1% at the California tiger salamander pond) and no emergent vegetation. Special-status amphibians were not observed at the four ponds with high levels of submerged vegetation (>20%). However, in 2009 California red-legged frog was detected in two of the ponds and California tiger salamander was detected in one pond that contained more than 20% submerged vegetation in 2017. It is unknown if the same level of submerged vegetation was present in these ponds during the 2009 surveys or what the pond conditions were at that time.

The water quality measurements between all ponds surveyed did not vary considerably, with nitrates, turbidity, and salinity levels being low at all ponds. The range of values for pH, conductivity, and total dissolved solids also did not vary greatly between the eight ponds. Although the range of dissolved oxygen varied greatly between ponds, California red-legged frog were found in ponds with low (5.1) and high (20.2) levels of dissolved oxygen. Because water quality conditions did not vary considerably between ponds with and without special-status species, we can't suggest any incipient trends related to water quality values and special-status species presence.

Because of the limited data collected with this project, we cannot currently suggest any specific aquatic feature characteristics that are associated with California red-legged frog or California tiger salamander presence. However, the data collected from this project will be combined with future data collected on breeding ponds to determine if there are statistically significant correlations with specific pond characteristics in breeding ponds that support special-status amphibians in the East Bay counties. Continued surveys and monitoring of the pond conditions would allow for a greater understanding of pond conditions at the same time that presence of special-status amphibian species are confirmed which would help correlate amphibian presence with certain pond characteristics over time.

The Connolly Ranch Property and the surrounding one mile radius includes 25 CNDDB records of California red-legged frog and California tiger salamander. CNDDB does not include negative data so it can not be determined what other ponds were surveyed that came up with negative results. However, the CNDDB presence data shows both species spread throughout the area, without any obvious locational patterns of species' presence. Areas like this, which are also protected and not in danger of development, should be focused on for future studies, to determine the current amphibian survey, water quality, and vegetation data in all ponds where presence was confirmed. Additionally, by continuing to study water quality, specific vegetation data in all ponds, including ponds with negative survey data, particularly in

areas where presence is known in surrounding ponds, could help better understand the species' distributions and habitat requirements. Funding for special-status amphibian surveys is often driven by development and therefore surveys are conducted in areas soon to be developed. By focusing funding and future studies on conducting surveys and studying pond characteristics in protected areas, this could help conduct more effective habitat management and monitoring for California red-legged frog and California tiger salamander.

4.2. RECOMMENDATIONS

An overall summary of the recommendations for management activities at each pond is included in Table 6. There are three main management activities recommended for the Connolly Ranch to improve special-status amphibian species habitat:

1) Reduce cattle access to California red-legged frog ponds in select locations to allow some emergent vegetation to grow for species cover
2) Install habitat features that will provide basking habitat and protection from predators
3) Additional surveys to determine species distribution and population size changes

Each of these management activity recommendations is summarized by aquatic feature in Table 6 and additional information provided in subsections below. There are many opportunities to conduct habitat enhancement activities and continued species monitoring within the Connolly Ranch. We understand that it may not be possible to implement all of these activities due to cost or other land use constraints. Because of this, we have included a priority class (high, moderate, low) to each recommendation in Table 7, based on our expertise and the knowledge we have gained from the baseline surveys.

4.2.1 INSTALL BASKING AND COVER HABITAT

The installation of structures that can provide basking and cover habitat in ponds that currently or could support California red-legged frog and/or western pond turtle is an enhancement activity that requires little implementation effort. Installation of basking and cover structures could be as simple as placing large logs, tree limbs, or other natural debris on the edges of the ponds. Basking structures are critical habitat features for western pond turtle, as it allows them to thermoregulate their body temperature. No western pond turtles were observed during the surveys within Connolly Ranch, however there are CNDDB recorded observations of western pond turtles between one and two miles from Connolly Ranch and the ponds within the study area appear to provide suitable habitat for the species. The structures can also provide cover for amphibians from predators and possibly provide additional locations for egg mass attachment. Emergent and submerged vegetation can also provide cover habitat, however it can be much more difficult to create additional vegetative growth and/or reduce cattle access than to install cover structures. Some ponds had fallen logs, etc. present at the ponds edges during the time of the survey (Foxtail Pond, Rock Pond, Unnamed Pond), other ponds have a large amount of submerged vegetation that likely provide cover habitat for amphibians (Foxtail Pond, Unnamed Pond, Frog Pond, and Stuart Pond). The two ponds with confirmed presence of California red-legged frog, Deerian Pond and Steep Canyon Pond, currently provide very little cover habitat for frogs. There were a few downed logs along the banks of Deerian Pond, but no logs or cover habitat observed at Steep Canyon Pond.

Table 7. Summary of Recommendations

Aquatic Feature ID	Recommendations	Potential Implementation Issues/Other Notes	Special-Status Species Potentially Benefitted	Priority Class
Rock Pond	Reduce cattle access	Relatively shallow so cover more important, however no special-status species were observed during 2017 survey	CRLF, CTS	Low
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, none observed in 2017	CRLF, CTS, WPT	Low
Steep Canyon Pond	Install basking and cover habitat	No cover habitat present	CRLF, CTS	Moderate
	Reduce cattle access	Relatively shallow thus higher priority	CRLF, CTS	Moderate
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, and if CRLF are breeding at pond, CTS presence recorded at pond in 2009, only one adult CRLF observed in 2017.	CRLF, CTS, WPT	High
Frog Pond	Install basking and cover habitat	Submerged and emergent vegetation provides some cover habitat thus lower priority	CRLF, CTS, WPT	Low
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present. None observed in 2017, but there is a record of larval CTS and CRLF observation from 2009.	CRLF, CTS, WPT	High
Section 6 Pond	Install basking and cover habitat	Large population of CTS present, cover habitat not thought to be as important for this species in deep ponds	CRLF, CTS, WPT	Low
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, CTS observed in 2017	CRLF, CTS, WPT	Low
Foxtail Pond	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, none observed in 2017	CRLF, CTS, WPT	Low
Deerian Pond	Install basking and cover habitat	Some cover habitat present, but could be supplemented for CRLF present	CRLF, CTS, WPT	Moderate
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, CRLF breeding documented in 2009 and 2017	CRLF, CTS, WPT	Low
Stuart Pond	Install basking and cover habitat	Submerged vegetation provides some cover habitat thus lower priority	CRLF, CTS, WPT	Low
	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, none observed in 2017, CRLF observed here in 2009	CRLF, CTS, WPT	High
Unnamed Pond	Additional Surveys	Conduct additional surveys to determine whether special-status species are present, none observed in 2017	CRLF, CTS, WPT	Low

Both ponds are low in submerged vegetation and had no emergent vegetation. Installation of basking and cover habitat in other ponds without confirmed presence of California red-legged frog or western pond turtle, could also be beneficial for the species if they were to colonize and/or could improve habitat for non-listed wildlife. Logs and other structures could be tripping hazards for cattle and make cattle access to ponds more difficult, therefore the landowner may not want to purposely introduce these types of structures around the ponds, or may choose to install them only in areas where cattle are not able to access. Another option for pond enhancement is to reduce cattle access in select locations to encourage growth of emergent vegetation and other vegetative growth within and along the banks of ponds to provide cover and substrate for egg mass laying.

4.2.2 Reduce Cattle Access in Select Locations

Only one of the eight ponds surveyed in June 2017 at Connolly Ranch contained emergent vegetation. California tiger salamander and California red-legged frog can breed successfully without emergent vegetation within ponds, however vegetative cover has been shown to be more important for California red-legged frogs and California tiger salamanders in ponds with bullfrogs present and in shallower features where larvae are more visible to predators (Ford et al. 2013). Since no bullfrogs were present during the survey, we will only focus on the shallow ponds within the study area – Rock Pond and Steep Canyon Pond.

These two ponds are relatively shallow ponds that appear to dry up each year based on the depth observed during the survey and personal communication with the landowner. Steep Canyon Pond had a low population of California red-legged frogs and no special-status species were observed at Rock Pond. By limiting cattle and other wildlife access along select pond edges this could allow some emergent vegetation to grow for cover and could provide more complex habitat features for amphibians to hide from predators and make these ponds more likely to support breeding California red-legged frog and/or California tiger salamander populations. Turbid water can also act as cover for California tiger salamander in shallower ponds if vegetative cover is not present. During our surveys, the ponds all appeared to have low turbidity, therefore vegetative cover and depth are likely important features for California tiger salamander populations to avoid predation.

