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May 12, 2011

State Water Resources Control Board
Division of Water Rights
Mr. Russ Kanz
Environmental Specialist III
1001 I Street, 14th Floor
Sacramento, CA 95812-2000

USDA, Forest Service
Stanislaus National Forest
Supervisors Office
Attn: Beth Martinez
19777 Greenley Road
Sonora, CA 95370

California Dept. of Fish and Game
Attn: Julie Means
Environmental Specialist III
1234 East Shaw Avenue
Fresno, CA 93719

U. S. Fish and Wildlife Service
Ms. Deborah Giglio
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

Re: Spring Gap/Stanislaus River Project - FERC No. 2130 -CA
FINAL Environmental Annual Report (2010):

- **Foothill Yellow-legged Frog**
- **Sierra Nevada Yellow-legged Frog**
- **Hardhead**
- **Riparian Vegetation Restoration and Streambank Stabilization**

Dear Agencies:

On April 24, 2009, the Federal Energy Regulatory Commission (FERC) issued to Pacific Gas and Electric Company (PG&E) a new license for the Spring Gap-Stanislaus Hydroelectric Project (FERC Project No. 2130). The new license has two appendices consisting of: 1) the State Water Resources Control Board's (SWRCB) Water Quality Certification pursuant to Section 401 of the Clean Water Act (401 Certification), and 2) the USDA Forest Service's (FS) Section 4(e) Conditions.

SWRCB Condition 8 and FS 4(e) Condition 39 require PG&E to develop, in consultation with the FS, SWRCB and California Department of Fish and Game (CDFG), detailed Environmental Monitoring Plans relating to the following: (1) Relief Reach Riparian Vegetation Restoration and Streambank Stabilization, (2) Hardhead Monitoring in Camp Nine Reach and Sand Bar Dam Reach, (3) Trout Population Monitoring in Spring Gap Reach and Sand Bar Dam Reach, (4) Foothill Yellow Legged Frog (FYLF) Monitoring in Sand Bar Reach and Camp Nine Reach, and (5) the required Mountain Yellow Legged Frog Study.

After approval by FERC, PG&E conducted the first year of studies in 2010. The Trout Population Monitoring study did not occur due to scheduling issues with CDFG.

On March 21, 2010, PG&E provided the draft reports to your Agencies and requested comments. All comments received have been incorporated in the Response to Comment Table contained in each report.

Enclosed are the 2010 final reports for the Foothill Yellow-legged Frog, Sierra Nevada Yellow-legged Frog, Hardhead and the Riparian Vegetation Restoration and Streambank Stabilization for your files. To save paper, only electronic copies are provided. If you need hard copies, please feel free to contact me.

If you have any questions, please give me a call at (415) 973-5747.

Sincerely,

FOR: Ross C. Jackson, Senior License Coordinator
Hydro Licensing

Enclosures

cc: Honorable Kimberly D. Bose, Secretary (E-File with enclosures)
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Central Sierra Environmental Resource Center (with enclosures)
Attn: John Buckley
P.O. Box 396
Twain Harte, CA 95383

HARDHEAD MONITORING REPORT

2010

Spring Gap-Stanislaus Project

(FERC Project No. 2130)

Final

Prepared By:

Pacific Gas and Electric Company™

May 2011

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APPENDICES

As required by the new Federal Energy Regulatory Commission (FERC) license for the Spring Gap-Stanislaus Project (FERC Project No. 2130), a Hardhead Monitoring Plan (Plan) (Pacific Gas and Electric Company [PG&E] 2010a) was prepared in consultation with the resource agencies. The Plan was approved by FERC order on October 19, 2010. The FERC order modified the reporting schedule to require filing:

> *The licensee shall file its annual and final hardhead monitoring reports with the Federal Energy Regulatory Commission by May 15th following each monitoring year. In the event that comments are not received from the resource agencies before May 15th, the licensee shall file an update on the progress of agency consultation and an anticipated filing date for the final draft of the monitoring report.*

The Plan for 2010 requires PG&E to:

- conduct snorkel surveys;
- radiotag hardhead from the Camp Nine Reach to determine if they are utilizing the lower Sand Bar Diversion reach of the Middle Fork Stanislaus River (MFSR);
- monitor algal abundance in Sand Bar Dam and Camp Nine reaches; and
- monitor water temperatures at several locations.

The first year data collection under the monitoring plan was initiated in 2010, which was a normal water year (CDWR 2010) for the Spring Gap-Stanislaus Project. Snorkel surveys were conducted in October of 2010 to document the baseline distribution, relative abundance and size distribution of hardhead in the Camp Nine and Sand Bar Dam Reaches. Physical habitat data, water quality data, and relative algal abundance data were collected in correlation with the snorkel survey effort. Adult hardhead were captured near the Collierville Powerhouse on the mainstem of the Stanislaus River at the bottom of the Camp Nine Reach, and radiotags were attached for tracking in 2011. Water temperature and hydrology data were collected within the study area. Seven sites were monitored in both the Camp Nine and Sand Bar Reaches. Stream discharge was collected from the Middle Fork Stanislaus River on the Sand Bar Dam Reach during the same period as water temperature monitoring. The methods employed in this study were consistent with those used in the 2001 surveys and with those used on the SCE Big Creek 4

Project on the San Joaquin River. These methods are described in detail in Appendix A, B and C.

1.0 INTRODUCTION

The new License for the Spring Gap-Stanislaus Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 2130-038) (Project) was issued by the Federal Energy Regulatory Commission (FERC) on April 24, 2009. The new License contains requirements for studies to monitor biota and environmental conditions during the term of the new license. The monitoring requirements addressed in the Hardhead Monitoring Plan (Plan) (PG&E 2010a) derive from Article 401 of the new License and conditions contained in the US Department of Agriculture Forest Service (Forest Service) 4(e) Conditions and State Water Resources Control Board (State Water Board) 401 Certification conditions. The Plan was approved by FERC order on October 19, 2010. The FERC order modified the reporting schedule to require filing:

> *The licensee shall file its annual and final hardhead monitoring reports with the Federal Energy Regulatory Commission by May 15th following each monitoring year. In the event that comments are not received from the resource agencies before May 15th, the licensee shall file an update on the progress of agency consultation and an anticipated filing date for the final draft of the monitoring report.*

1.1 LICENSE REQUIREMENTS

The hardhead monitoring component of Forest Service Final 4(e) Condition No. 39 for the Project is stated as follows:

> *The Licensee shall, within six months after license issuance, or as otherwise indicated, and in consultation with the Forest Service, State Water Resources Control Board (SWRCB) and California Department of Fish and Game (CDFG), develop detailed monitoring plans consistent with the descriptions provided below. The Licensee shall provide the final detailed plans, along with all agency comments received and an explanation for any such comments not adopted, to the Commission for final approval. The Licensee shall perform the Environmental Monitoring as approved by the Commission. It is anticipated that certain details of the environmental monitoring (e.g., specific years of sampling and/or specific study sites) may need modification during development of detailed study plans or during subsequent implementation of the environmental monitoring. All such modifications shall be developed in consultation with the Forest Service, SWRCB, and CDFG, and approved by these agencies and provided to the Commission*

before implementation. Where years are specified, year one is the first full calendar year after issuance of the new license.

Objective: Determine if the specified streamflow regime affects hardhead habitat in the lower portions of the Sand Bar Dam Reach by evaluating hardhead distribution and abundance in the Camp Nine Reach (the 2.4 mile-long section of the Stanislaus River from the confluence of the Middle and North Forks of the Stanislaus River to the Stanislaus powerhouse) and the lower two miles of the Sand Bar Dam Reach.

Cost: Consistent with specified scope.

- *Conduct five years of snorkel surveys and/or electrofishing to determine abundance and distribution of hardhead in the Camp Nine Reach and the lower two miles of the Sand Bar Dam Reach, beginning in year 1.*
- *Radio tag 10-20 hardhead from the Camp Nine Reach in year 1 to determine if hardhead are utilizing the lower Sand Bar Dam Reach or are only utilizing the Camp Nine Reach and New Melones Reservoir. The Licensee shall consult with the Forest Service in early year 1 to develop a detailed study plan for this task.*
- *Monitor algae abundance in Sand Bar Dam and Camp Nine reaches to determine relative food availability and evaluate if algae is limiting hardhead use in the lower Sand Bar Dam Reach. Conduct a general survey of algae abundance in the Sand Bar Dam and Camp Nine reaches in year 1 and, if needed, collect additional quantitative algae abundance information in year 2.*
- *Monitor water temperature for up to five years to coincide with snorkel surveys and/or electrofishing (i.e., same years as for snorkel and/or electrofishing surveys) at the following four sites: (1) Middle Fork Stanislaus River above North Fork Stanislaus River, (2) Stanislaus River above Collierville PH, (3) Stanislaus River below Collierville Powerhouse, and (4) Stanislaus River below Stanislaus Powerhouse).*
- *Prepare and distribute to the Forest Service, SWRCB, CDFG, and others upon request a final report after five years of study, including recommendations. Submit results of temperature monitoring and snorkel surveys to the Forest Service within six months following completion of each year of monitoring.*

The following terms and conditions, provided in the State Water Board's Revised Water Quality Certification (Order WR 2009-0039, July 9, 2009), are required as part environmental monitoring under Condition 9 for the Project.

The Licensee shall, within six months after license issuance, or as otherwise indicated, and in consultation with the USFS, Deputy Director, and CDFG,

develop detailed monitoring plans consistent with the descriptions provided below. The Licensee shall provide the final detailed plans, along with all agency comments received and an explanation for any such comments not adopted, to the Deputy Director for final approval. It is anticipated that certain details of the Environmental Monitoring (e.g., specific years of sampling and/or specific study sites) may need modification during development of detailed study plans or during subsequent implementation of the Environmental Monitoring. All such modifications shall be developed in consultation with the USFS, Deputy Director, and CDFG, and approved by these agencies and provided to FERC before implementation.

1.2 OBJECTIVES

The goal of the Plan is to determine if the new streamflow regime specified in the license affects hardhead habitat in the lower portions of the Sand Bar Dam Reach. This will be determined by:

- conducting snorkel surveys to determine distribution and abundance in the Camp Nine Reach and the lower two miles of the Sand Bar Dam Reach;
- radio tagging 10-20 hardhead in the Camp Nine Reach and tracking them in License Year One to determine if they are using the lower Sand Bar Dam Reach;
- monitoring algal abundance in both reaches; and
- monitoring water temperatures at four stations in both reaches.

1.3 STUDY AREA

The Spring Gap-Stanislaus Project is shown in Figure 1. The hardhead monitoring study area includes the Camp Nine Reach (the 2.4 mile-long section of the Stanislaus River from the confluence of the Middle and North Forks of the Stanislaus River to the Stanislaus Powerhouse) and the lower two miles of the Sand Bar Dam Reach (Figure 2) of the Middle Fork Stanislaus River.

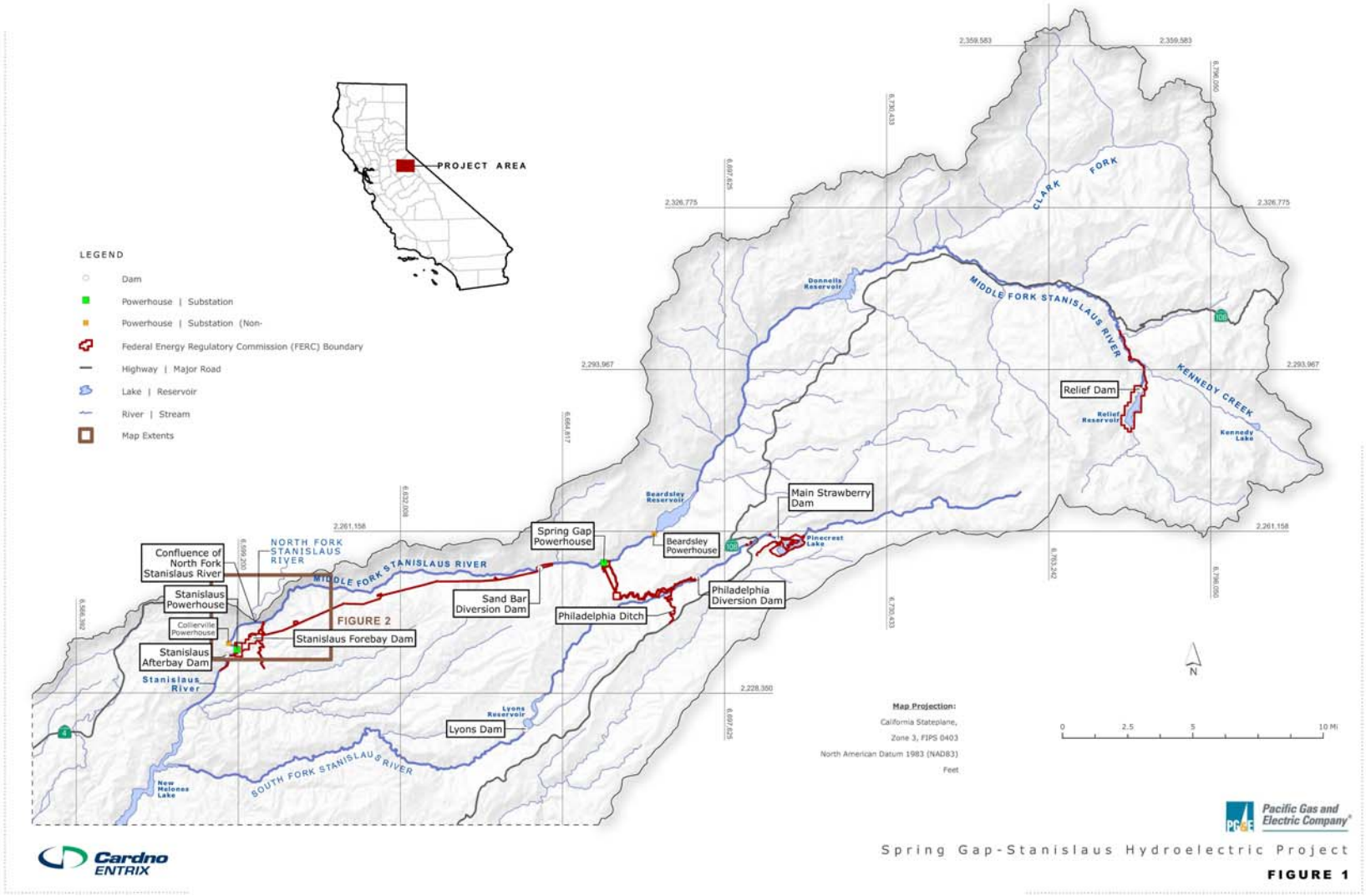


Figure 1. Stanislaus Project Area showing the Hardhead Study Area (Figure 2).

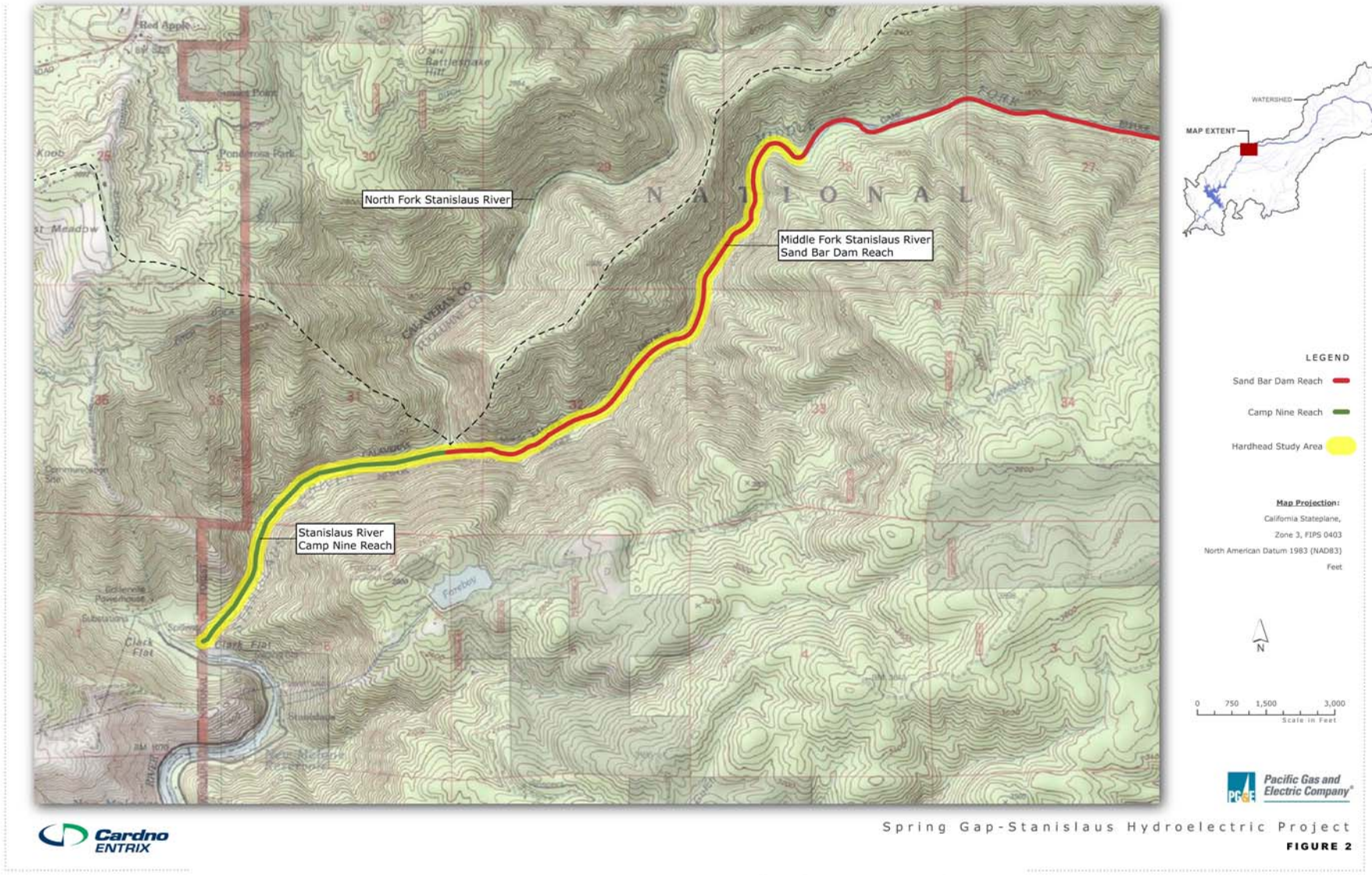


Figure 2. Hardhead Study Area in the Stanislaus and Middle Fork Stanislaus Rivers.

1.4 CONSULTATION

PG&E consulted with the Forest Service, State Water Board, and California Department of Fish and Game in the preparation of the Plan. That documentation was included with the Plan.

Documentation of consultation regarding this report with the Forest Service, the State Water Board, U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Game (CDFG) is provided in Appendix F, as well as notes and comments from the annual consultation meeting in April 2011.

2.0 APPROACH

2.1 HABITAT

Habitat data were collected to characterize the snorkeling sites. For each site, habitat types were identified as either "Fastwater" or "Pool". The length of each habitat type was measured to the nearest foot. Three to four transects were established at each habitat type. Width, depth and substrate information was characterized at ¼, ½, and ¾ of the width of each transect.

2.2 TEMPERATURE AND STREAM FLOW MONITORING

Temperature monitoring for hardhead was conducted in coordination with the temperature monitoring required for the Foothill Yellow-legged Frog (*Rana boylii*) Monitoring Plan (PG&E 2010b). A detailed methodology for this monitoring effort is provided in Appendix C. