FLOW FLUCTUATION MONITORING FOR FOOTHILL YELLOW-LEGGED FROG (*Rana boylii*) ON THE SOUTH FORK AMERICAN RIVER, EL DORADO COUNTY, CALIFORNIA FOR THE EL DORADO HYDROELECTRIC PROJECT (FERC NO. 184)

Prepared for:

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JOB 1342-11

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1.0 INTRODUCTION

1.1 Monitoring Requirements

The El Dorado Irrigation District (District) owns and operates the El Dorado Hydroelectric Project (Project) in El Dorado County, California. The Project is licensed by the Federal Energy Regulatory Commission (Project 184). The District, in coordination with the U.S. Forest Service, the California State Water Resources Control Board, and the Ecological Resources Committee, developed the Project 184 Foothill Yellow-legged Frog Monitoring Plan (Plan) as required by the Project 184 License[1].

The Plan requires monitoring for foothill yellow-legged frog (FYLF) be conducted at four sites "June through September at any time the SFAR flow is 100 cfs or less and the reach between Kyburz Diversion Dam and Silver Creek changes 50 cfs or more in 1 day." Two separate flow fluctuations occurred on July 1 and July 8, 2013, which triggered FYLF monitoring.

On July 1, 2013, at approximately 5:15 p.m., the wide-spread power outage associated with the wildfire in the Cameron Park area caused the El Dorado Powerhouse (Powerhouse) to shutdown. With the shutdown, it was not possible to make releases from the Powerhouse and it was then necessary to store inflows from the canal in the El Dorado Forebay. To maintain the El Dorado Forebay below the maximum allowable reservoir storage elevation as required by the Federal Energy Regulatory Commission and California Division of Safety of Dams, the District released water from the canal at Spillway 44. Spillway 44 is identified as a preferred spillway in the Project 184 Preferred Canal Drainage Structure and Release Point Plan and is located on the lower reach of the canal approximately 4 miles east of the El Dorado Forebay. The maximum release was estimated at 128 cfs. The duration of the release from Spillway 44 was approximately 2 ½ hours. Flows measured below Kyburz Diversion Dam (gage A-12) during this event were approximately 46 cfs. The maximum release from Spillway 44 was greater than 50 cfs. Therefore, a flow fluctuation, as defined by the Project No. 184 license, occurred and triggered the need to conduct FYLF monitoring downstream of where Spillway 44 releases enter the SFAR. These sites include 120R, upstream of Silver Creek, and 124R at confluence with Soldier Creek (Figure 1).

On July 8, 2013, at approximately 8:00 a.m., during canal patrol, the District observed a 4 inch diameter hole in the lining of Flume 46. The District determined it was necessary to repair the hole immediately to protect the integrity of the flume. To facilitate the safe repair of the flume, the District released water from the canal at Spillway 10 and Spillway 27. Both spillways are identified as preferred spillways in the Project 184 Preferred

[1] United States Forest Service Section 4(e) Conditions 37 and 38; State Water Resources Control Board 401 Water Quality Certification Condition 13; Project 184 Settlement Agreement Sections 7 and 8.

Canal Drainage Structure and Release Point Plan. Spillway 10 is located on or near Camp 1 just east of Alder Creek and Spillway 27 is located at Camp 3 at Ogilby Creek. The maximum release from Spillway 10 was estimated at 128 cfs for 4.25 hours. The maximum release from Spillway 27 was estimated at 20 cfs for 5 minutes. Flows measured below Kyburz Diversion Dam (gage A-12) during this event were approximately 45 cfs. The maximum release from Spillway 10 was greater than 50 cfs. Therefore, a flow fluctuation, as defined by the Project No. 184 license, occurred and triggered the need to conduct FYLF monitoring. The District was already scheduled to conduct FYLF monitoring on July 9 associated with the power outage flow fluctuation that occurred a week prior. The District expanded that monitoring effort to include the upper flow fluctuation monitoring sites located on the SFAR upstream of Ogilby Creek (213R) and the SFAR at Maple Grove (220R) (Figure 1).

