

Combined Annual Report

**Revised Lower Piru Creek Herpetological Monitoring Plan
and
Arroyo Toad Protection Plan**

Santa Felicia Project FERC P-2153

Reporting Period: January 1 through December 31, 2016

Prepared by:



UNITED WATER CONSERVATION DISTRICT

Environmental Planning and Conservation Department

Table of Contents

Executive Summary	1
1.0 Background.....	1
1.1 Arroyo Toad Protection Plan.....	1
1.2 Herpetological Monitoring Plan.....	2
2.0 Reporting Period	2
3.0 Activities Conducted during this Reporting Period	3
3.1 Arroyo Toad Protection Plan.....	3
3.2 Revised Monitoring Plan.....	3
4.0 Effectiveness of Aquatic Exotic Species Eradication Management Efforts.....	3
5.0 Assessment of Implementation and Effectiveness of the Revised Monitoring Plan	4
6.0 Recommendations for Changes to the Revised Monitoring Plan	4
7.0 Update Status of Access to Private Property	4
8.0 Updated Record of Consultation with Participating Agencies	4
9.0 Submittals to California Natural Diversity Database.....	5
Attachment A	A
Attachment B	B

Executive Summary

This annual report documents activities conducted between January 1 and December 31, 2016, in accordance with the “Arroyo Toad Protection Plan” and the “Revised Lower Piru Creek Herpetological Monitoring Plan” (Revised Monitoring Plan). United Water Conservation District (United) did not conduct any activities under the Arroyo Toad Protection Plan because United did not undertake any activities on U.S. Forest Service (USFS) land within the Santa Felicia Project boundary during the reporting period. United did not have permission to access private land in lower Piru Creek during 2016, and therefore implemented the “No Access Plan” section of the Revised Monitoring Plan. Aquatic exotic species management activities were implemented in pools below the Santa Felicia spillway between January and December following the methods outlined in the Revised Monitoring Plan. The removal efforts continue to be most effective at reducing the abundance of bullfrogs in the treatment area. Capture efficiencies for other target species were low, but higher than previous years. Capture counts for each species are included in the methods and results report presented in Attachment A. Eradication management methods were refined throughout the reporting period, and will continue to be refined as appropriate, following the adaptive management strategy outlined in the Revised Monitoring Plan, to improve the effectiveness of future eradication management activities.

1.0 Background

United Water Conservation District (United) owns and operates the Santa Felicia Project (Project) on Piru Creek in Ventura County, California. The Federal Energy Regulatory Commission (FERC) issued a new license (License) to United for the operations of the Project on September 12, 2008 (FERC Project No. 2153). Articles 401 and 404 of the License required United to file an *arroyo toad protection plan* and *herpetological monitoring plan* (respectively). The following background information pertains to each plan.

1.1 Arroyo Toad Protection Plan

In compliance with Article 401 of the License, United filed with FERC the “Arroyo Toad Protection Plan” on October 8, 2009. FERC issued an order approving the plan on January 5, 2011. The plan describes procedures to minimize and mitigate for effects to arroyo toads and arroyo toad critical habitat resulting from any project United undertakes on U.S. Forest Service (USFS) land located within the Project boundary. As required in article 404 of the License, the content of the Arroyo Toad Protection Plan was incorporated into the herpetological monitoring plan (discussed below), and therefore, the annual reporting requirements are being addressed in combination with annual reporting requirements for the herpetological monitoring plan.

The Arroyo Toad Protection Plan requires United to produce an annual report that discusses the following:

1. Any activities conducted by United during the reporting period that had the potential to impact arroyo toads or arroyo toad critical habitat on USFS land located within the Project boundary;
2. Any activities proposed to occur in the upcoming year that have the potential to impact arroyo toads or arroyo toad critical habitat on USFS land located within the Project boundary;
3. Assessment of implementation and effectiveness of the plan;
4. Recommendations for changes to the plan;

5. Updated record of consultation with participating agencies;
6. Submittal of documented information for all sensitive species observed during implementation of the plan to the California Natural Diversity Database.

The Arroyo Toad Protection Plan requires United to provide a copy of the annual report to U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), USFS, and FERC. No deadline for completing the annual report was established in the plan or in FERC's order approving the plan. Given the integration of the Arroyo Toad Protection Plan with the Revised Monitoring Plan, United intends to complete all required monitoring for both plans by the same date, December 31, annually.

1.2 Herpetological Monitoring Plan

In compliance with article 404 of the License, United filed with FERC a "Lower Piru Creek Herpetological Monitoring Plan" on October 8, 2009. FERC issued an order approving the plan on January 19, 2011. The October 2009 plan outlined activities that required access to private property. In December of 2011, and supplemented in May of 2012, United was denied access to private property comprising the majority of lower Piru Creek. In a meeting on January 6, 2012 United consulted with USFWS, CDFW, and National Marine Fisheries Service (NMFS) to develop a strategy for addressing the access issue. The "Revised Lower Piru Creek Herpetological Monitoring Plan" (Revised Monitoring Plan) dated May of 2012 incorporates the approach developed in consultation with the resource agencies, termed the "No Access Plan." United filed the Revised Monitoring Plan on June 6, 2012, and FERC issued an order approving the Revised Monitoring Plan on August 9, 2012.

For the reporting period covered in this annual report, United did not have permission to access private property and so implemented the "No Access Plan" portion of the Revised Monitoring Plan. The Revised Monitoring Plan, under this no access situation, requires that the annual report discusses the following.

1. Effectiveness of aquatic exotic species eradication management efforts.
2. Assessment of implementation and effectiveness of the Revised Monitoring Plan.
3. Recommendations for changes to the Revised Monitoring Plan.
4. Update status of access to private property.
5. Updated record of consultation with participating agencies.
6. Submittal of documented information for all sensitive species observed during implementation of the Revised Monitoring Plan to the California Natural Diversity Database.

The Revised Monitoring Plan requires United to complete an annual report by December 31 of each year and provide a copy of the report to USFWS, CDFW, USFS, NMFS, and FERC.

2.0 Reporting Period

This document serves as the annual report for activities conducted for the Arroyo Toad Protection Plan and Revised Monitoring Plan between January 1 and December 31, 2016.

3.0 Activities Conducted during this Reporting Period

3.1 Arroyo Toad Protection Plan

United did not conduct any activities on USFS land within the Project boundary during 2016. Because of this, United did not implement any activities under the Arroyo Toad Protection Plan. Therefore, no additional information is included in this report associated with the Arroyo Toad Protection Plan.

3.2 Revised Monitoring Plan

During 2016, United did not have access to private property on lower Piru Creek. Therefore, the “No Access Plan” described in section 3.0 of the Revised Monitoring Plan was implemented. The “No Access Plan” requires that United implement the following activities:

- A. Provisions for mitigation and minimization measures for protecting arroyo toads and arroyo toad critical habitat to be implemented in the event that United conducts operations on USFS land within the Project boundary;
 - a. This requirement was incorporated from the Arroyo Toad Protection Plan. As described in Section 3.1, United did not undertake any activities under the Arroyo Toad Protection Plan. Therefore, United did not implement any provisions for arroyo toad protection under the Revised Monitoring Plan.
- B. Aquatic exotic species management;
 - a. United undertook the required management activities for aquatic exotic species. As required under the “No Access Plan,” these activities took place in the pools located below the Santa Felicia spillway (treatment area). United implemented tasks 1 and 2 as described in the Revised Monitoring Plan. Task 3 is focused on addressing the effects of United’s fall conservation release. Due to dry conditions, a conservation release did not occur during 2016. Additional details of the methods implemented are contained in attachment A.
- C. Reporting criteria.
 - a. This report serves to satisfy the reporting requirements for 2016 activities associated with the Revised Monitoring Plan and the Arroyo Toad Protection Plan. Copies of the report will be provided to USFWS, CDFW, USFS, NMFS, and FERC. As required, within three months following submittal of this annual report, United will host a meeting to discuss the effectiveness of the aquatic exotic species management program and any operational mitigation or minimization measures performed during the year. All consulting federal and state agencies will be invited to attend.

4.0 Effectiveness of Aquatic Exotic Species Eradication Management Efforts

The Revised Monitoring Plan identifies the American bullfrog (*Rana catesbeiana*), African clawed frog (*Xenopus laevis*), red swamp crayfish (*Procambarus clarkii*), and invasive fishes as targets for

management actions. In addition to focusing on these targets, United also implemented removal activities for exotic turtles. Exotic turtles are known to occur in the treatment area and, similar to the other target species, can have detrimental effects on native species. Eradication activities were implemented between January and December of 2016. The activities are described in the methods and results report presented in Attachment A.

Similar to aquatic exotic species eradication efforts in prior years, the 2016 eradication effort was most effective at reducing the abundance of adult bullfrogs in the treatment area, but was less effective with other taxa. The number of adult frogs present in the treatment area has gradually increased since the large reduction in 2012. Sixteen juvenile frogs and 37 tadpoles were observed in the treatment area indicating at least some successful reproduction occurred within the past two years. Data collected during implementation of eradication management activities suggest that including the early breeding season is critical to successfully reducing or eliminating reproduction. Early season efforts were expanded during 2016, but consistently high temperatures throughout the year may have resulted in an extended breeding season. Early season efforts will continue in 2017.

Fish production was high in 2016, with clear evidence of successful reproduction by largemouth bass and bluegill sunfish. Capture rates were lower in 2016 compared to 2015, and many of the fish captured were young of the year. Capture efficiencies for other taxa remain low, despite high abundances of most exotic taxa and increased catch rates compared to those resulting from 2012 or 2013 efforts. United increased and modified trapping efforts during 2016 and may continue to modify and/or incorporate additional styles of traps to increase the effectiveness of the management program during 2017.

5.0 Assessment of Implementation and Effectiveness of the Revised Monitoring Plan

Eradication activities for targeted exotic aquatic species during 2016 produced results that are within an acceptable range. Monitoring data indicate that eradication efforts continue to be most effective at reducing the abundance of adult bullfrogs in the treatment area, but less effective with other taxa. Implementation efforts yielded valuable lessons and resulted in refinement of methods associated with equipment and timing of activities. The modifications were implemented following an adaptive management strategy as outlined in the Revised Monitoring Plan, and therefore do not warrant amending the Revised Monitoring Plan. As stated above, United may increase and/or modify trapping efforts during 2017 or incorporate additional styles of traps.

6.0 Recommendations for Changes to the Revised Monitoring Plan

United will continue to refine removal and monitoring techniques as appropriate following the adaptive management strategy outlined in the Revised Monitoring Plan. United has not identified any elements of the Revised Monitoring Plan that require amendment at this time.

7.0 Update Status of Access to Private Property

As of this filing date, United has not received permission to access private property located on lower Piru Creek and the access situation remains the same.

8.0 Updated Record of Consultation with Participating Agencies

The last annual report “Combined Annual Report for the Revised Lower Piru Creek Herpetological Monitoring Plan and Arroyo Toad Protection Plan 2015” (2015 Annual Report) was filed with FERC

and submitted to all consulting federal and state agencies (Los Padres National Forest [LPNF], Angeles National Forest [ANF], USFWS, NMFS, and CDFW) on December 31, 2015. Most of the consultation activities that occurred during 2016 were associated with the 2015 Annual Report. United consulted with representatives of LPNF on February 2, 2016. During the consultation United presented a status report for implementation activities associated with conditions of section 4(e) of the License, which included discussion of activities addressed in the 2015 Annual Report. All consulting federal and state agencies were invited to participate in a conference call scheduled on February 23, 2016, to discuss the effectiveness of the aquatic exotic species management program performed during 2015. The only agency representative that participated in the conference call was Daniel Blankenship, of CDFW.

9.0 Submittals to California Natural Diversity Database

United submitted native species field survey forms to the California Natural Diversity database describing several incidents of western pond turtles being captured in partially submerged inverted-funnel style crayfish traps or floating turtle traps during aquatic exotic species eradication activities. The completed forms are included in Attachment B.

Attachment A

2016 Exotic Species Eradication Management:
Methods and Results

2016 Aquatic Exotic Species Eradication Management; Methods and Results

Introduction

This report details aquatic exotic species eradication management activities performed by United Water Conservation District (United) during the year 2016. The eradication management activities were in accordance with the “Revised Lower Piru Creek Herpetological Monitoring Plan” (May 2012) which was developed to satisfy requirements of article 404 of the license issued to United by the Federal Energy Regulatory Commission (FERC) for operations of the Santa Felicia Project (FERC Project No. 2153-012). The revised plan describes alternative activities to be implemented based on United’s ability to access private property located downstream of the Santa Felicia Dam. During 2016, United did not have permission to access private property below the dam, and therefore, eradication management activities were conducted following protocols outlined in the revised plan for the “no access” condition.

The eradication management activities were conducted in three pools located in the Santa Felicia Dam spillway channel, in Ventura County, California. The pools are not hydrologically connected to Lake Piru or lower Piru Creek except under spill conditions¹. Because the pools are hydrologically isolated under most conditions, the opportunities for aquatic exotic species to enter or leave the pools are limited to species that can travel overland. Removing exotic species from the pools is expected to have a biological benefit until the next spill occurs. The pools have the potential to provide suitable habitat for the California red-legged frog, among other important native species. Removing the exotic species that predate upon or compete with these native species may create an opportunity for them to colonize the pools.

The conditions documented during the initial aquatic exotic species removal and monitoring effort in 2012 are considered representative of baseline conditions with respect to exotic species densities and population dynamics within the eradication management treatment area. Observations made during this reporting period (2016) and subsequent periods will be compared to baseline conditions to evaluate the effectiveness of the exotic removal techniques and activities. Methods were refined throughout the reporting period, and will continue to be refined, as appropriate, in an iterative effort to improve the effectiveness of future eradication management activities.

¹ In order to conduct an inspection of the Santa Felicia intake tower in October of 2015, an alternative water conveyance system was constructed to transport water between the Santa Felicia outlet works and the largest of the spillway channel pools. Water was piped from the outlet works and stored in the spillway channel pool, and then pumped back to the outlet works release pool to provide minimum required water releases during a period that the outlet works were out of service.

2016 Conditions

Water surface elevations in the three spillway channel pools within the eradication management treatment area fluctuated seasonally during the reporting period based on atmospheric temperature and rainfall patterns. Although 2016 was a dry year, pond levels initially were elevated as a result of the water conveyance in October 2015 described above. Initial water surface elevations (WSEs) in the spillway channel pools at the beginning of the 2016 eradication effort were similar to those measured during 2012 activities. However, dry winter and spring conditions resulted in rapid decline in WSE and by June, levels were approximately the same as WSEs measured during 2014 and 2015 activities. This decrease in WSE resulted in a reduction of available habitat for target species as compared to baseline conditions. The pools surveyed were primarily inhabited with largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), bullfrogs (*Rana catesbeiana*) and red swamp crawfish (*Procambarus clarki*). Adult largemouth bass were present in two of the pools (P1 and P2D, Figure 1), and juvenile largemouth bass were present in P1, P2, and P3. In previous years, African clawed frog (*Xenopus laevis*) adults were only observed in downstream pools (P2D and P3, Figure 1), but in 2016, they were only collected in P3. Native western pond turtles (*Emys marmorata*) were also observed in the treatment area.

Methods

Physical Habitat and Water Quality Parameters

The eradication management treatment area was mapped using a GPS unit when activities were initiated in 2012 (Figure 1). Total area was quantified for each pool using Manifold GIS (v8.0.28). During the 2016 management period, water quality data were only collected in the largest pool (P1, Figure 1) where the removal effort was focused due to greater habitat area. Water quality parameters were collected at three sites within P1 (furthest upstream, middle pool and shallow shelf).

Turtles

Capture strategies for turtles included use of two types of floating traps throughout the year. Floating, unbaited basking traps (Pond King, Gainesville, TX) specifically designed for capturing turtles were deployed continuously from January to December and checked once per week following manufacturer recommendations. The Pond King traps were supplemented with PVC frame floating traps during the same period. If non-target species (e.g., native species such as western pond turtle and two-striped garter snake) were captured, they were released at the capture location. Turtles were also incidentally captured in large crayfish traps. Western pond turtles were uniquely marked on two marginal scutes to facilitate identification and genetic samples were collected when possible. Target species were euthanized by freezing and submitted to the herpetology collection at the Los Angeles County Natural History Museum.

Bullfrogs

Bullfrogs (*Rana catesbeiana*) were captured using direct methods: frog gigs, a custom modified fishing pistol crossbow, and hand/dipnet. Beginning 20 to 40 minutes after sunset, two or three teams (composed of one to three biologists each) surveyed the treatment area using high powered headlamps

(Black Diamond Icon 200 lumen). A two-person team in a small boat traversed the shoreline of the largest pool (P1), while the other teams walked the shorelines of P1D, P2U, P2D, and P3. Bullfrogs were sighted using eye-shine, approached as closely as possible to maximize capture probability while limiting detection by the frog, and then gigged, shot with a customized pistol crossbow with retrievable arrows, or captured by hand/dipnet. Captured frogs were euthanized in an anesthetic overdose of buffered MS-222 (3-5 g/L), measured and sexed (over 100 mm SV), individually frozen, and submitted to the herpetology collection at the Los Angeles County Natural History Museum.

Fish

Non-native fish were captured using an experimental gill net (150 feet long, with six panels of different mesh size), hook and line, or minnow traps. The gill net and minnow traps were deployed for durations of approximately 96 hours and checked once per day. The gill net was deployed across the largest pond (P1). Hook and line fishing and dipnetting occurred when time was available and by technicians of varying skill, therefore, fishing effort using this technique was not assessed or quantified.

Crayfish/Bullfrog Tadpoles

Crayfish and bullfrog tadpoles were captured in minnow/crayfish traps baited with cuttings of fish captured from the ponds or when fish were unavailable, chicken liver and gizzards. Traps were deployed for durations of approximately 96 hours and checked once per day. Traps were placed in shallow water near the edge of pools P1, P2, and P3. Several models of traps were used: square wire “walk-in” traps, fine mesh collapsible minnow traps (funnel style), and medium mesh collapsible crayfish traps (funnel style).

Removal effort

Removal treatments targeting bullfrogs, fish, crayfish, and bullfrog tadpoles were implemented in February (4 days), March (4 days), April (4 days), May (4 days), June (4 days), July (4 days), and August (4 days) of 2016. Three to five biologists participated in each removal treatment. Passive capture methods were deployed for a total of 622 hours (experimental gill net), 20,154 hours (crayfish traps), and 41,939 hours (turtle traps). Active capture methods for bullfrog and clawed frog capture were employed for 17.1 hours (fishing crossbow), 3.2 hours (hand) and 100 hours (frog gigs). The total hours of effort per treatment event and capture data are presented in Table 2.

Results

Physical Habitat and Water Quality Parameters

Water quality parameters were within acceptable levels for aquatic life during the survey period. Surface water temperature increased, dissolved oxygen decreased, and P1 had some degree of stratification throughout the monitoring season of 2016. Several algal blooms occurred in P1 and P2 over the course of the summer. The total surface area for each pool in April was approximately 3,148 m² for P1, 854 m² for P2 and 108 m² for P3. By the end of the sampling season, P1 had decreased by approximately 30 percent, and P3, P2U, and P2D had decreased by approximately 20 percent. P0, typically a small puddle (1 m²) between P1 and P2, was dry during all monitoring events in 2016. Water quality parameters measured in P1 during this reporting period are presented in Table 1.

Removal results

Bullfrogs/Tadpoles

Treatment effort was increased in 2016 over prior years, with the addition of sampling events in February, March, and August and 4-5 biologists present during each sampling event. Within the treatment area, 41 adult and 16 juvenile bullfrogs were captured and euthanized, and 37 bullfrog tadpoles were captured. Average bullfrog size was 140 ± 8 mm snout-vent length (Figure 2), with females (167 ± 7 mm) slightly smaller than males (179 ± 3 mm). The sex ratio was heavily skewed towards males (0.625:1 F:M; two adult frogs were not sexed). Capture rates for adults were consistent, but low throughout the season compared to baseline conditions. The number of adults captured was not reduced over the course of the removal efforts, unlike previous years (Figure 4). In addition, adult bullfrogs were regularly captured in crayfish traps, which occurred very rarely in prior years. Similar to 2012 and 2014, we observed a spike in captures in June, and consistently captured recently metamorphosed juvenile frogs through the remainder of the sampling period. Most bullfrogs were observed and captured in treatment area P1/P1D (54.2 hrs; 35 frogs), which has the largest amount of available habitat in the study area. The combined effort in P2/P3 was greater than P1, and the catch rate was approximately 40 percent less (63 hrs; 21 frogs)—in actuality, the active catch rate was even lower, as 11 of the frogs in P2/P3 were captured in passive traps. Although eradication efforts were logistically more difficult to implement in the smaller pools (P2/P3) than in the larger pool (P1), the difference in catch rates is greater than would be expected if it were only due to logistical differences in sampling activities. The substantially greater catch rate in P1 suggests that the population size in the lower pools was smaller than the population size in the larger pool.

Turtles and snakes

Native western pond turtles (*Emys marmorata*) were captured five times during 2016 and represent 3 individuals; of these captured turtles, two were marked and one was recaptured from 2015. All of the turtles were male. The majority of captures occurred in the floating turtle traps, but one was captured in a large crayfish trap in treatment area P2 on July 29, 2016. All turtles were released back into the water adjacent to the traps or on the bank of the pool where they were captured. United collected genetic samples from one pond turtle for submittal to USGS for analysis. A native species field survey form was submitted to the California Natural Diversity database describing the turtle observations in 2016. No exotic turtles (red-eared slider) were captured in 2016. No two-striped garter snakes were captured in 2016, but one was observed on land adjacent to P2.

Invasive Fish

Fish were captured in all pools in 2016 (P1, P2, P3). Likely as a result of elevated water levels from the water conveyance in October 2015, juvenile largemouth bass were observed in P3. A total of 16 fish (largemouth bass and bluegill; Table 2) were captured in the experimental gill net. The minnow/crayfish traps captured 183 young-of-the-year (YOY) largemouth bass, 1 bluegill sunfish, and 4 prickly sculpin. Hook and line fishing was performed when time was available and resulted in the capture of 18 largemouth bass (mostly YOY) and 85 bluegill sunfish. In spite of higher capture rates than were experienced during prior years, all treatment methods for capturing exotic fish species appeared to be ineffective, and a large number of fish are still observed in the study area. Largemouth bass of at least

one life stage (P2U and P3 only had young bass) were observed in all pools with fish. The presence of YOY bass indicates successful reproduction during 2016, however, the maximum size of bass has declined since 2013, from approximately 550 mm total length to 350 mm total length. Schools of 0+ age class juvenile bass were visible and extremely abundant in P1 and P2D, but were not typically captured via hook and line and were too large to enter minnow traps during the latter part of the season.

Crayfish

A total of 423 red swamp crayfish (*Procambarus clarkii*) were captured in crayfish traps. Trapping was more efficient than 2012 and 2013. The increased efficiency is attributed to placement of bait in heavy mesh bags to prevent crayfish from eating the bait without entering the trap and the use of local fish as bait. Trapping effort was similar to 2015, with both more days of trapping and more traps than previous years. Based on data from 2012-2015, relatively few crayfish entered the wire mesh “walk-in” traps compared to the cloth minnow traps. Fewer crayfish were observed in the study area and substantially fewer were captured during 2016, potentially a result of removal efforts in 2014 and 2015.

Discussion

Similar to aquatic exotic species eradication efforts in prior years, the 2016 eradication effort was most effective at reducing the abundance of adult bullfrogs in the treatment area, but was less effective with other taxa. Fewer total frogs were captured in 2016 than in either 2012 or 2013, but the number of captured adult frogs has increased each year since the initial large reduction in 2012 (Figure 5). The number of adult frogs present in the treatment area was reduced compared to 2012, however, juvenile frogs and tadpoles were observed in 2016 indicating that successful reproduction occurred within the past two years. Several adult bullfrogs were heard calling during the removal effort but not all were successfully captured. The continued presence of adult frogs is potentially due to animals that have avoided capture in past efforts, but also may be a result of frogs that have dispersed overland from upstream or downstream areas—tadpoles and adult bullfrogs are abundant in the nearby release channel of Piru Creek.

The number of adult bullfrogs captured has gradually rebounded each year since 2012 and although nearly all adults that were observed were captured, a population of adults likely remains in the ponds. Effort was higher in 2016 and may have contributed to the increased number of adults captured (15 frogs were captured in February and August, months that were not sampled in prior years). In addition, compared to previous years when trap capture occurred rarely, adult bullfrogs were regularly captured in traps in 2016—potentially a result of the smaller average size of adult bullfrogs or decreased crayfish abundance. The presence of 16 recent metamorphs and 37 tadpoles indicates that successful reproduction likely occurred in 2014 or 2015 and it is likely that tadpoles observed in 2016 will metamorphose in 2017. In addition, overland dispersal from areas outside the treatment area may result in additional recolonization of these ponds in the future.

Fish production was high in 2016, with clear evidence of successful reproduction by largemouth bass and bluegill sunfish and high numbers of juvenile bass in all ponds. Unlike prior years, green sunfish were not captured in any pond. Capture rates, both in the gill net and hook and line, were similar to

2015. However, the catch frequency of large fish is lower than prior years and the maximum size of largemouth bass was approximately 200 mm smaller than baseline conditions. Conversely, capture of small size class bass and bluegill has increased during the same period, potentially a result of a release from predation pressure by large fish. P1 had higher fish diversity, with all species observed, while P2 had very high densities of small size class largemouth bass but no sunfish captured or observed. Only YOY bass were observed in P3 and all African clawed frogs observed in 2016 were captured in this very small habitat (potentially due to minimal fish predation).

It was not clear why capture efficiencies for other taxa were low. Despite high abundances of most exotic taxa and increased catch rates compared to those resulting from 2012 or 2013 efforts, trapping, netting, and manual capture appear to be below the amount required to significantly reduce population sizes. Funnel style traps had higher catch rates and captured a larger variety of taxa and were more effective than walk-in traps; this style of trap will be phased out in future years. In 2017, we may continue to increase or modify trapping efforts (e.g., minnow traps, and gill nets), potentially using greater numbers of crayfish traps. The expanded treatment window employed in 2016 (February and August) will be implemented in 2017.

With the exception of turtles, all of the target species appear to be subject to strong density dependent population growth (Adams and Pearl 2007)—meaning that removing adults relaxes predation on juveniles, which can lead to exponential population growth. Permanent or at least long-lasting eradication may require habitat level controls in addition to direct control (e.g., gigging and trapping).

References

Adams, M. J., and C. A. Pearl. 2007. Problems and opportunities managing invasive Bullfrogs: is there any hope? Pages 679–693 *in* F. Gheradi, editor. Biological invaders in inland waters: Profiles, distribution, and threats. Springer, Dordrecht.

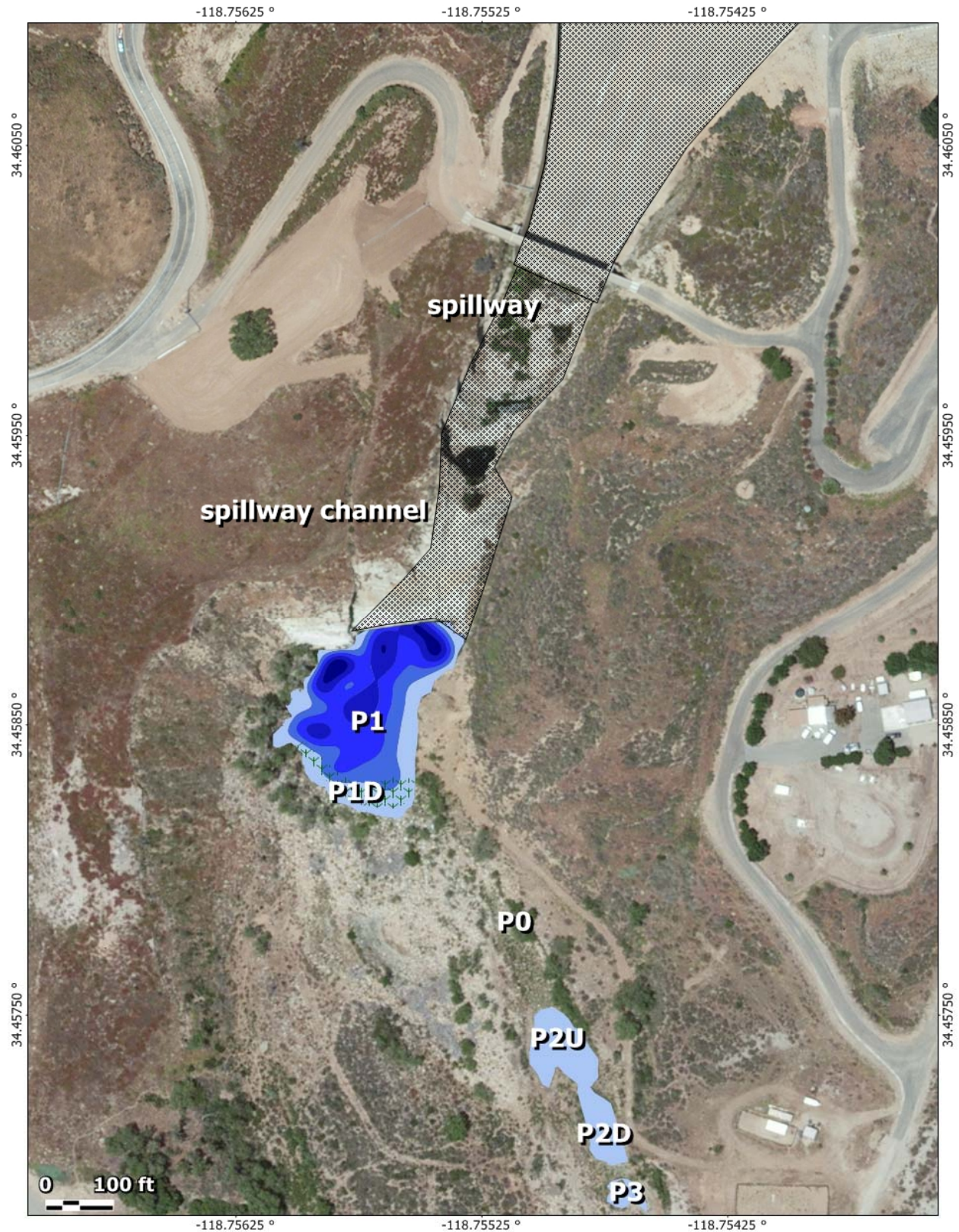


Figure 1 - Aquatic exotic eradication management treatment area.

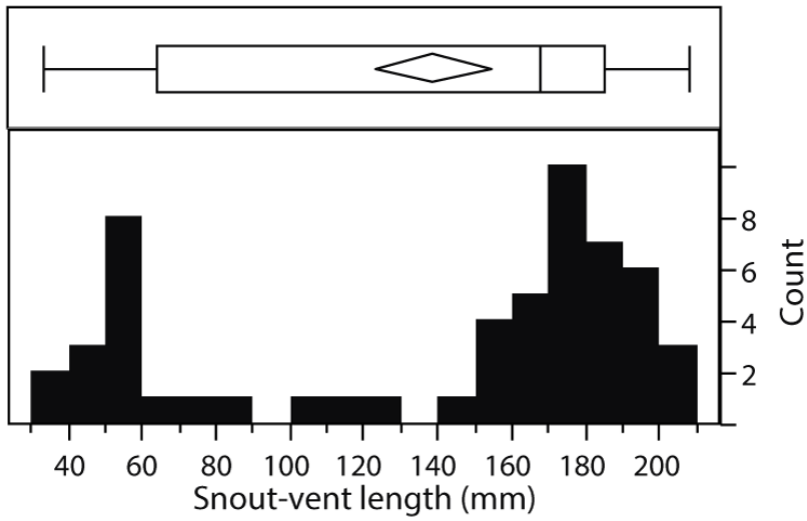


Figure 2 - Size distribution of captured bullfrogs.

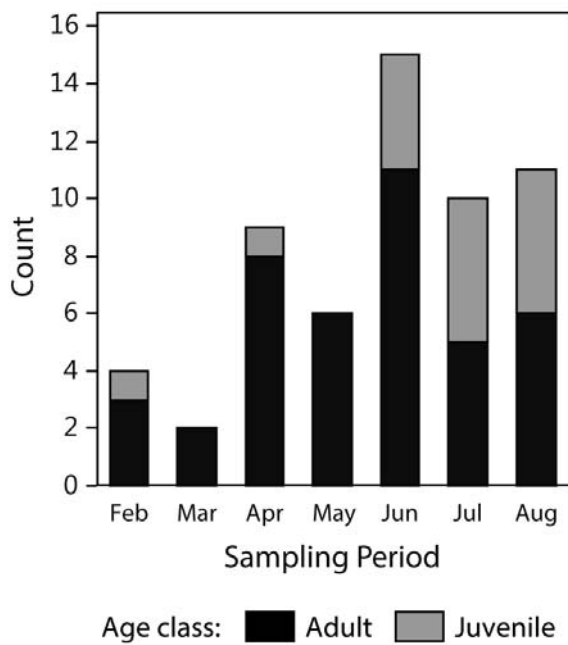


Figure 3 – Number and age class of captured bullfrogs.

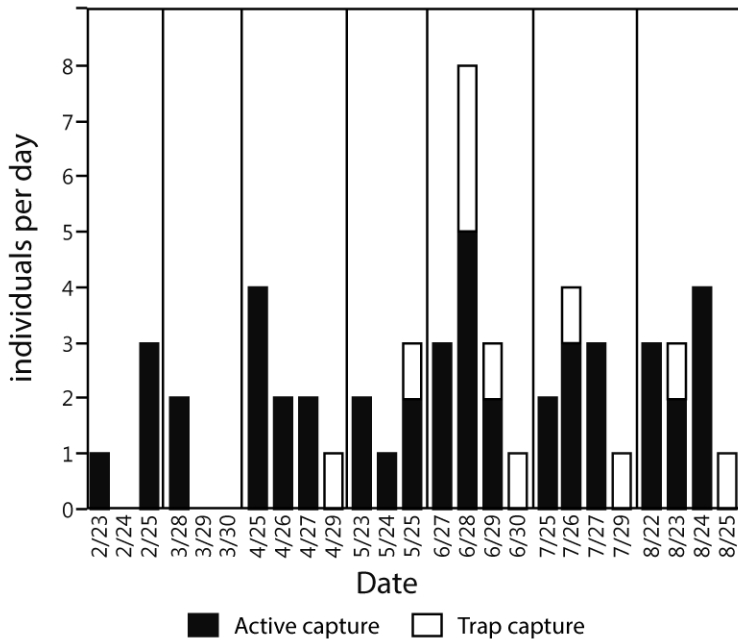


Figure 4 - Number of bullfrogs captured on each eradication treatment event day.

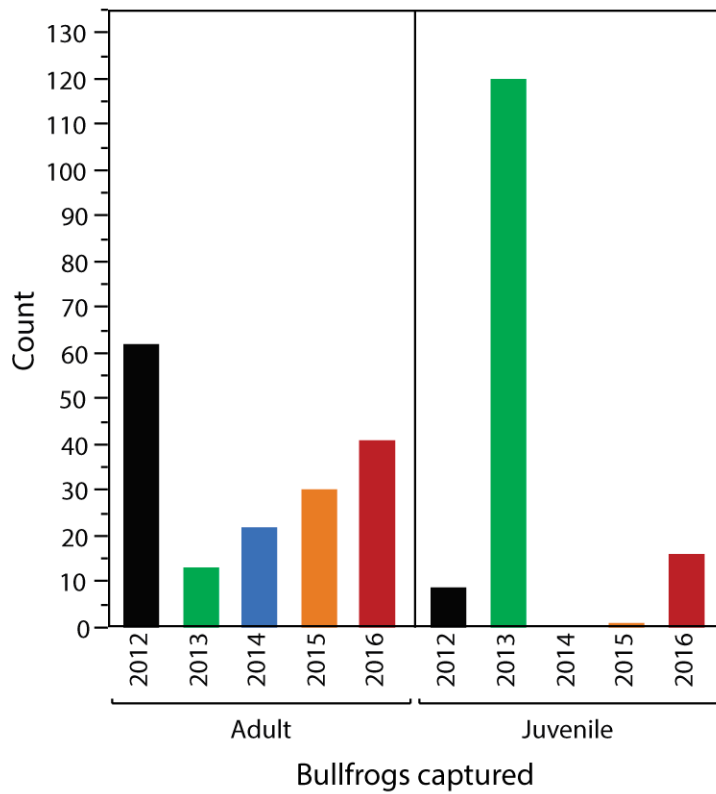


Figure 5. Catch of adult and juvenile bullfrogs during removal project, 2012 to 2016.

Table 1 - Physical characteristics and water quality parameters for P1.

2016 Sampling Period	Depth (ft)		Temp (°C)		DO (mg/L)		pH		Cond (mS/cm)		Turbidity (ntu)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
February	0	18	13.1	15.7	5.44	10.03	6.60	7.70	1.48	1.69	0.0	5999.0
March	0	16	15.8	17.9	4.99	8.70	7.61	7.81	1.37	1.46	0.0	146.0
April	0	14	18.5	19.7	-	-	7.52	9.42	7.86	8.12	0.0	0.0
May	-	-	-	-	-	-	-	-	-	-	-	-
June	0	14	20.4	28.4	0.02	10.47	7.16	8.29	1.53	1.60	0.0	16.6
July	0	13	21.4	28.4	0.17	9.75	6.98	8.34	1.61	1.98	0.0	999.0
August	0	16	20.8	26.7	0.23	11.79	6.98	8.46	1.70	1.87	90.8	5999.0

Attachment B

Completed California Native Species Field Survey Form

CNDDDB Online Field Survey Form Report



California Natural Diversity Database
Department of Fish and Wildlife
1416 9th Street, Suite 1266
Sacramento, CA 95814
Fax: 916.324.0475
cnddb@wildlife.ca.gov
www.dfg.ca.gov/biogeodata/cnddb/



Source code xxxx
Quad code 3411847
Occ. no. _____
EO index no. _____
Map index no. _____

This data has been reported to the CNDDDB, but may not have been evaluated by the CNDDDB staff

Scientific name: *Emys marmorata*

Common name: western pond turtle

Date of field work (mm-dd-yyyy): 12-07-2016

Comment about field work date(s): All year turtle trap monitoring

OBSERVER INFORMATION

Observer: Michael Booth

Affiliation: United Water Conservation District

Address: 106 N 8th St, Santa Paula, CA 93060

Email: mikeb@unitedwater.org

Phone: (805) 317-8988

Other observers: Heather D'Anna, Akiko Mandell, Cherie Benthin, Danielle Yaconelli, Rainey Barton, Bailey Barkley

DETERMINATION

Keyed in: Stebbins. Western Reptiles and Amphibians 3rd edition

Compared w/ specimen at:

Compared w/ image in:

By another person:

Other:

Identification explanation:

Identification confidence: Very confident

Species found: Yes If not found, why not?

Level of survey effort: Floating turtle traps deployed all year, 1-4 per pond

Total number of individuals: 3

Collection? No

Collection number:

Museum/Herbarium:

ANIMAL INFORMATION

How was the detection made? Captured/released

Number detected in each age class:

3

adults

juveniles

larvae

egg mass

unknown

Age class comment:

Site use description:

What was the observed behavior?

Describe any evidence of reproduction:

SITE INFORMATION

Habitat description: Shallow (1-2 m deep) pool surrounded by bullrush and small willows. One turtle was captured in a partially submerged inverted-funnel style crayfish trap baited with fish, three turtles were captured in floating "Pond King" turtle traps. Turtles were released on the pond bank next to the pond or in the water adjacent to the floating traps.

Slope:

Land owner/manager: United Water Conservation District

Aspect:

Site condition + population viability:

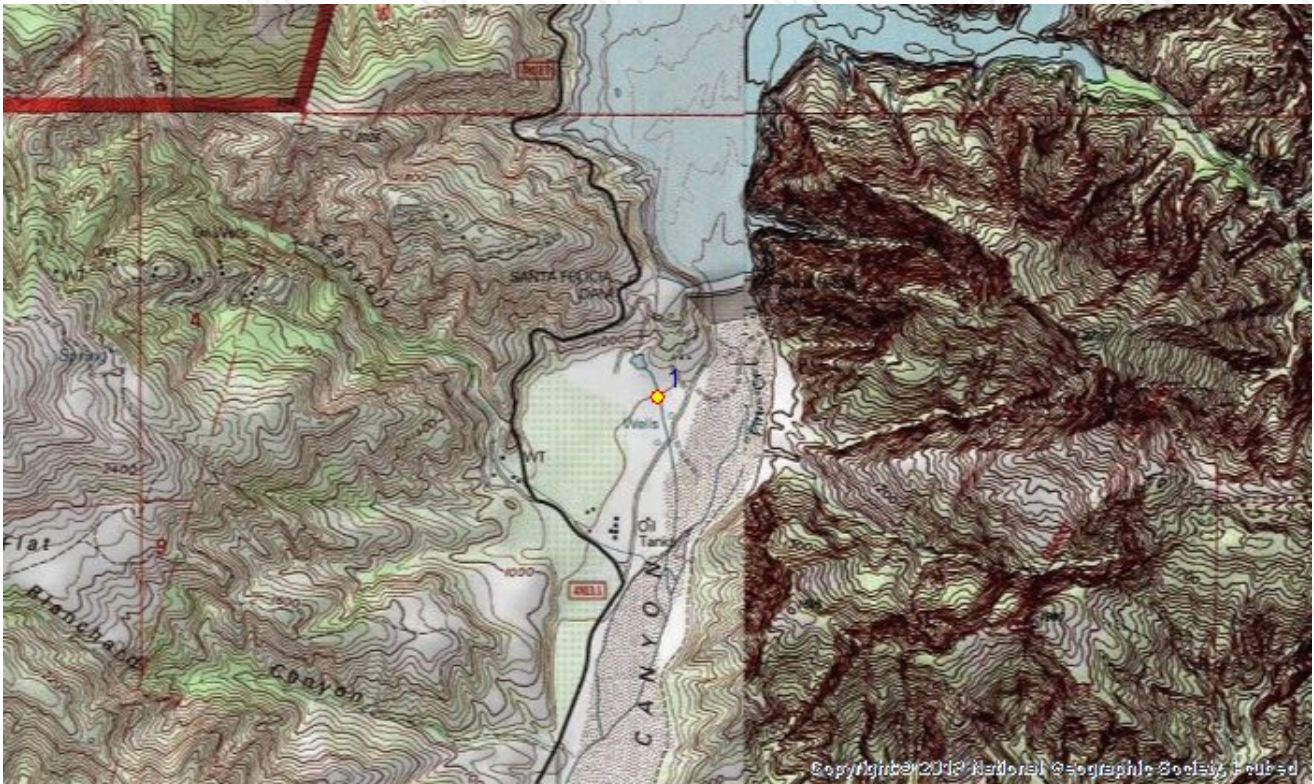
Immediate & surrounding land use: relatively undisturbed overflow channel, no current human use

Visible disturbances:

Threats: Numerous largemouth bass present

General comments:

MAP INFORMATION



ID	County	24K Quadrangle	Elev. (ft)	Latitude NAD83	Longitude NAD83	UTM E NAD83	UTM N NAD83	UTM Zone
	Ventura	Piru	866	34.457095	-118.754875	338805	3814237	11
1	Public Land Survey	Feature Comment						
	S T04N R18W 3							

The mapped feature is accurate within: 5 m

Source of mapped feature: GPS, 3 m accuracy

Mapping notes:

Location/directions comments: Small pond below Piru Lake spillway,

Attachment(s): [cnddb attachment2016.pdf](#)