Wildlife biologist experts in California tiger salamander, California red-legged frog, and their habitats, should be consulted during the implementation of any pond enhancement activities to ensure that it will improve habitat for special-status amphibian species.

4.2.3 Monitoring and Adaptive Management

Adaptive management is a decision-making process promoting flexible management such that actions can be adjusted as uncertainties become better understood or as conditions change. Additional surveys at the ponds within Connolly Ranch are required to better understand the distribution and population levels of special-status amphibian species. Additional surveys are most important at ponds where California red-legged frog and/or California tiger salamander were observed in 2009 but were not observed in 2017 (Steep Canyon Pond, Frog Pond, Stuart Pond). This will help determine whether the species is still present and was not detected during the 2017 surveys or if ponds no longer support breeding populations of California tiger salamander and/or California red-legged frog. As stated previously, California red-legged frog can be difficult to detect in ponds with low population levels and known California tiger salamander breeding ponds may go several years between breeding detections, but the population can still remain viable. The specific monitoring recommendations within Connolly Ranch will be driven by the management actions performed and the special-status species' populations identified. If management actions are not performed, monitoring of known special-status species' populations should still be

conducted to determine population trends and if proposed management actions should be placed in a higher priority class or if new management needs have developed.

By conducting surveys of the ponds at the Connolly Ranch within Alameda County, this project identified where special-status amphibian species populations are present. The habitat assessment and survey results also provided the guidance to identify preliminary recommendations for management and monitoring activities to implement in future years, as feasible, within the Connolly Ranch. These management and monitoring recommendations are intended to provide the greatest chance of future success of existing special-status amphibian species populations and to provide opportunities for their population growth and distribution within the Connolly Ranch property.

Frog Pond at Connolly Ranch. 6/20/17

Section 5. REFERENCES

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APPENDIX A: PHOTOS

Photo 1. Deerian Pond. 6/20/17

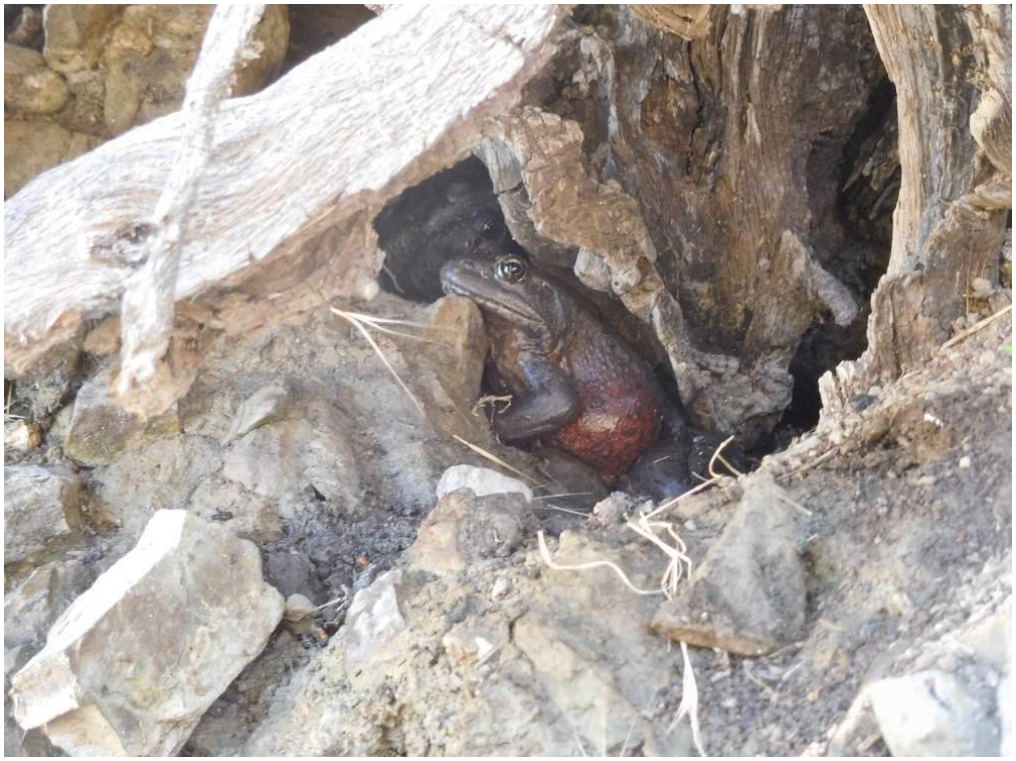

Photo 2. California red-legged frog adult, Deerian Pond. 6/20/17

Photo 3. California red-legged frog adult, Deerian Pond. 6/20/17

Photo 4. California red-legged frog tadpoles, Deerian Pond. 6/20/17

Photo 5. Aquatic garter snake foraging at Deerian Pond. 6/20/17

Photo 6. Section 6 Pond. 6/19/17

Photo 7. California tiger salamander larvae, with the one on the right being very close to metamorphosis. Section 6 Pond. 6/19/17

Photo 8. California tiger salamander larvae approaching full metamorphosis. Section 6 Pond 6/19/2017

Photo 9. Mature California tiger salamander larvae caught with seine. Section 6 Pond 6/19/2017

Photo 10. Steep Canyon Pond. 6/15/17

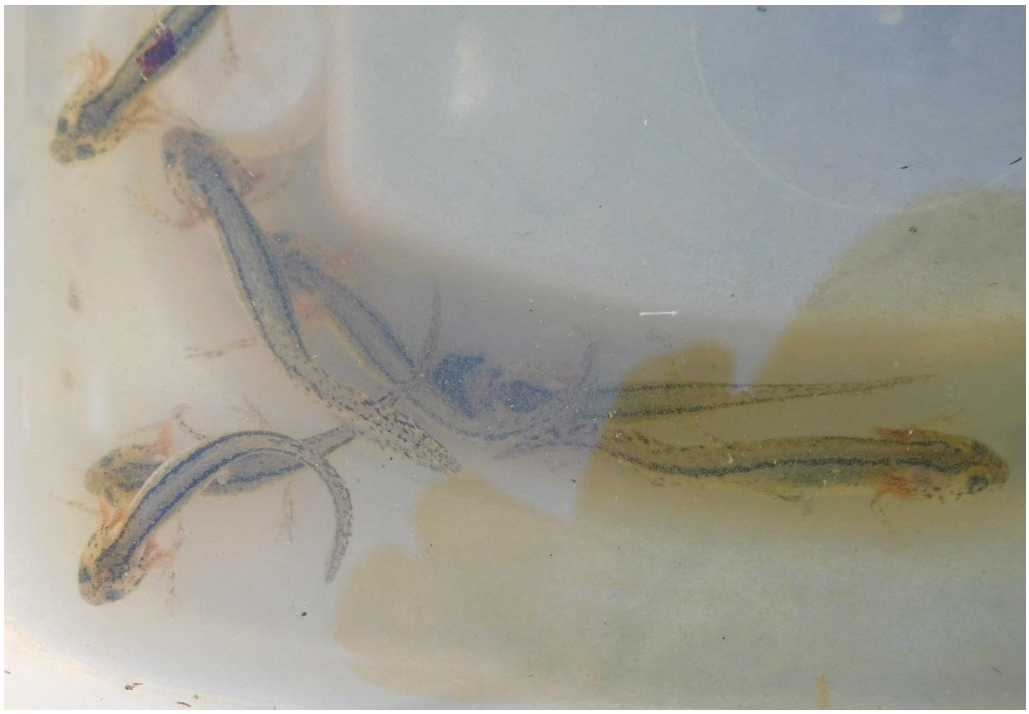

Photo 11. California newt larvae captured at Steep Canyon Pond. 6/15/17

Photo 12. California toad metamorphs at Steep Canyon Pond. 6/15/17

Photo 11. Rock Pond. 6/15/2017

Photo 12. Frog Pond. 6/19/2017

Photo 13. Foxtail Pond. 6/20/2017

Photo 14. Unnamed Pond. 6/27/2017

Photo 15. Stuart Pond. 6/27/2017

Photo 16. Juvenile California newt observed at the edge of Stuart Pond. 6.27.17