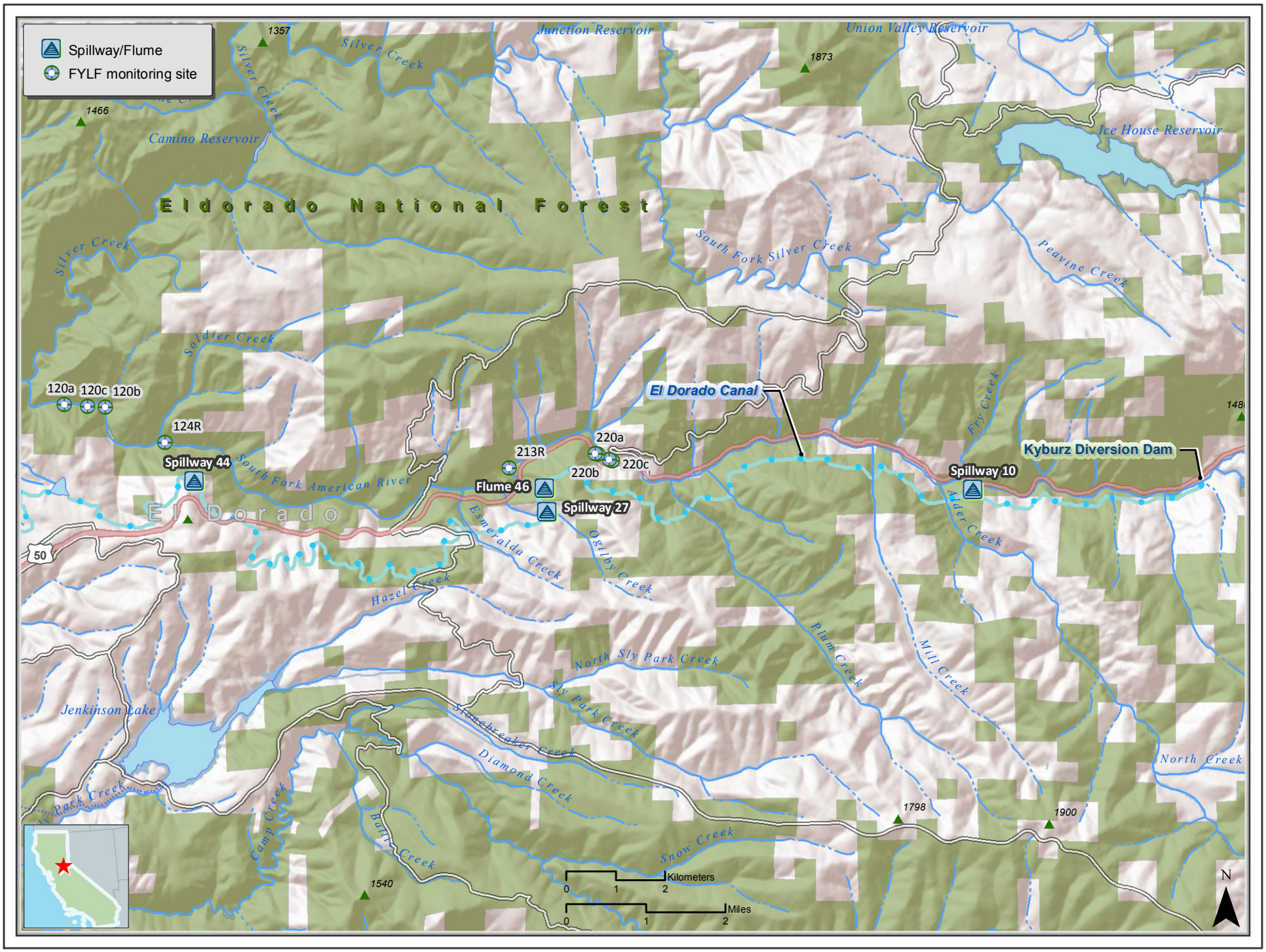

Figure 1. Flow Fluctuation Monitoring Sites and Spillway Locations.

1.2 FYLF Status, Distribution and Current Threats to Populations

The FYLF is designated as a Federal Species of Concern, a Forest Service Sensitive species, and a California Species of Special Concern. FYLF occur in the Coast Ranges from the Santiam River in Oregon south to the San Gabriel River in Los Angeles County and along the west slopes of the Sierra/Cascade crest in most of central and northern California. Other isolated populations have been reported in Baja California Norte (Loomis 1965), in southern California, and at Sutter Buttes in Butte County, California (Stebbins 2003). The elevational range of FYLF extends from sea level to 2,042 m (6,700 ft.) in Baja California Norte. In California, FYLF have been recorded in the Sierras as high as 1,830 m (6,000 ft.) near McKessick Peak in Plumas County and 1,940 m (6,365 ft.) at Snow Mountain in Trinity County (Stebbins 2003). In the Project Area, FYLF are currently known to occur along the mainstem SFAR and associated tributaries from the upstream end of Slab Creek Reservoir upstream to Riverton at 975 m (3,200 ft.) elevation (GANDA 2011).

In the Sierra Nevada, FYLF have disappeared from an estimated 66 percent of their former range (Stebbins 2003). Non-native predators, land use conversion, pesticide use, and modification of hydrology are considered the main threats to FYLF populations (Jennings and Hayes 1994, Davidson et al. 2002). Non-native bullfrogs (*Lithobates catesbeiana*) negatively affect FYLF populations via larval competition and direct predation (Moyle 1973, Kupferberg 1997, Crayon 1998). Signal crayfish feed on FYLF eggs and tadpoles (Rombough and Hayes, 2005; Wiseman et al. 2005) and have been shown to negatively affect other amphibians through direct predation and egg mass displacement in ponds (Nyström et al. 2001). Invasive fish, particularly centrarchids, are suspected to feed upon FYLF (Werschkul and Christensen 1977, Van Wagner 1996). Construction of dams and altered hydrological systems continue to threaten FYLF populations by reduction of breeding habitat and scouring of egg masses by untimely water releases (Lind et al. 1996, GANDA 2005).

2.0 METHODS

2.1 Visual Encounter Surveys

Visual Encounter Surveys (VES) were conducted at a total of eight subsites on the SFAR including subsites 120a, 120b, 120c, 124R, 213R, 220a, 220b, and 220c (Figure 1). Surveys were conducted according to *A Standardized Approach for Habitat Assessments and Visual Encounter Surveys for the Foothill Yellow-Legged Frog* (*Rana boylii*) (Seltenrich and Pool 2002). All VES were conducted by GANDA biologists Kevin Wiseman and Michael Mulroy on July 9, 2013.

Survey data were recorded onto Visual Encounter Survey Data Sheets for each subsite surveyed. Separate data sheets were completed for tadpoles, while data for juveniles and adults were recorded on separate data sheets. Juvenile and subadult frogs were defined as frogs from previous years' cohorts, ranging approximately 30-40 mm SVL, but not considered of adult size. Adults were defined as frogs $\geq$ 40 mm SVL.

Data parameters collected for tadpoles included: tadpole group location in site; number of tadpoles in each group; distance from the shore; velocity; total length; substrate; percent algae and detritus; and, water depth. The data parameters collected for juvenile and adult FYLF included: number of frogs observed; frog location within the site; sex; age; snout-vent length; habitat type; activity; percent cover of vegetation; percent shade; and, substrate.

3.0 RESULTS

3.1 Visual Encounter Survey Results

Results for the visual encounter surveys are summarized in Table 1. Copies of survey data sheets are provided in Appendix A, and site photographs are located in Appendix B.

Table 1. Survey results for the flow fluctuation monitoring.

Subsite #	Date	Beg. Time	End Time	Actual VES time (min.)	Beg. Air Temp. (°C)	End Air Temp. (°C)	Water Temp. (edgew.) (°C)	Water Temp. (channel) (°C)	# Egg Masses	# Tadpoles/ # groups	# Juvenile /YOY Frogs	# Adult Frogs
120a	7/09/13	1010	1030	20	26	29	21.5	22	0	0	0	0
120b	7/09/13	1120	1145	20	31.5	30	22.5	22.5	0	0	0	0
120c	7/09/13	1045	1110	25	29	28	23.5	22	0	0	0	0
124R	7/09/13	1330	1351	21	29.5	31	24.5	23	0	0	0	0
213R	7/09/13	1730	1810	30	25	25	25.5	26	0	2/1	0	1*
220a	7/09/13	1630	1655	20	34	34	25.5	25	0	1/1	0	0
220b	7/09/13	1623	1655	32	34	34	25.5	24.75	0	0	0	0
220c	7/09/13	1700	1715	15	29	29	24.75	24.75	0	0	0	0

* Observed incidentally approx. 50 m upstream of the top of Site 213R.

3.1.1 Site 120R – SFAR upstream of Silver Creek

Site 120R is located on the SFAR approximately 1.0 km upstream of the confluence with Silver Creek at an elevation of 685 m (2,240 ft). The total site length is 352 m and includes three subsites: 120a, 120b, and 120c.

Subsite 120a contained several small (approximately 1-3m^2) isolated pools along the lateral cobble bar near the river margin (Photos 1-2, App. B). Signal crayfish (*Pacifasticus leniulsculus*), damselfly larvae, gerrids, cyprinids, smallmouth bass

(*Micropterus dolomieu*) and sucker (*Catostomus occidentalis*) young-of-the-year (YOY) were observed. No FYLF life stages were observed during the survey.

Subsite 120b was largely dry during the survey, except for several isolated pools (2-28m^2) and a few connected side pools located at the top 50 m of the subsite (Photos 3-4, App. B). Chorus frog (*Pseudacris regilla*) tadpoles and a metamorph were observed in the isolated pools in addition to a larval Sierra newt (*Taricha sierrae*), a juvenile Sierra garter snake (*Thamnophis couchii*) and a dead crayfish. Fish observed at this site included cyprinids and sucker YOY. No FYLF life stages were observed during the survey.

Subsite 120c was largely dry at the downstream portion of the site, consisting of several small, isolated pools (Photos 5-6, App. B). Rainbow trout (*Oncorhynchus mykiss*), cyprinids, sucker YOY and juveniles, speckled dace (*Rhinichthys osculus*), river otter (*Lontra canadensis*) scat and crayfish were observed. No FYLF lifestages were observed at this site.

3.1.2 Site 124R – SFAR at confluence with Soldier Creek

Site 124R is located on the left bank of the SFAR across from the confluence with Soldier Creek at an elevation of 755 m (2,480 ft) (Photos 7-8, App. B). Crayfish, gerrids, smallmouth bass and sucker YOY and juveniles were observed. No FYLF lifestages were observed at this site.

3.1.3 Site 213R – SFAR upstream of Ogilby Creek

Site 213R is located on the left bank of the SFAR about 0.6 km (1,970 ft) upstream of the confluence with Ogilby Creek, at an elevation of 930 m (3,050 ft) (Photos 9-10, App. B). Two FYLF tadpoles were observed (Photo 11, App. B) 45 m upstream of the bottom of the site. One spent adult female (67 mm snout-urostyle-length; 28.5 g) was observed incidentally 50 m upstream of the top of Site 213R (Photo 12, App. B). Great blue herons (*Ardea herodias*), speckled dace, a juvenile Sierra garter snake, Western pearlshell mussels (*Margaritifera falcata*), and crayfish were also observed.

3.1.4 Site 220R – SFAR at Maple Grove

Site 220R is located near Maple Grove Campground at an elevation of 965 m (3,160 ft). Three subsites are included within the site: 220a (Photos 13-14, App. B), 220b (Photos 16-17, App. B), and 220c (Photos 18-19, App. B). The total site length is 286 m.

One FYLF tadpole was observed at Subsite 220a (Photo 15, App. B), 25 m upstream of the bottom of the site, 1.8 m from the edgewater. Cyprinid YOY and crayfish were also observed.

No FYLF lifestages were observed at Subsites 220b and 220c, however, crayfish, mussels and cyprinid YOY were observed.

4.0 LITERATURE CITED

Crayon, J.J. 1998. *Rana catesbeiana* (bullfrog) Diet. Herpetological Review 29(4):232.

Davidson, C., H. B. Shaffer, and M. R. Jennings. 2002. Spatial tests of the pesticide drift, habitat destruction, UV-B, and climate-change hypotheses for California amphibian declines. Conservation Biology 16:1588-1601.

El Dorado Irrigation District (EID). 2007. Project 184 Foothill yellow legged frog monitoring plan. May, 2007. 6 pp. plus appendices.

Garcia and Associates (GANDA). 2005. Results of 2004 Surveys and Monitoring for Foothill Yellow-Legged Frog *(Rana boylii)* within the Rock Creek-Cresta Project Area, North Fork Feather River, and 2002-2004 Recreation And Pulse Flow Biological Evaluation Summary. Report to Pacific Gas and Electric Company by Garcia and Associates, San Francisco, CA.

_____ 2011. Results of 2011 Surveys for Foothill Yellow-legged Frog (*Rana boylii*) on the South Fork American River**,** El Dorado County, California for the Eldorado Hydroelectric Project (FERC No. 184). Prepared for Eldorado Irrigation District. November 2011.

Jennings, M.R., and M.P. Hayes. 1994. Amphibian and reptile species of special concern. Final report submitted to the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, California.

Kupferberg, S.J. 1997. Bullfrog (*Rana catesbeiana*) invasion of a California river: the role of larval competition. Ecology 78, 1736-1751.

Lind, A.J., H.H. Welsh, Jr., and R.A. Wilson. 1996. The effects of a dam on breeding habitat and egg survival of the foothill yellow-legged frog (*Rana boylii*) in northwestern California. Herpetological Review 27(2):62-67.

Loomis, R.B. 1965. The yellow-legged frog, *Rana boylii*, from the Sierra San Pedro Martin, Baja California Norte, Mexico. Herpetologica 21(1):78-80.

Moyle, P. B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. *Copeia* 1973:18-22.

Nyström et al. 2001. The influence of multiple introduced predators on a littoral pond community. Ecology 82: 1023-1039.

Rombough, C.J. and M.P. Hayes. 2005. *Rana boylii* (Foothill yellow-legged frog) Predation: eggs and hatchlings. Herpetological Review 36(2): 163-164.

Seltenrich, C.P. and A.C. Pool. 2002. A Standardized Approach for Habitat Assessments and Visual Encounter Surveys for the Foothill Yellow-Legged Frog (*Rana boylii*). May 2002. Pacific Gas and Electric Company, Technical and Ecological Services, unpublished report.

Stebbins, R.C. 2003. *A Field Guide to Western Reptiles and Amphibians.* Third Edition. Houghton Mifflin Company, Boston, New York.

Van Wagner, T.J. 1996. Selected life history and ecological aspects of a population of foothill yellow-legged frogs (*Rana boylii*) from Clear Creek, Nevada County, California. Masters Thesis, Department of Biological Sciences, California State University, Chico. 143 pp.

Werschkul, D. F., and M. T. Christensen. 1977. Differential predation by *Lepomis macrochirus* on the eggs and tadpoles of *Rana*. *Herpetologica* 33:237-241.

Wiseman, K. D., K.R. Marlow, R.E. Jackman, and J.E. Drennan. 2005. *Rana boylii* (foothill yellow-legged frog) predation. Herpetological Review 36(2): 162-163.

Appendix A: Visual Encounter Survey Data Sheets

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Juveniles/Subadults and Adults

Date: mm 7 dd 9 yy 13 Site #: 120 Subsite #: 120A River Name/Location: SF AMERICAN BELOW KYBURZ Observers: KMW MDM
Survey Method: tandem separate Start Time: 1010 End Time: 1030 Actual VES Time: 20 MIN. Start Air Temp: 26°C End Air Temp: 29°C
Water Temp: (edgewater) 21.5°C (main channel) 22°C (pool) 21.5°C Discharge: 45 cfs Total Site Length: 352 m Subsite Length: 82 m
Search Area Length: 82 m Search Area Width: $\bar{x}$ = 5m Total Area Searched: (m^2): 410 m^2 Site Visit: 1 2 3 4
Weather: *Sky*: Overcast Partly Overcast Clear *Wind:* Inclement Fair Ideal Past 24 hrs: *Sky*: Overcast Partly Overcast Clear *Wind:* Inclement Fair Ideal
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Number of Frogs	Distance[1]	Sex (M/F)	Age[2] (J, A)	Snout-Vent Length (mm)	Activity[3]	River or Creek Habitat[4]	Microhabitat Type[5]	Dominant Substrate[6]	Comments
0	NO FYLF OBSERVED								

[1] Distance – distance from bottom of site/subsite to frogs
[2] Age – J = Juvenile/Subadult (<= 39 mm), A = Adult (>= 40 mm), snout-vent length
[3] Activity – (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, (10) other
[4] River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other
[5] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) exposed bank, (11) protected bank, (12) other
[6] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris, (9) aquatic vegetation, (10) margin vegetation, (11) other

Fish Present Yes No Type: Salmonid Centrarchid SMB YOY Cyprinid Other: SUCKER YOY
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other _____
Other Species Observed: CRAYFISH IIII, DAMSELFLY LARVAE, GERRIDS
Comments: PHOTOS KMW 41: BOTTOM → U/S
42: ISOLATED POOL SHOWING RECENT FLOW + RECEDE ~1 FT. STAGE HEIGHT Δ
43: BACKWATER POOL (ISOLATED) 1x3 m, 40 cm max depth 21.5°C
44: ISOLATED POOL NEAR TOP 1x1 m, ~20 cm max depth
45: TOP → D/S

QA/QC (initials): KMW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Juveniles/Subadults and Adults

Date: mm 7 dd 9 yy 13 Site #: 120 Subsite #: 120B River Name/Location: SF AMERICAN BELOW KYBURZ Observers: KDW MDM
Survey Method: tandem separate Start Time: 1120 End Time: 1145 Actual VES Time: 20 min. Start Air Temp: 31.5°C End Air Temp: 30°C
Water Temp: (edgewater) 22.5°C (main channel) 22.5°C (pool) 20.5°C Discharge: 45 cfs Total Site Length: 352 m Subsite Length: 95 m
Search Area Length: 95 m Search Area Width: $\bar{x}$=4 m Total Area Searched: (m^2): 380 m^2 Site Visit: (1) 2 3 4
Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal) Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Number of Frogs	Distance[1]	Sex (M/F)	Age[2] (J, A)	Snout-Vent Length (mm)	Activity[3]	River or Creek Habitat[4]	Microhabitat Type[5]	Dominant Substrate[6]	Comments
0	NO FYLF OBSERVED								

[1] Distance – distance from bottom of site/subsite to frogs
[2] Age – J = Juvenile/Subadult (<= 39 mm), A = Adult (>= 40 mm), snout-vent length
[3] Activity – (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, (10) other
[4] River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other
[5] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) exposed bank, (11) protected bank, (12) other
[6] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris, (9) aquatic vegetation, (10) margin vegetation, (11) other

Fish Present (Yes) No (UNK.) Type: Salmonid Centrarchid (Cyprinid) Other: SUCKER JWS, YOY
Herpetofauna & Lifestage (A J T E) tree frog TADS bullfrog _____ western pond turtle _____ garter snake 1 J Other NEWT LARVA
Other Species Observed: CRAYFISH (DEAD) └ T. torosus
Comments: PHOTOS KDW 53: BOTTOM → U/S
54-56: ISOLATED 1x1 m POOL W/ PSEUDACRIS TADS ~100-150
57: ISOLATED POOL 1x2 m w/~25 TADS (PSEUDACRIS)
58: 4x7 m ISOLATED POOL NEWT TOP
59: NEWT LARVA
60: TOP → D/S

QA/QC (initials): KDW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Juveniles/Subadults and Adults

Date: mm 7 dd 9 yy 13 Site #: 120 Subsite #: 120C River Name/Location: South Fork American below Kyburz Observers: KDW MDM
Survey Method: tandem separate Start Time: 1045 End Time: 1110 Actual VES Time: 25 min. Start Air Temp: 29°C End Air Temp: 28°C
Water Temp: (edgewater) 23.5°C (main channel) 22°C (pool) 19.5°C Discharge: 45 cfs Total Site Length: 352 m Subsite Length: 175 m
Search Area Length: 175 m Search Area Width: $\bar{x}$ = 4 m Total Area Searched: (m^2): 700 m^2 Site Visit: (1) 2 3 4
Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal) Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Number of Frogs	Distance[1]	Sex (M/F)	Age[2] (J, A)	Snout-Vent Length (mm)	Activity[3]	River or Creek Habitat[4]	Microhabitat Type[5]	Dominant Substrate[6]	Comments
(0)	NO FYLF OBSERVED								

[1] Distance – distance from bottom of site/subsite to frogs
[2] Age – J = Juvenile/Subadult (<= 39 mm), A = Adult (>= 40 mm), snout-vent length
[3] Activity – (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, (10) other
[4] River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other
[5] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) exposed bank, (11) protected bank, (12) other
[6] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris, (9) aquatic vegetation, (10) margin vegetation, (11) other

Fish Present (Yes) No Type: Salmonid (RBT adults; 1 DEAD) Centrarchid Cyprinid Other: SUCKER YOY, SMVS; SPECKLED DACE
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other _____
Other Species Observed: RIVER OTTER (SCAT), CRAYFISH 1
Comments: PHOTOS KDW 46: BOTTOM → U/S
47: MIDSITE → U/S
48: " → D/S
49: DRIED ISOLATED SIDE POOL @ TOP
50: ↗
51: SPECKLED DACE
52: TOP → D/S

QA/QC (initials): KDW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Juveniles/Subadults and Adults

Date: mm 7 dd 9 yy 13 Site #: 124R Subsite #: 124R River Name/Location: SF AMERICAN RIVER @ SOUDER CREEK Observers: KMW MDM
Survey Method: tandem separate Start Time: 1330 End Time: 1351 Actual VES Time: 21 min Start Air Temp: 29.5°C End Air Temp: 31°C
Water Temp: (edgewater) 24.5°C (main channel) 23°C (pool) — Discharge: 45 cfs Total Site Length: 144m Subsite Length: 144m
Search Area Length: 144m Search Area Width: x̄ = 4 Total Area Searched: (m^2): 576 m^2 Site Visit: 1 2 3 4
Weather: *Sky*: Overcast Partly Overcast Clear *Wind:* Inclement Fair Ideal Past 24 hrs: *Sky*: Overcast Partly Overcast Clear *Wind:* Inclement Fair Ideal
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Number of Frogs	Distance[1]	Sex (M/F)	Age[2] (J, A)	Snout-Vent Length (mm)	Activity[3]	River or Creek Habitat[4]	Microhabitat Type[5]	Dominant Substrate[6]	Comments
0	NO FYLF OBSERVED								

[1] Distance – distance from bottom of site/subsite to frogs
[2] Age – J = Juvenile/Subadult (<= 39 mm), A = Adult (>= 40 mm), snout-vent length
[3] Activity – (1) sitting in shade, (2) basking, (3) hiding, (4) calling, (5) swimming, (6) foraging, (7) amplexus, (8) floating, (9) underwater, (10) other
[4] River or Creek Habitat – (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other
[5] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) exposed bank, (11) protected bank, (12) other
[6] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris, (9) aquatic vegetation, (10) margin vegetation, (11) other

Fish Present Yes No Type: Salmonid Centrarchid SMB Cyprinid Other: SUCKER YOY, SUVIS
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other _____
Other Species Observed: CRAYFISH II, GERRIDS
Comments: PHOTOS 70: BOTTOM → U/S
KMW 71-76: MIDSTR showing INUNDATION LINES AND SEDIMENT DEPOSITION
77: TOP → D/S

QA/QC (initials): KMW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Tadpoles

Date: mm 7 dd 9 yy 13 Site #: 213R Subsite #: 213R River Name/Location: SF American u/s of Olgilby Creek Observers: KMW MDM
Survey Method: tandem separate Start Time: 1730 End Time: 1810 Actual VES Time: 30 min. Start Air Temp: 25°C End Air Temp: 25°C
Water Temp: (edgewater) 25.5°C (main channel) 26°C (pool) — Discharge: 45 cfs Total Site Length: 105 m Subsite Length: 105 m
Search Area Length: 105 m Search Area Width: x̄ = 3 m Total Area Searched: (m^2): 315 m^2 Site Visit: (1) 2 3 4
Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal) Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Group Letter[1]	Distance[2] (m)	Approx. No. of Tadpoles[3]	Distance From Shore[4]	Max. Water Depth[5] (cm)	Velocity[6] (cm/sec)	Tadpole Stage[7]	Gosner Stage[8]	Avg. TL[9] (mm)	% Algae	% Detritus	Dominant Substrate[10]	Micro-Habitat[11]	River or Creek Habitat[12]	Water Temp. (°C)
A	45	2	0.3	21	0	2	~30	~25	30	60	5	7	4	25.5

[1] Group Letter – if multiple groups of tadpoles at a site/subsite
[2] Distance – distance from bottom of site/subsite
[3] No. of Tadpoles – Estimate the total number of tadpoles for the area. If tadpole counts are determined by number/meter^2, convert number of tadpoles/m^2 to number of tadpoles/site/subsite
[4] Distance From Shore –For an aggregation of tadpoles, measure to the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water's edge.
[5] Max. Water Depth – Max. depth at tadpole location
[6] Velocity – measure where tadpoles are located
[7] Tadpole Stage – (1) no legs, (2) rear legs, (3) rear legs and front nubs, (4) legs fully grown, but with tail, (5) mixed
[8] Gosner Stage or Field Stage (e.g., GS 36 *or* FS 3)
[9] Avg. TL – average total length of tadpoles
[10] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris (9) aquatic vegetation
[11] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) other
[12] River or Creek Habitat (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other

Fish Present (Yes) No Type: Salmonid Centrarchid Cyprinid Other: SPECKLED DACE (DEAD)
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake 1 J 2 Other T. couchii (NOT CAPTURED)
Other Species Observed: DEAD CRAYFISH, 2 GREAT BLUE HERONS ROOSTING IN CONIFER, MUSSEL (SHELL)
Comments: TADPOLE FECES OBS. MIDSITE PHOTOS KMW 89: BOTTOM → U/S
90: DEAD SPECKLED DACE
91-95: FYLF tadpole
96: TOP → D/S
* spent female obs. ~50 m u/s of top of site. Observed in sedge in edgewater
KDW 98-100 SVL = 67mm, 28.5 g

QA/QC (initials): KMW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Tadpoles

Date: mm 7 dd 9 yy 13 Site #: 220 Subsite #: 220A River Name/Location: SF AMERICAN RIVER @ MAPLE GROVE Observers: KMW

Survey Method: tandem separate Start Time: 1630 End Time: 1655 Actual VES Time: 20 min. Start Air Temp: 34°C End Air Temp: 34°C

Water Temp: (edgewater) 25.5°C (main channel) 25°C (pool) — Discharge: 45 cfs Total Site Length: 286 m Subsite Length: 102 m

Search Area Length: 102 m Search Area Width: $\bar{x}$ = 3 m Total Area Searched: (m^2): 306 m^2 Site Visit: (1) 2 3 4

Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal) Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)

Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Group Letter[1]	Distance[2] (m)	Approx. No. of Tadpoles[3]	Distance From Shore[4]	Max. Water Depth[5] (cm)	Velocity[6] (cm/sec)	Tadpole Stage[7]	Gosner Stage[8]	Avg. TL[9] (mm)	% Algae	% Detritus	Dominant Substrate[10]	Micro-Habitat[11]	River or Creek Habitat[12]	Water Temp. (°C)
A	25	1	1.8	12	0	2	~30	2	30	60	4	7	3	26°

[1] Group Letter – if multiple groups of tadpoles at a site/subsite

[2] Distance – distance from bottom of site/subsite

[3] No. of Tadpoles – Estimate the total number of tadpoles for the area. If tadpole counts are determined by number/meter^2, convert number of tadpoles/m^2 to number of tadpoles/site/subsite

[4] Distance From Shore –For an aggregation of tadpoles, measure to the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water's edge.

[5] Max. Water Depth – Max. depth at tadpole location

[6] Velocity – measure where tadpoles are located

[7] Tadpole Stage – (1) no legs, (2) rear legs, (3) rear legs and front nubs, (4) legs fully grown, but with tail, (5) mixed

[8] Gosner Stage or Field Stage (e.g., GS 36 *or* FS 3)

[9] Avg. TL – average total length of tadpoles

[10] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris (9) aquatic vegetation

[11] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) other

[12] River or Creek Habitat (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other

Fish Present (Yes) No Type: Salmonid Centrarchid (Cyprinid - YOY) Other: _____

Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other _____

Other Species Observed: CRAYFISH

Comments: CONFIRMED FYLF TAD : ESCAPED BEFORE CAPTURE / PHOTO

PHOTOS KMW 82: BOTTOM → U/S
83: BOTTOM 220B → U/S
84: TAD MICROHABITAT
85: TOP → D/S

QA/QC (initials): KMW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Tadpoles

Date: mm 07 dd 09 yy 13 Site #: 220 Subsite #: 2208 River Name/Location: SFAR @ Maple Cove Observers: MDM
Survey Method: tandem (separate) Start Time: 1623 End Time: 1655 Actual VES Time: 32 Start Air Temp: 34°C End Air Temp: 34 C
Water Temp: (edgewater) 25.5 (main channel) 24.75 (pool) — Discharge: 45 cfs Total Site Length: 286 m Subsite Length: 112 m
Search Area Length: 112 m Search Area Width: x̄ = 4 m Total Area Searched: (m^2): 448 m^2 Site Visit: (1) 2 3 4
Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement (Fair) Ideal Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)
Photograph # (index to notebook): _____ Roll/Disc/Card #: _____

Group Letter[1]	Distance[2] (m)	Approx. No. of Tadpoles[3]	Distance From Shore[4]	Max. Water Depth[5] (cm)	Velocity[6] (cm/sec)	Tadpole Stage[7]	Gosner Stage[8]	Avg. TL[9] (mm)	% Algae	% Detritus	Dominant Substrate[10]	Micro-Habitat[11]	River or Creek Habitat[12]	Water Temp. (°C)
		NO FYLF OBSERVED												

[1] Group Letter – if multiple groups of tadpoles at a site/subsite
[2] Distance – distance from bottom of site/subsite
[3] No. of Tadpoles – Estimate the total number of tadpoles for the area. If tadpole counts are determined by number/meter^2, convert number of tadpoles/m^2 to number of tadpoles/site/subsite
[4] Distance From Shore –For an aggregation of tadpoles, measure to the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water's edge.
[5] Max. Water Depth – Max. depth at tadpole location
[6] Velocity – measure where tadpoles are located
[7] Tadpole Stage – (1) no legs, (2) rear legs, (3) rear legs and front nubs, (4) legs fully grown, but with tail, (5) mixed
[8] Gosner Stage or Field Stage (e.g., GS 36 *or* FS 3)
[9] Avg. TL – average total length of tadpoles
[10] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris (9) aquatic vegetation
[11] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) other
[12] River or Creek Habitat (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other

Fish Present Yes (No) Type: Salmonid Centrarchid Cyprinid Other: _____
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other crayfish
Other Species Observed: mussel 0

Comments: KDW 83 - bottom looking n/s
86 - top looking 0 n/s

QA/QC (initials): KMW Date: 7/15/13

Foothill Yellow-Legged Frog
River and Creek Visual Encounter Survey Data Sheet
Tadpoles

Date: mm 7 dd 9 yy 13 Site #: 220 Subsite #: 220C River Name/Location: SF American River @ Maple Grove Observers: KMW MDM
Survey Method: tandem separate Start Time: 1700 End Time: 1715 Actual VES Time: 15 min. Start Air Temp: 29°C End Air Temp: 29°C
Water Temp: (edgewater) 24.75°C (main channel) 24.75°C (pool) 35°C Discharge: 45 cfs Total Site Length: 286 m Subsite Length: 72 m
Search Area Length: 72 m Search Area Width: x̄ = 3m Total Area Searched: (m^2): 216 m^2 Site Visit: (1) 2 3 4
Weather: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal) Past 24 hrs: *Sky*: Overcast Partly Overcast (Clear) *Wind:* Inclement Fair (Ideal)
Photograph # (index to notebook): _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ Roll/Disc/Card #: _____

Group Letter[1]	Distance[2] (m)	Approx. No. of Tadpoles[3]	Distance From Shore[4]	Max. Water Depth[5] (cm)	Velocity[6] (cm/sec)	Tadpole Stage[7]	Gosner Stage[8]	Avg. TL[9] (mm)	% Algae	% Detritus	Dominant Substrate[10]	Micro-Habitat[11]	River or Creek Habitat[12]	Water Temp. (°C)
Ø	NO FYLF OBSERVED													

[1] Group Letter – if multiple groups of tadpoles at a site/subsite
[2] Distance – distance from bottom of site/subsite
[3] No. of Tadpoles – Estimate the total number of tadpoles for the area. If tadpole counts are determined by number/meter^2, convert number of tadpoles/m^2 to number of tadpoles/site/subsite
[4] Distance From Shore –For an aggregation of tadpoles, measure to the center of the group. If tadpoles are dispersed along the shoreline, record an average distance from the water's edge.
[5] Max. Water Depth – Max. depth at tadpole location
[6] Velocity – measure where tadpoles are located
[7] Tadpole Stage – (1) no legs, (2) rear legs, (3) rear legs and front nubs, (4) legs fully grown, but with tail, (5) mixed
[8] Gosner Stage or Field Stage (e.g., GS 36 *or* FS 3)
[9] Avg. TL – average total length of tadpoles
[10] Dominant Substrate – (1) silt/clay/mud, (2) sand, (3) gravel/pebble, (4) cobble, (5) boulder, (6) bedrock, (7) small woody debris, (8) large woody debris (9) aquatic vegetation
[11] Microhabitat – (1) isolated side pool, (2) connected side pool, (3) scour pool, (4) backwater pool, (5) side channel, (6) boulder/sedge, (7) edgewater, (8) pool tail-out, (9) riffle, (10) other
[12] River or Creek Habitat (1) low gradient riffle, (2) high gradient riffle, (3) run, (4) glide, (5) main channel pool, (6) step-pool, (7) other

Fish Present (Yes) No Type: Salmonid Centrarchid (Cyprinid) 4oy Other: _____
Herpetofauna & Lifestage (A J T E) tree frog _____ bullfrog _____ western pond turtle _____ garter snake _____ Other _____
Other Species Observed: CRAYFISH (DEAD) / EXUVIAE
Comments: PHOTOS KMW 87: BOTTOM → U/S
88: TOP → D/S

QA/QC (initials): KMW Date: 7/15/13

Appendix B: Site Photographs

Photo 1. Bottom of site 120a, view upstream. 7/09/13

Photo 2. Top of site 120a, view downstream. 7/09/13

Photo 3. Bottom of site 120b, view upstream. 7/09/13

Photo 4. Top of site 120b, view downstream. 7/09/13

Photo 5. Bottom of site 120c, view upstream. 7/09/13

Photo 6. Top of site 120c, view downstream. 7/09/13

Photo 7. Bottom of site 124R, view upstream. 7/09/13

Photo 8. Top of site 124R, view downstream. 7/09/13

Photo 9. Bottom of site 213R, view upstream. 7/09/13

Photo 10. Top of site 213R, view downstream. 7/09/13

Photo 11. One of two FYLF tadpoles observed at site 213R. 7/09/13

Photo 12. Adult female FYLF observed 50 m upstream of site 213R. 7/09/13

Photo 13. Bottom of site 220a, view upstream. 7/09/13

Photo 14. Top of site 220a, view downstream. 7/09/13

Photo 15. Microhabitat along site 220a, where an FYLF tadpole was observed. 7/09/13

Photo 16. Bottom of site 220b, view upstream. 7/09/13

Photo 17. Top of site 220b, view downstream. 7/09/13

Photo 18. Bottom of site 220c, view upstream. 7/09/13

Photo 19. Top of site 220c, view downstream. 7/09/13