2017 Amphibian and Aquatic Reptile Monitoring Report

Sacramento Municipal Utility District

Hydro License Implementation • June 2018

Upper American River Project

FERC Project No. 2101

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Acronyms and Abbreviations

Acronym	Definition
°C	Degrees Celsius
CD	Camino Dam
CFS	Cubic Feet Per Second
FERC	Federal Energy Regulatory Commission
ft	feet
FYLF	Foothill yellow-legged frog
GIS	Geographic Information Systems
GPS	Global Positioning System
in	inch
JD	Junction Dam
mi	mile
mm	millimeter
PG&E	Pacific Gas and Electric Company
RPD	Robbs Peak Dam
SCD	Slab Creek Dam
SF	South Fork
SMUD	Sacramento Municipal Utility District
SWRCB	State Water Resources Control Board
UARP	Upper American River Project
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
VES	Visual Encounter Survey
WPT	Western pond turtle

1.0 INTRODUCTION AND BACKGROUND

This Amphibian and Aquatic Reptile Monitoring Report (Report) addresses monitoring requirements set forth in Sacramento Municipal Utility District's (SMUD) Amphibian and Aquatic Reptile Monitoring Plan (Plan) (SMUD 2016). Requirements for the Plan are found in State Water Resources Control Board (SWRCB) Conditions 8.C, 8.D, 9.A, 9.B, and 9.C, and U.S. Forest Service (USFS) 4(e) Conditions 31 and 32, located in Appendices A and B, respectively, of the Federal Energy Regulatory Commission's (FERC) Order Issuing New License for the Upper American River Project (UARP; FERC Project No. 2101), dated July 23, 2014. The Plan was developed in consultation with the SWRCB, USFS, California Department of Fish and Wildlife, and U.S. Fish and Wildlife Service (USFWS). FERC approved the Plan on May 19, 2016. This Report presents results of implementing the Plan in 2017.

SMUD owns and operates the UARP which is licensed by FERC. The UARP lies within El Dorado and Sacramento counties, primarily within lands of Eldorado National Forest. The UARP consists of three major storage reservoirs: Loon Lake, Union Valley, and Ice House (with a combined capacity of approximately 379,000 acre-feet), eight smaller regulating or diversion reservoirs, and eight powerhouses. The UARP also includes recreation facilities containing over 700 campsites, five boat ramps, hiking paths, and bicycle trails at the reservoirs.

Surveys focused on Sierra Nevada yellow-legged frog (*Rana sierrae*) will be described under a separate monitoring plan, as required by the License.

2.0 MONITORING PLAN OBJECTIVES

The main objectives of the Plan are to monitor for and document the presence and distribution of sensitive amphibians and aquatic reptiles, focused primarily on foothill yellow-legged frog (*Rana boylii*) (FYLF) and western pond turtle (*Actinemys marmorata*) (WPT), over the term of the License (SMUD 2016). This includes identifying FYLF breeding and larval periods in the Project-affected reaches by periodically surveying reaches of known and potential FYLF presence during spring and summer. The Plan also includes stream water temperature monitoring at specified sites with known breeding or suitable breeding habitat for FYLF.

Monitoring goals include determining the timing and success of early life stages (i.e., eggs, tadpoles, and metamorphs [newly metamorphosed individuals, also referred to as "young-of-year"]) of known populations during the first survey year[1], and documenting the size and condition of young-of-year in fall to estimate the probability of overwintering success.

[1] None of these early life stages were found during the first survey year (2016).

Determining presence and distribution of sensitive amphibian species and identifying breeding and larval periods are important in identifying potential impacts resulting from streamflow modifications. In particular, along with temperature monitoring and other aquatic species monitoring, FYLF monitoring may help inform whether short-term flow fluctuations resulting from spill events below Slab Creek Reservoir Dam and/or Camino Reservoir Dam result in unacceptable environmental impacts. Identification of FYLF breeding and larval periods may also be used to monitor effects of spring recreational boating flows and future potential October recreational boating flows in the South Fork (SF) American River below Slab Creek Reservoir.

FYLF monitoring is being conducted to help determine if populations of this species in Project-affected streams are increasing or decreasing for any life stage as a result of Project streamflow changes or fluctuations. Monitoring for 1 to 2 years within each five-year period (following more intensive surveys at the beginning) provides an opportunity to detect changes in amphibian populations, following sufficient response time to streamflow modifications. Trends in population size and/or changes in distribution over time will be monitored with consideration of Project-related changes in water temperature and habitat availability. Monitoring before (when feasible) and after spill events and during flow fluctuations will provide information on whether egg masses and/or larvae are being displaced or stranded.

Water temperature monitoring in known or suitable breeding sites is intended to provide information about the relationship between water temperature and the initiation of FYLF breeding.

3.0 MONITORING SITES AND FREQUENCY

3.1 MONITORING SITES

In accordance with the Plan (SMUD 2016), five monitoring sites within four Project reaches[2] were surveyed during License Year 3 (2017), as listed in Table 1 and illustrated in Figure 1. These sites include locations with either documented FYLF presence (sites Camino Dam [CD]-A3 and CD-A4) or potential habitat, as described in the Plan.

[2] "Project reach" is a term to describe a segment of stream downstream of a dam (e.g., "Camino Dam Reach" is Silver Creek downstream of Camino Dam)

Table 1. Amphibian and Aquatic Reptile Monitoring Sites, 2017

Project Reach	Site Code	Site Description	UTM Coordinates[a]				Site Length[b,c]	Elev.[b,d]	FYLF[e] Observed in 2003/ 2004?	WPT[e] Observed in 2003/ 2004?	Water Temp. Monitoring
			Downstream End		Upstream End						
			N	E	N	E					
Junction Dam Reach	JD-A15	Silver Creek below Junction Reservoir Dam	4302306	713564	4302466	713444	653 ft/ 0.12 mi	3,045 ft	No	No	No
Camino Dam Reach	CD-A3	Silver Creek below Camino Reservoir Dam (near Camino Adit)	4298484	710087	4298651	710236	735 ft/ 0.14 mi	2,336 ft	Yes	No	Yes
	CD-A4	Silver Creek below Camino Reservoir Dam (at confluence with SF American River)	4296233	709331	4296310	709424	404 ft/ 0.08 mi	2,067 ft	Yes	No	Yes
Slab Creek Dam Reach	SCD-A1	SF American River below Slab Creek Reservoir Dam	4292873	692573	4295022	692931	10,404 ft/ 2.0 mi	1,007 ft	No	Yes	Yes
Rock Creek Reach	RC-A1	Rock Creek	4294981	692886	4296217	693204	4,954 ft/ 1.0 mi	1,102 ft	No	No	No

[a] Projection: NAD83 UTM Zone 10 North, N = Northing, E = Easting
[b] Site lengths and elevations are calculated in geographic information systems (GIS) (projection: NAD83 UTM Zone 10 North)
[c] Site lengths are reported in feet (ft) and miles (mi)
[d] Elevations are for the most downstream survey location at the site
[e] FYLF = Foothill yellow-legged frog; WPT = Western pond turtle

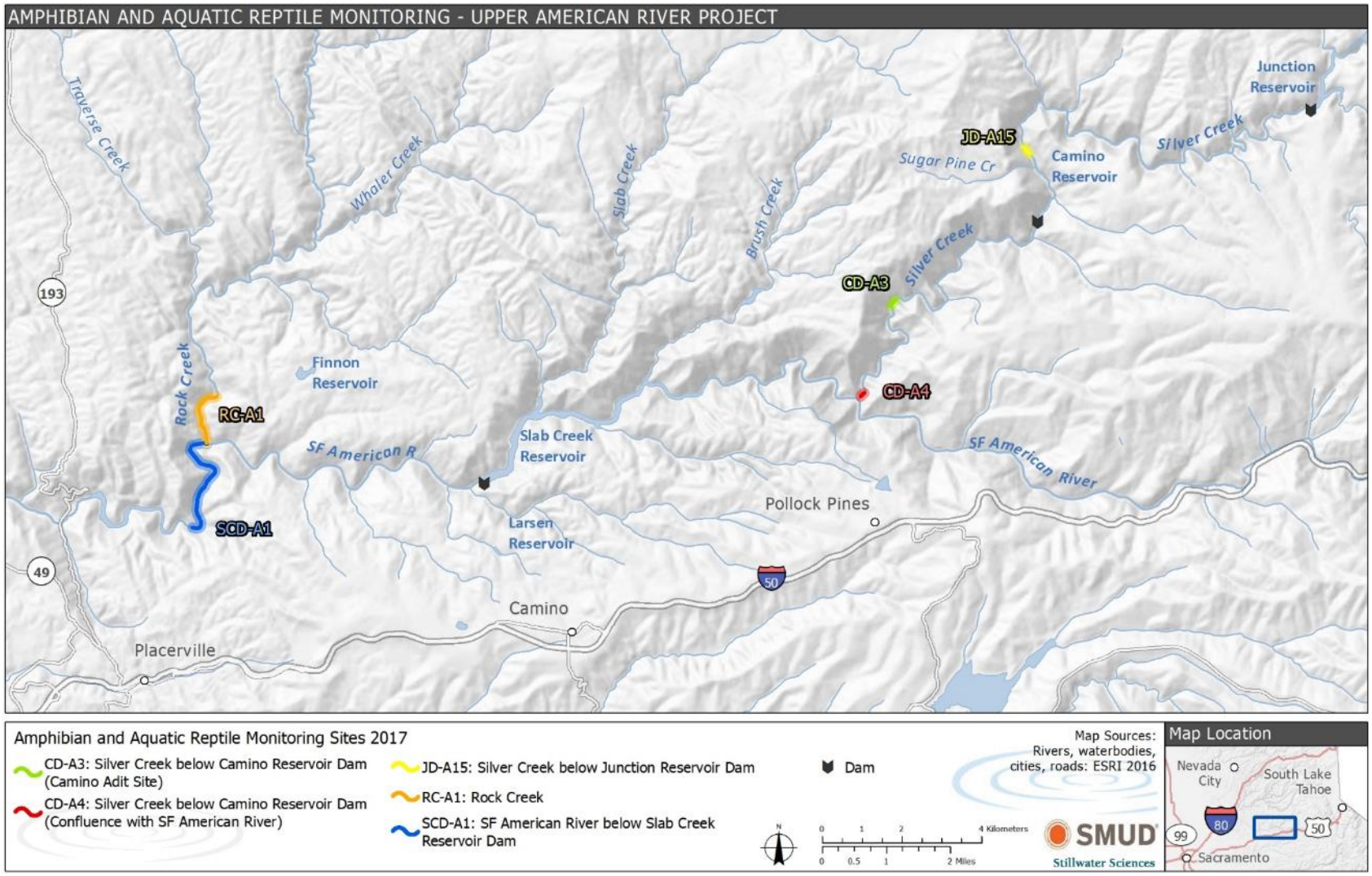

Figure 1. Amphibian and Aquatic Reptile Monitoring Sites and Study Area Overview, 2017

During relicensing studies in 2003 and 2004, FYLF were documented along the Camino Dam Reach of Silver Creek at sites CD-A3 and CD-A4 (SMUD and PG&E 2005). Relicensing studies did not document species presence at the Junction Dam Reach of Silver Creek site (JD-A15) and Slab Creek Dam Reach of SF American River (SCD-A1), though they contained FYLF habitat and were therefore included in the Plan. Rock Creek was included in the Plan to provide information on whether FYLFs are using this major tributary of the reach below Slab Creek Dam. A one-time investigative survey for FYLF presence was completed along the Robbs Peak Dam Reach of the South Fork Rubicon River (RPD-A1) in 2016 (SMUD 2017).

During 2016, the initial year of implementing the Plan after License issuance, FYLF were found at Site CD-A3. No FYLF were documented at the remaining sites in 2016 (SMUD 2017).

3.2 MONITORING FREQUENCY

The Plan specifies that surveys will be conducted at each site over the term of the License during specific years (SMUD 2016). Table 2 outlines the monitoring schedule for each site over the term of the license. Surveys can also be triggered by flow fluctuations and spill events (see Section 4.1.3).

Table 2. Monitoring Schedule for Each Amphibian/Aquatic Reptile Monitoring Site Over Term of License[1]

Site Description	License Years 1 through 25																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Silver Creek below Junction Reservoir Dam		X	X		X					X					X					X					X
Silver Creek below Camino Reservoir Dam		X	X	X	X	X				X	X				X	X				X	X				X
SF American River below Slab Creek Reservoir Dam		X	X	X	X	X	X			X	X				X	X				X	X				X
Rock Creek		X	X	X																					
SF Rubicon River below Gerle Creek		X																							
Site Description	**License Years 26 through 50**																								
	26	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Silver Creek below Junction Reservoir Dam					X					X					X					X					X
Silver Creek below Camino Reservoir Dam	X				X	X				X	X				X	X				X	X				X
SF American River below Slab Creek Reservoir Dam	X				X	X				X	X				X	X				X	X				X
Rock Creek																									
SF Rubicon River below Gerle Creek[1]																									

[1] Year 1 is 2015

X = Amphibian and aquatic reptile monitoring years

4.0 METHODS

Visual Encounter Surveys (VESs) were performed in all safely accessible and permissible areas within each site, following protocols outlined in the Visual Encounter Survey Protocol for *Rana boylii* in Lotic Environments (Peek et al. 2017), as well as protocols similar to those outlined in Heyer et al. (1994), Lind (1997), and Pacific Gas and Electric Company (PG&E) (2002a, 2002b). In addition to FYLF, all other amphibian and reptile species observed during the surveys were recorded, as well as any potential predators (e.g., fish, crayfish, and bullfrogs). The specific survey methodology for each species is addressed below, as are methods for adaptive management monitoring.

4.1 FOOTHILL YELLOW-LEGGED FROG

4.1.1 Visual Encounter Surveys

Focused VESs were conducted in 2017 as follows:

- one egg mass survey during the late breeding and early tadpole development period (July),
- one tadpole survey during the tadpole development period (August), and
- one survey for newly metamorphosed (young-of-year) FYLF in the fall (September).

Survey dates for each site are listed in Table 3. VESs were conducted once crews were able to safely navigate study reaches downstream of dam infrastructure without risk of uncontrolled spill events. An unusually high snowpack in late spring/early summer[3] resulted in high spring run-off and prolonged spills at Project dams, including Camino Dam upstream of the Silver Creek sites. The UARP road system also sustained significant storm damage during the 2016–2017 winter, further complicating study site access during the spring months. These circumstances resulted in variances from survey schedules prescribed in the Plan (2016). While the typical egg-laying period for FYLF is mid-April to late June, initial egg mass surveys needed to be postponed until mid-July, and reduced from two to one. In addition, young-of-the year surveys were not safe to conduct in the SF American River below Slab Creek Reservoir Dam due to high flows as a result of manufactured spills designed to provide the Chili Bar Project's streamflow requirements during SMUD's White Rock tunnel outage.

[3] Data from DWR (2017) indicated northern Sierra snowpack was 199% of average on May 1,

Table 3. Amphibian and Aquatic Reptile Monitoring Survey Dates, 2017

Site Code	Site Description	Survey Date (2017)		
		VES 1	VES 2[a]	VES 3
JD-A15	Silver Creek below Junction Reservoir Dam	7/11	8/4	9/22
CD-A3	Silver Creek below Camino Reservoir Dam (near Camino Adit)	7/11	8/3	9/13
CD-A4	Silver Creek below Camino Reservoir Dam (near confluence with SF American River)	7/13	8/3	9/13
SCD-A1	SF American River below Slab Creek Reservoir Dam	7/12	8/2	--[b]
RC-A1	Rock Creek	7/14	8/1	9/22

[a] Focused western pond turtle surveys were conducted during VES 2.
[b] A third VES was not conducted due to high flows. Temperature loggers were retrieved on October 19, 2017.

Two to three surveyors initiated each VES at the downstream end of the site and surveyed upstream, except for Site SCD-A1, where all four surveys were performed upstream to downstream (due to the larger river channel and flow and increased difficulty surveying against the current). When wading in near-shore habitat, surveyors used a carefully gauged zig-zag pattern to search the shallows in one pass. Data from the surveys was recorded on a field form adapted from Peek et al. 2017 (Attachment 1). Water and air temperatures were recorded at the beginning of every VES. Start and end times were recorded, as well as the actual time spent exclusively searching for FYLF.

During egg mass surveys, each team included one snorkeler to survey deeper areas where safe and feasible[4] (e.g., in water 1.6–9 ft deep in and adjacent to suitable breeding habitat). Surveyors carefully used their hands to feel in areas where they could not see, including under bedrock or boulder ledges, and in deep pockets beneath large cobble in low-velocity areas.

Surveys for post-metamorphic individuals focused on the surface of the ground, on rocks, or at the water's edge. Data collected for each post-metamorphic individual captured included sex[5] and snout-to-vent length. An individual was classified as adult if it possessed secondary sexual characteristics (such as enlarged nuptial pads in males) or was equal to or greater than 37 millimeters (mm) (2 inch [in]) snout-to-vent length (Storer 1925, Zweifel 1955). An individual would be classified as a young-of-year based on size (which can measure from 22 to 27 mm [0.8 to 1 in] snout-to-vent length, but typically from 22 to 24 mm [0.8 to 0.9 in] [Nussbaum et al. 1983, Zeiner et al. 1988,

[4] It was not feasible to snorkel a large proportion of the survey area during VES 1 and VES 2 at SCD-A1 and RC-A1 due to relatively strong currents and long survey distances.
[5] For size classes of juvenile and younger, when determination of sex is not feasible, sex was recorded as "unknown."

PG&E 2002a]) and possible evidence of tail absorption; in addition, young-of-year are present in fall only.

Habitat data collected as part of the post-metamorphic frog surveys included perch substrate, dominant riparian type, and geomorphic unit. Chin photographs were taken to use for comparison with future FYLF captures, allowing potential identification of individual frogs and potential tracking of movement by individual frogs. Chin patterns are hypothesized to be unique to each frog and persist throughout the life of the frog (Marlow et al. 2016).

4.1.2 Water Temperature Monitoring

The Plan (2016) requires temperature monitoring as an indicator of FYLF breeding initiation at the two sites below Camino Reservoir Dam (historical breeding sites CD-A3 and CD-A4) and below Slab Creek Reservoir Dam (suitable breeding Site SCD-A1) during years 2 through 6 of the new License. Six Onset Hobo© Pro v2 water temperature loggers were deployed at each site to ensure an adequate sample size and for redundancy in the case of equipment failure (Figures 2–4) (Attachment 2).

Figure 2. Temperature Logger Locations at Monitoring Site SCD-A1, 2017

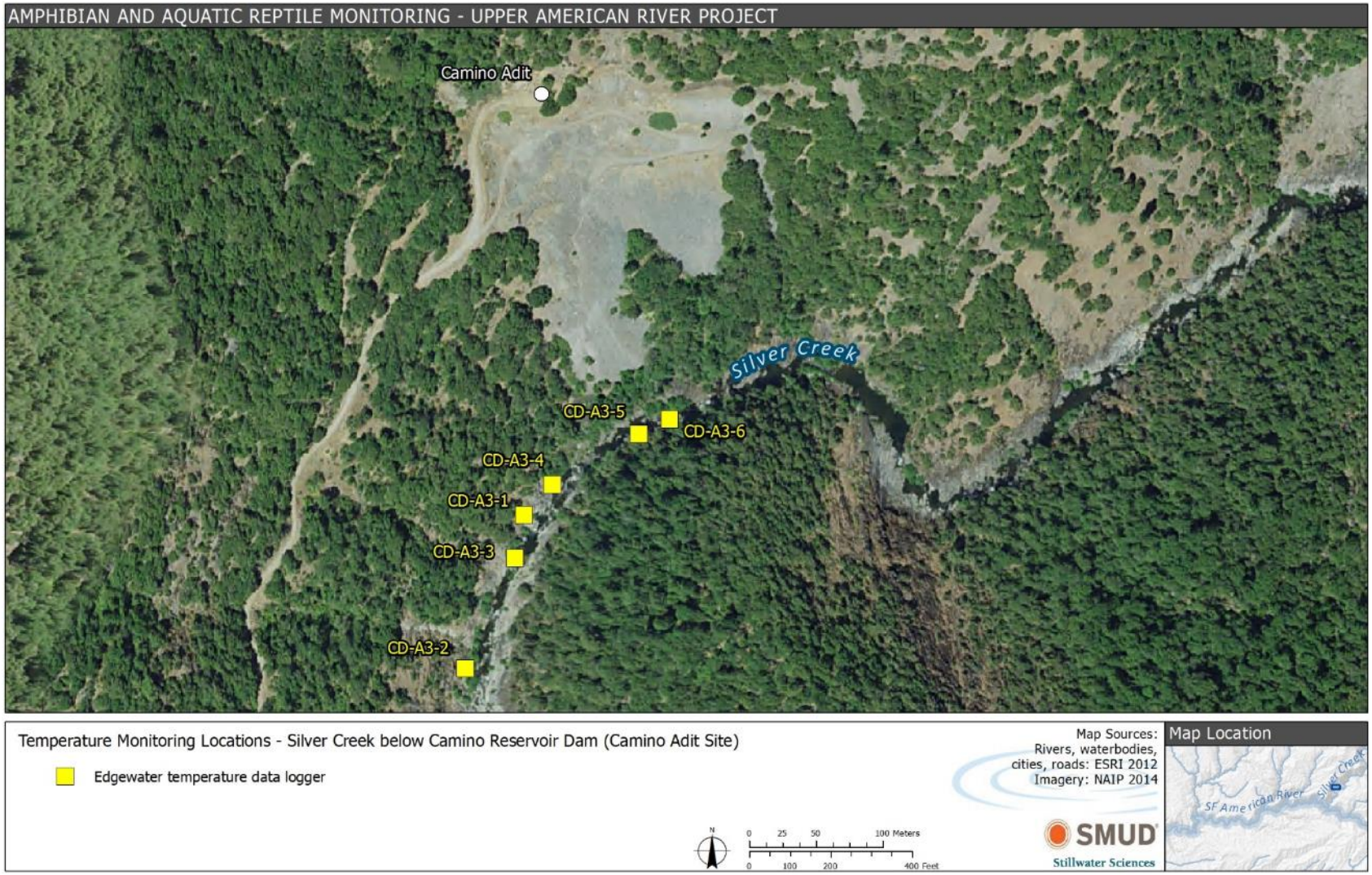

Figure 3. Temperature Logger Locations at Monitoring Site CD-A3, 2017

Figure 4. Temperature Logger Locations at Monitoring Site CD-A4, 2017

The areas targeted for temperature logger installation generally included relatively shallow and slow-moving edgewater locations, though monitoring sites were of varying velocities, depths, and substrates to represent areas with a variety of potential breeding habitats. Six temperature loggers per site were deployed during July at sites CD-A3, CD-A4, and SCD-A1. The temperature loggers were deployed when flows were still relatively high; therefore, loggers were positioned in areas that were expected to remain submerged during anticipated lower summer flows. All temperature loggers were deployed in water less than 3 ft deep (an estimated average of 1.5 ft deep) and within 9 ft of the shoreline. Temperature loggers were retrieved during the September VESs at sites CD-A3 and CD-A4, and in October at Site SCD-A1. At the time of retrieval, temperature loggers were situated between 0.4 and 3.0 ft deep, and usually within 4 ft of the shoreline. Attachment 2 provides photographs showing the approximate locations of each temperature logger at the end of the survey season, just prior to removal.

The temperature loggers were housed within metal cylinders, and anchored to alder trees using 1/8th-in stainless steel cable; cable loops were secured with aluminum crimping sleeves (Figure 5). Loggers were secured inside the housing using two (redundant) brightly colored nylon zip ties with the excess zip tie material left in place to help relocate the logger in the event of burial of the housing. Loggers were periodically checked on during VESs and cleaned of any debris or gravel around the cylinders.

Figure 5. Temperature Data Logger Set-up at Monitoring Site CD-A4 (July 14, 2017)

Temperature monitoring in stream margin habitats is typically conducted concurrently with stream thalweg water temperature monitoring performed under SMUD's Water Temperature Monitoring Plan (SMUD 2015). However, the telemetered temperature monitoring stations were damaged during flood flows in 2017; there are no concurrent thalweg data for SF American River and limited data for Silver Creek near the confluence with SF American River in 2017. The statistical analysis being performed to establish data relationships between edgewater temperatures and thalweg temperatures at the end of the 5-year monitoring period will be adapted accordingly. The thalweg temperatures will eventually be used to initiate egg-mass VESs based on reach-specific temperature thresholds identified from results of this initial five-year investigation. The telemetered thalweg water temperature monitoring stations were rebuilt and operational as of September 2017.

4.1.3 Adaptive Management Monitoring

As part of an adaptive management effort, the approved Plan outlines requirements for SMUD to monitor amphibians and aquatic reptiles following spill events at Camino and Slab Creek reservoirs, and during flow fluctuations from Camino Dam. Monitoring for effects to FYLF include looking for evidence of damage, displacement, or scouring of egg mass or larvae, as well as evidence of egg mass or larval stranding/desiccation.

4.1.3.1 Following Spill Events at Camino and Slab Creek Reservoirs

For spill events at Camino Dam, VES sites CD-A3 and CD-A4 are to be monitored for effects on FYLF as soon as possible after the decline of spill flows that occur after water temperatures rise above a daily mean of 12°C (Celsius) for a seven-day running average at Water Temperature Monitoring Site 8.I.14 (located on Silver Creek immediately upstream of the SF American River).

For spill events at Slab Creek Dam, VES Site SCD-A1 is to be monitored for effects on FYLF as soon as possible after the decline of spill flows that occur after water temperatures rise above a daily mean of 12°C for a seven-day running average at Water Temperature Monitoring Site 8.I.18 (located approximately ½ -mile upstream of White Rock Powerhouse).

4.1.3.2 During Flow Fluctuations from Camino Reservoir Dam

As required under the approved Plan, VESs for FYLF are to be conducted in Silver Creek below Camino Reservoir Dam at any time during June through September when the following criteria are triggered:

- the streamflows are 100 cubic feet per second (cfs) or less; and
- the flows fluctuate more than 40 cfs over one week's time.

4.2 WESTERN POND TURTLE

WPT surveys were conducted concurrently with the mid-summer/August FYLF survey (see Section 4.1.1), where one additional dedicated surveyor independently looked for WPT (for the survey on the SF American River, this increased to two surveyors due to the larger river channel).

The surveyor(s) typically walked in an upstream direction[6], first scanning ahead and searching from a distance to identify potential basking locations, such as sunlit rocks, logs, exposed banks, floating vegetation, and for WPT at the surface of the water. The surveyor(s) also searched for skeletal remains and evidence of WPT nests, such as the scrapes produced by females when digging nest-holes, signs of nests opened by predators, and remnants of hatched eggshells. Surveyors also searched for WPT while snorkeling in deep pools and backwaters. Key attributes of a WPT site (e.g., vegetation, habitat type, and the presence and nature of basking sites) were characterized and recorded, along with global positioning system (GPS) coordinates (where possible) and corresponding photographs. Captured WPTs were measured, categorized by sex (if determinable), and photographed in dorsal (carapace) and ventral (plastron) view. An adult turtle was defined as equal to or greater than 120 mm (4.7 in) total carapace length, and a juvenile was less than 120mm (4.7 in) total carapace length

5.0 RESULTS

Table 4 provides survey start and end times, along with water and air temperatures recorded during VESs at each site. Representative habitat photos are included in Attachment 3.

[6] Except for site SCD-A1, where all four surveys were performed upstream to downstream, due to the larger river channel and flow and increased difficulty surveying against the current.

Table 4. Foothill Yellow-legged Frog and Western Pond Turtle Survey Conditions, 2017

Site Code	Survey Date (2017)	VES #	Start Time (hours)	End Time (hours)	Temperature Ranges	
					Water Temp. (°C)	Air Temp. (°C)
JD-A15	7/11	1	1010	1050	13.5–14	23.5
	8/4	2	1140	1210	18	31–33.5
	9/22	3	930	1020	9	7.5–16.5
CD-A3	7/11	1	1502	1610	16–17	33.5–34.5
	8/3	2	1350	1440	18.5–19	35
	9/13	3	1350	1450	18	19.5–21.5
CD-A4	7/13	1	1050	1119	17	25.5–26
	8/3	2	918	1005	18.5	26.5–27.5
	9/13	3	915	1045	18	21–25
SCD-A1	7/12	1	1000	1711	17.5–21	27.5–31
	8/2	2	955	1630	19.5–22.5	28–31.5
RC-A1	7/14	1	916	1333	17.5–18.5	21.5–28
	8/1	2	1028	1448	19.5–20	27–32
	9/22	3	1235	1450	13.5	17.5–20.5

VES # = visual encounter survey number
°C = degrees Celsius

5.1 FOOTHILL YELLOW-LEGGED FROG

5.1.1 Visual Encounter Surveys

5.1.1.1 Foothill Yellow-legged Frog Observations

No egg masses or tadpoles were found in the study area during 2017. Adult FYLF were found in two general locations within the study area (Table 5, Figures 6); one of these locations, Site CD-A3, was a formal VES site. The other location was a tributary informally surveyed for FYLF while surveyors were en route to the main channel site.

Table 5. Foothill Yellow-legged Frog Observation Locations at or Near Site CD-A3, 2017

Location Description	UTM Coordinates[a]		Date (2017)	Foothill Yellow-legged Frog Observations
	Northing	Easting		
Site CD-A3 along Silver Creek	4298645	710238	7/11	One adult male in the upstream end of Site CD-A3 during VES 1
	4298560	710149	7/13	One adult male in the middle of Site CD-A3, incidentally observed during thermograph install
Tributary to Silver Creek, downstream of access road and adjacent to foot trail to Silver Creek	4298712	710267	9/13	One adult, sex unknown, in small tributary
	4298723	710268		One adult female in small tributary

[a] Projection: NAD83 UTM Zone 10 North

Figure 6. Foothill Yellow-legged Frog Observation Locations at or Near Site CD-A3, 2017

One FYLF was documented within the study area during formal VESs; an adult male found at the upstream end of Site CD-A3 on July 11 (Table 5, Figures 6–7). This frog was found on a bedrock outcropping with no riparian vegetation, located in a connected side pool using slackwater/edgewater habitat. The frog's snout-vent length was 53 mm (2.1 in). An additional adult male FYLF was incidentally found near the middle of Site CD-A3 on July 13 (Figure 8), two days later, during thermograph installation at the same site.

Two adult FYLFs were found incidentally during an informal survey in a small tributary to Silver Creek, located near the top of Site CD-A3 (Table 5, Figure 6).

Other areas which were informally searched for FYLF during site visits included: Camino Adit; a wet roadside ditch associated with a seep along a bedrock cliff face, located on the west side of the access road to and approximately 0.5 miles before Camino Adit; and a small tributary upstream of the unpaved access road, west of Camino Adit. These locations were visited several times throughout the monitoring season, since FYLFs were observed using these habitats during post-License monitoring in 2016 (SMUD 2017); no FYLFs were found there in 2017. Additionally, a large pool upstream of Site CD-A3, at the confluence of the tributary to Silver Creek where FYLF were found, was informally snorkeled during the July 11 and August 3 VESs; no FYLF were found in this pool.

Figure 7. Adult Male Foothill Yellow-legged Frog (Left) Found in Slackwater/Edgewater Habitat (Right) During the VES at Site CD-A3 on July 11, 2017

Figure 8. Foothill Yellow-legged Frog Observed in the Tributary to Silver Creek Near Site CD-A3 on September 13, 2017

5.1.1.2 Habitat Conditions

The habitat along the Silver Creek sites (JD-A15, CD-A3, and CD-A4) and the South Fork American River site (SCD-A1) varied considerably from conditions observed during 2016 monitoring (Figure 9–12), presumably due to high stream flows during the wet 2017 water year. Riparian vegetation was stripped of leaves/branches or completely removed, decreasing cover and increasing sunlight along the channel and banks. Sediment, including fines and debris which had accumulated after the 2014 King Fire, were flushed from slow-water habitat units and banks, resulting in larger average substrate sizes and more exposed bedrock. At Site CD-A3, sediment, gravel, and jagged cobble deposited by the rockslide near the west slope were no longer present in the streambed (Figure 11). Benthic green algae were present during the August surveys in several slow-moving habitat units at sites CD-A3 and CD-A4 (Figure 13–14). No significant change in habitat was observed along Rock Creek (Site RC-A1). Additional habitat photos are provided in Attachment 3.

Figure 9. Stripped Riparian Vegetation along Silver Creek, Site JD-A15, on July 11, 2017

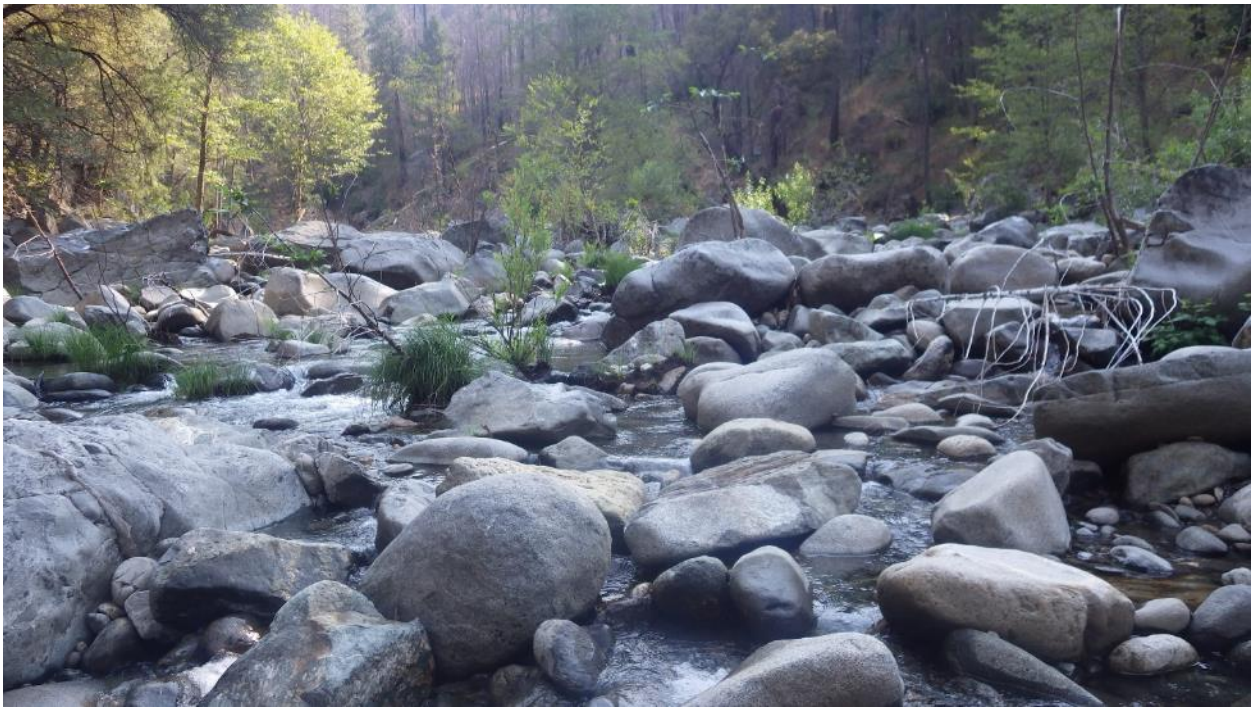

Figure 10. Stripped Riparian Vegetation on Silver Creek, Site CD-A4, on July 11, 2017

Figure 11. Rock Slide and Stripped Riparian Vegetation on Silver Creek, Site CD-A3, on July 11, 2017

Figure 12. Cobble Bank on South Fork American River, Site SCD-A1, on August 2, 2017

Figure 13. Benthic Green Algae in Silver Creek, Site JD-A15, on August 4, 2017.

Figure 14. Benthic Green Algae in Silver Creek, Site CD-A3, on August 3, 2017.

5.1.2 Water Temperature Monitoring

Table 6 provides edgewater temperature data recorded at water monitoring locations, summarized by month. As described in the methods, installation of temperature loggers was delayed until mid-July due to safety concerns and access constraints. The mean monthly edgewater temperatures for all three sites ranged from 15.6 °C to 19.5°C during the general tadpole rearing months of July through September. Maximum daily averages for this time period were 17.8°C to 23.8°C (Table 6). Mean monthly temperatures for Silver Creek were approximately 2°C to 3 °C warmer at CD-A4 (near the confluence with SF American River) than at Site CD-A3 (near the Camino Adit Site).

Figures 15–17 provide plots of mean daily edgewater temperatures for all three sites. Thalweg temperatures for the 2017 breeding season were unavailable due to the telemetered temperature logging stations being washed away during the winter storms.

Table 6. Edgewater Temperature Data Summarized by Month, 2017

Temperature Monitoring Site	Month	Mean Monthly Temperature (°C)	Maximum Daily Average Temperature (°C)
Silver Creek Near Camino Adit (CD-A3)	July[1]	15.7	17.8
	August	17.1	22.8
	September[2]	17.3	19.9
Silver Creek at Confluence with SF American River (CD-A4)	July[1]	17.9	21.0
	August	19.5	23.8
	September[2]	19.3	22.1
SF American River Upstream of White Rock Powerhouse (SCD-A1)	July[1]	19.3	22.5
	August	19.3	22.5
	September	15.1	20.3

[1] Edgewater data used for calculations does not include the entire month of July. Data included in the analysis were collected from approximately July 13 through July 31, 2017

[2] Edgewater data used for calculations does not include the entire month of September. Data included in the analysis were collected from approximately September 1 through September 13, 2017.

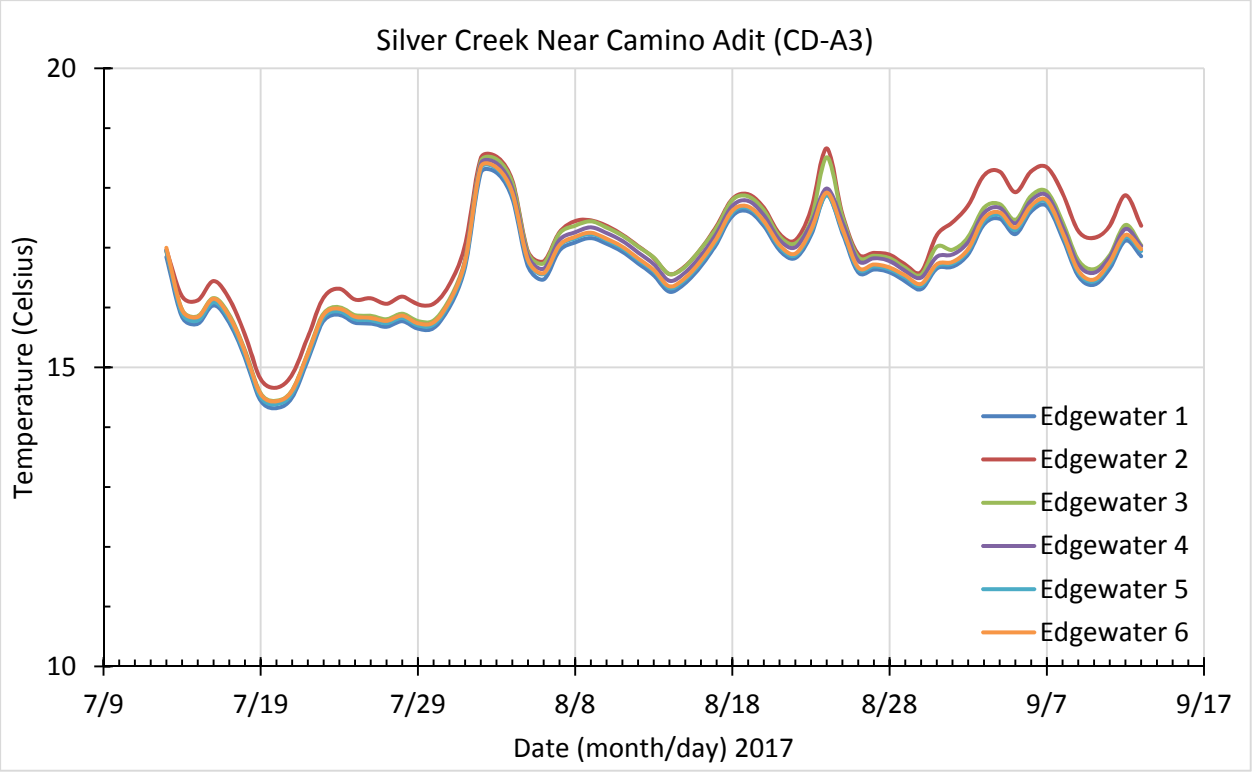

Figure 15. Mean Daily Edgewater Temperature Data for Silver Creek Near Camino Adit (CD-A3)

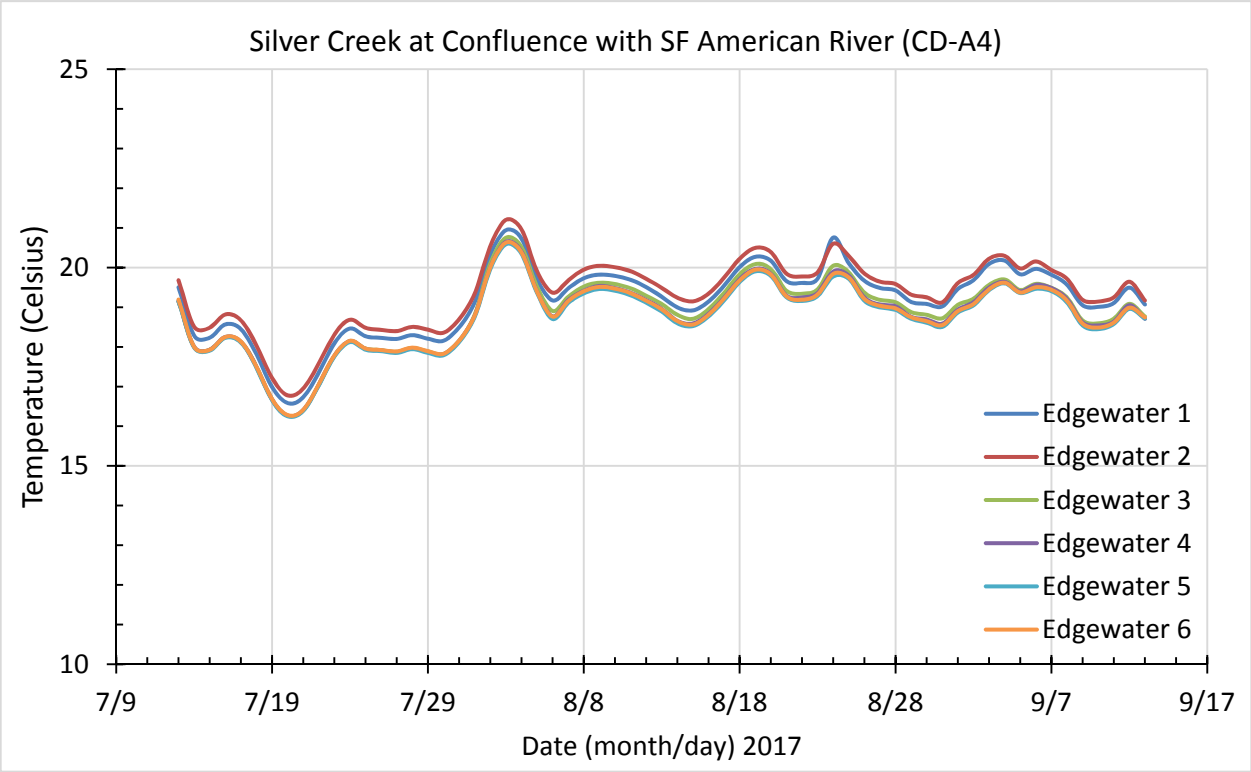

Figure 16. Mean Daily Edgewater Temperature Data for Silver Creek Upstream of SF American River Confluence (CD-A4)

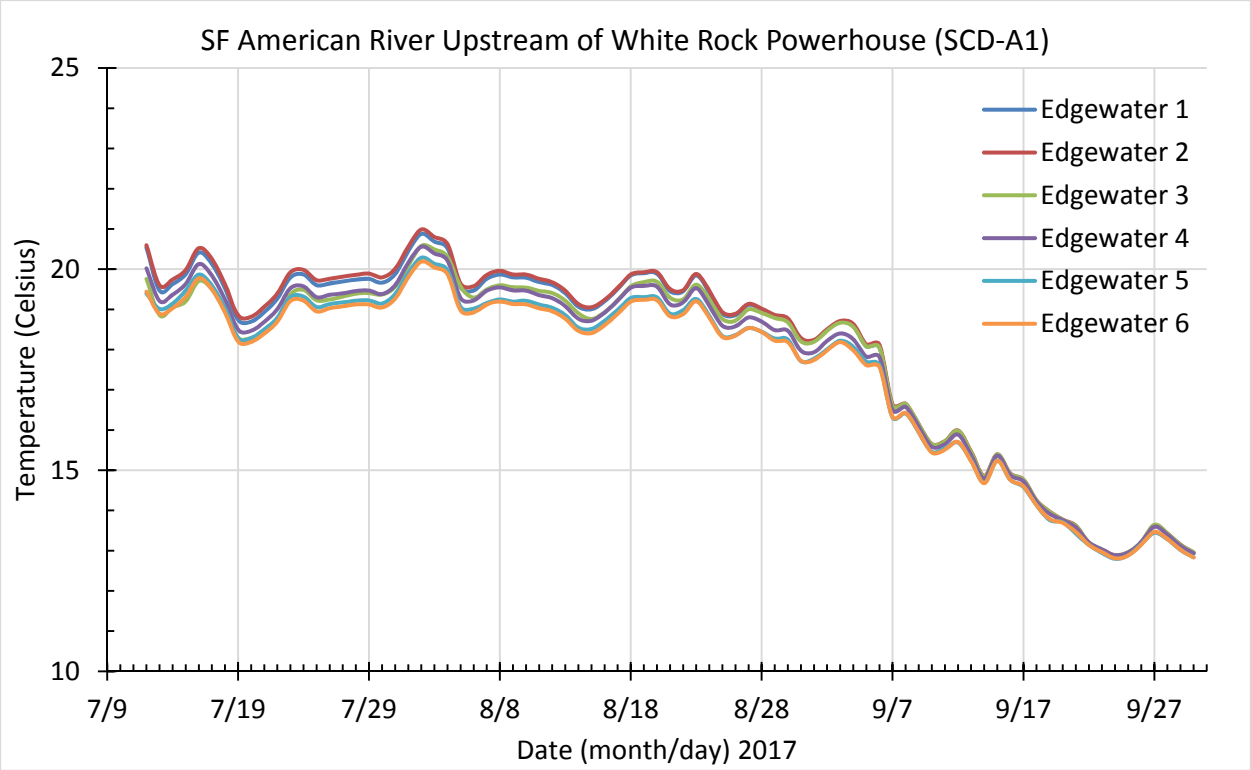

Figure 17. Mean Daily Edgewater Temperature Data for SF American River Upstream of White Rock Powerhouse (SCD-A1)

5.1.3 Adaptive Management Monitoring

5.1.1.3 Following Spill Events at Camino and Slab Creek Reservoirs

Camino Dam and Slab Creek Reservoir Dam spilled for several weeks after water temperatures presumably reached a daily mean of 12°C[7] for a seven-day running average at the Water Temperature Monitoring Sites (see Section 4.1.2). Camino Dam and Slab Creek Reservoir Dam stopped spilling around July 7. The monitoring sites were surveyed as soon as possible after the decline of the spill flows, coinciding with VES 1. No egg masses were found; therefore, there was no evidence of damaged, displaced, or scoured egg masses.

There were no additional spill events at Slab Creek Dam or Camino Dam during 2017 that required monitoring.

[7] While the telemetered thalweg temperature monitoring stations were damaged, data from the edgewater temperature loggers in Silver Creek indicated that average daily water temperatures had already exceeded 19°C and 17°C at CD-A3 and CD-A4, respectively, by the time of the first surveys on July 12–13.

5.1.2.3 During Flow Fluctuations from Camino Reservoir Dam

Flow fluctuation criteria in Silver Creek below Camino Reservoir Dam to trigger FYLF monitoring were not met in 2017, and therefore no associated adaptive management surveys were conducted.

5.2 WESTERN POND TURTLE

Conditions for WPT surveys (with one or more dedicated WPT surveyors) are provided in Table 4. Weather conditions were good to ideal during all WPT surveys, with warm temperatures, sunny/clear or partly cloudy skies, and no wind to a light breeze.

One WPT was found during VES 2 on August 2 at Site SCD-A1 upstream of White Rock Powerhouse (UTM coordinates 692805E, 4292979N, NAD83, Zone 10S) (Figure 18). The adult male WPT (121 mm [4.8 inches total carapace length]) was observed underwater in vegetation at the base of a cut bank of a small island approximately 11.5 ft (3.5 m) from the mainstem river bank (Figures 19–21). Exposed bedrock, comprising much of the adjacent banks, provided nearby basking habitat. Riparian vegetation was dominated by torrent sedge (*Carex nudata*) and willows. The aquatic habitat was a large pool/glide complex on the mainstem South Fork American River, approximately 200 m long, with low gradient riffle habitat both upstream and downstream. The water temperature was 22°C and air temperature was 39°C.

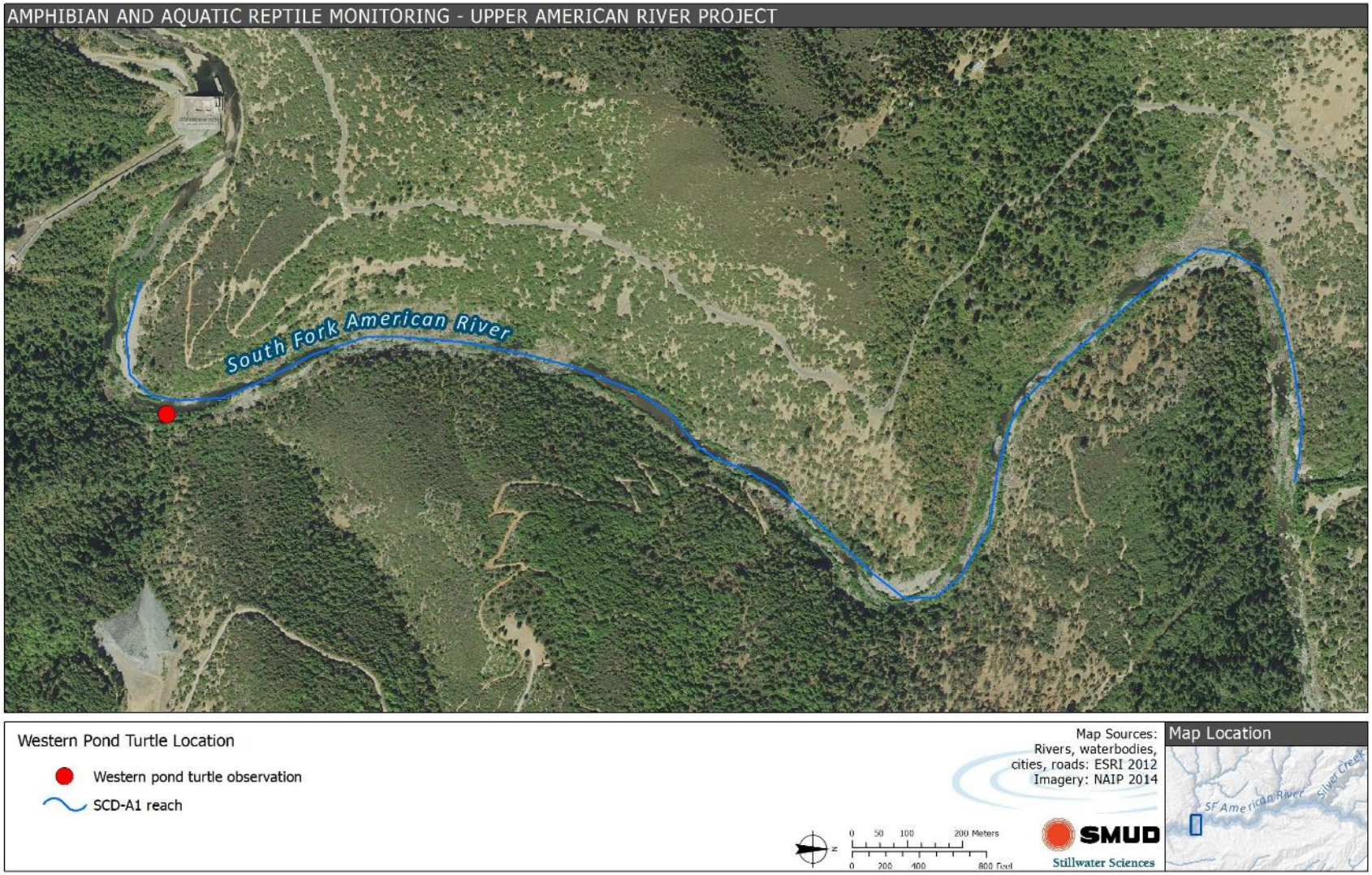

Figure 18. Western Pond Turtle Observation Location at Site SCD-A1, 2017

Figure 19. Adult Male Western Pond Turtle Photographed in Dorsal (Carapace) and Ventral (Plastron) View, August 2, 2017

Figure 20. Adult Male Western Pond Turtle Photographed in Dorsal View, August 2, 2017

Figure 21. Western Pond Turtle Habitat at Site SCD-A1, August 2, 2017 (the turtle was found at the base of this small island, under water)

5.3 OTHER AMPHIBIAN AND AQUATIC REPTILE SPECIES

Five non-special-status amphibian and reptile species were observed throughout the study area during VESs, listed in Table 7 by species, life stage, and location(s) where the species was/were documented. Sierra newts, Sierran treefrog, and Sierra garter snakes were the most abundant and widely distributed herpetofauna species observed in the study area. The non-native amphibian American bullfrog (*Lithobates catesbeianus*) was not observed during 2017 VESs, despite observations of tadpoles and adults during 2016 surveys (SMUD 2017).

Table 7. Additional Herpetofauna Species Observed, by Life Stage, 2017

Species Common Name *(Scientific name)*	Life Stage				Location(s) Where Species Documented
	Egg Mass	Larvae	Young-of-Year	Juv/ Adult	
Amphibians					
Sierra newt (*Taricha sierrae*)	X	X			CD-A3 (larvae only), JD-A15
Sierran treefrog (*Pseudacris sierra*)		X	X		SCD-A1
Reptiles					
Northern alligator lizard (*Elgaria coerulea*)				X	RC-A1
Northwestern fence lizard (*Sceloperus occidentalis*)				X	RC-A1
Sierra garter snake (*Thamnophis couchii*)				X	CD-A3, JD-A15, SCD-A1

Juv = Juvenile
X = Observed during 2017 surveys

6.0 OTHER INCIDENTAL SIGHTINGS

One western pearlshell freshwater mussel (*Margaritifera falcata*) (Figure 22) was incidentally observed at Site JD-A15 on August 4, 2017 (approximate UTM coordinates 713546E, 4302361N, NAD83, Zone 10S).

Figure 22. Freshwater Mussel Found in Silver Creek Below Junction Reservoir Dam on August 4, 2017

7.0 DISCUSSION

The lack of observed tadpoles[8] or young-of-year during 2017 (as well as 2016 [SMUD 2017]) amphibian and aquatic reptile monitoring suggests that FYLF breeding is uncommon in the UARP area. Breeding FYLF that were previously documented during 2003–2004 relicensing surveys at the Site CD-A3 survey reach may have been absent in 2017 for a number of reasons (e.g., changes in physical habitat, minimum or peak flows, or water temperature); in 2017, there were unusually high streamflows during the oviposition period, which may have delayed egg-laying. The presence of adult FYLFs in the surrounding area suggests that FYLF continue to successfully breed along Silver Creek, but possibly outside of the main channel survey area.

The quality of suitable habitat for FYLF was higher at the Silver Creek sites (JD-A3, CD-A4, and CD-A3) and South Fork American River site (SCD-A1) during 2017 compared with 2016, presumably as a result of very high and prolonged winter flushing flows throughout the UARP. The resulting reduction on riparian vegetation/canopy, sediment, and silt provided increased opportunities for egg laying, tadpole rearing, and adult basking. Additionally, American bullfrog, a non-native FYLF predator, was not found at Site SCD-A1 during 2017, potentially indicating a reduction in population size since the 2016 surveys (SMUD 2017).

[8] Egg masses were excluded from this evaluation since persistent, high stream flows during 2017 delayed the VES schedule to mid-July, which is later than the typical egg-laying period from mid-May through the end of June.

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Attachment 1
Amphibian and Aquatic Reptile Survey Data Form

FYLF Survey Data Sheet

Date: _____ Site :_____ VES#: 1 2 3 4 Surveyors:_____ Location/Reach:_____

Start UTM:_____/_____ Error: _____ Way Point#: _____ End UTM:_____/_____ Error: _____ Way Point#: _____

Start Time: _____ End Time: _____ Total Survey Time: _____ Air Temp (C°): (start)_____ (end)_____ Water Temp (C°): (start)_____ (end)_____

Current Wx: (Sky) Overcast / Drizzle / Showers / Clear (Wind) Calm / Light / Moderate / Strong Total Site Length (m): _____ Width (m):_____

Photos: Camera #_____ Bottom (looking U/S):_____ (looking D/S):_____ Top (looking U/S):_____ (looking D/S)_____

Photo Notes: _____

UTM E	UTM N	GPS error (m)	Lifestage/ Sex[1]	#Obs	Gosner Stage	Length (mm)[2]	Total Depth (m)[3]	Mid-Col Velocity (m/s)[3]	EM/Perch Sub[4]	Dominant Riparian Type[5]	Geom Unit[6]	Nearest Bank[7]	Photo Numbers	Notes

[1]Lifestage/Sex-(L)arvae, (E)gg Mass, (Y)oung-of-year, (J)uvenile, (AM) adult male, (AF) adult female, (AU) adult unknown; Adult >= 37 mm SVL; YOY = 22-27 SVL [2]Length in mm- SVL-Snout Vent for A, J, Y; Total Length for Tadpoles

[3]Eggs/Tads: Total depth at obs. location. Velocity avg for 30 sec (m/s) at location [4]Substrate Attachment/Perch Substrate- SLT, SND, GRV, COB, BLD, BDX (Bedrock), WOOD, VEG

[5]Dominant Riparian Type- (1) Grav/ Cobb Bar, (2) Willow, (3) Willow-Alder, (4) Alder, (5) Mature Riparian/Forest, (6) Bedrock

[6]Geomorphic Unit- RIF, BAR, POOL, STEP, RUN, RAP, BDX

[7]Bank nearest Obs (looking downstream): (RB) right bank, (LB), (MC) Center Channel

Crayfish Present (circle)? Yes / No

Fish Present: Yes / No Type: Salmonid Centrarchid Cyprinid Catastomids Other: _____

Other Herpetofauna: Yes / No Species (Lifestage, Number): _____

_____

_____

_____

_____

QA/QC (initials):_____ Date:_____

Attachment 2
Temperature Logger Location Photos

Figure 1. Temperature Logger CD-A3-1 Location on September 13, 2017

Figure 2. Temperature Logger CD-A3-2 Location on September 13, 2017

Figure 3. Temperature Logger CD-A3-3 Location on September 13, 2017

Figure 4. Temperature Logger CD-A3-4 Location on September 13, 2017

Figure 5. Temperature Logger CD-A3-5 Location on September 13, 2017

Figure 6. Temperature Logger CD-A3-6 Location on September 13, 2017

Figure 7. Temperature Logger CD-A4-1 Location on September 13, 2017

Figure 8. Temperature Logger CD-A4-2 Location on September 13, 2017

Figure 9. Temperature Logger CD-A4-3 Location on September 13, 2017

Figure 10. Temperature Logger CD-A4-4 Location on September 13, 2017

Figure 11. Temperature Logger CD-A4-5 Location on September 13, 2017

Figure 12. Temperature Logger CD-A4-6 Location on September 13, 2017

Figure 13. Temperature Logger SCD-A1-1 Location on October 19, 2017

Figure 14. Temperature Logger SCD-A1-2 Location on October 19, 2017

Figure 15. Temperature Logger SCD-A1-3 Location on October 19, 2017

Figure 16. Temperature Logger SCD-A1-4 Location on October 19, 2017

Figure 17. Temperature Logger SCD-A1-5 Location on October 19, 2017

Figure 18. Temperature Logger SCD-A1-6 Location on October 19, 2017

Attachment 3
Representative Habitat Photos

Figure 1. Silver Creek Below Junction Reservoir Dam (JD-A15) Amphibian and Aquatic Reptile Monitoring Site Habitat Photographs, 2017

Figure 2. Silver Creek Below Camino Reservoir Dam (near Camino Adit) (CD-A3) Amphibian and Aquatic Reptile Monitoring Site Habitat Photographs, 2017

Figure 3. Silver Creek Below Camino Reservoir Dam (At Confluence with SF American River) (CD-A4) Amphibian and Aquatic Reptile Monitoring Site Habitat Photographs, 2017

Figure 4. SF American River Below Slab Creek Reservoir Dam (SCD-A1) Amphibian and Aquatic Reptile Monitoring Site Habitat Photographs, 2017

Figure 5. Rock Creek (RC-A1) Amphibian and Aquatic Reptile Monitoring Site Habitat Photographs, 2017

Camino Adit on July 13, 2017

Tributary on September 13, 2017

Seep on July 13, 2017

Pool Upstream of Site CD-A3 on September 13, 2017

Figure 6. Informal Amphibian and Aquatic Reptile Monitoring Survey Areas Near Silver Creek, 2017

Edgewater 1

Edgewater 2

Edgewater 3

Edgewater 4

Figure 7. Edgewater Thermograph Habitat Photographs at Silver Creek below Camino Reservoir Dam (Near Camino Adit) (CD-A3), September 13, 2017 (1 of 2)

Edgewater 5

Edgewater 6

Figure 8. Edgewater Thermograph habitat photographs at Silver Creek Below Camino Reservoir Dam (Near Camino Adit) (CD-A3), September 13, 2017 (2 of 2)

Edgewater 1

Edgewater 2

Edgewater 3

Edgewater 4

Figure 9. Edgewater Thermograph Habitat Photographs at Silver Creek Below Camino Reservoir Dam (Near Confluence with SF American River) (CD-A4), September 13, 2017 (1 of 2)

Edgewater 5

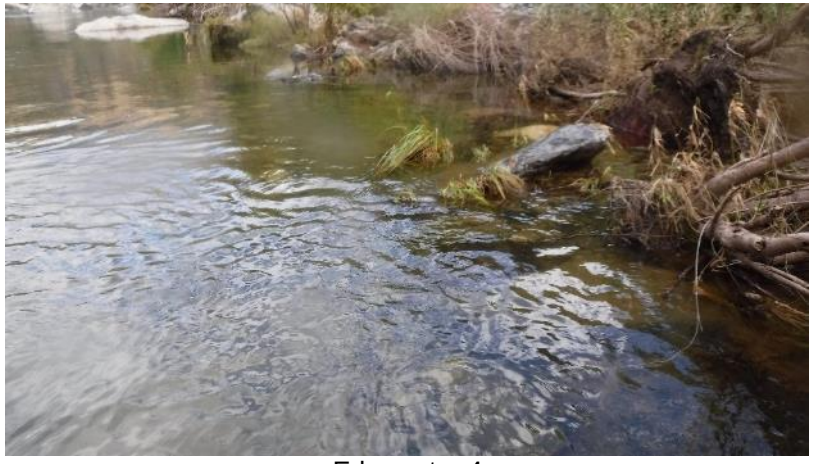
Edgewater 6

Figure 10. Edgewater Thermograph Habitat Photographs at Silver Creek Below Camino Reservoir Dam (Near Confluence with SF American River) (CD-A4), September 13, 2017 (2 of 2)

Edgewater 1

Edgewater 2

Edgewater 3



Edgewater 4

Figure 11. Edgewater Thermograph Habitat Photographs at SF American River Below Slab Creek Reservoir Dam (SCD-A1), October 19, 2017 (1 of 2)

Edgewater 5

Edgewater 6

Figure 12. Edgewater Thermograph Habitat Photographs at SF American River Below Slab Creek Reservoir Dam (SCD-A1), October 19, 2017 (2 of 2)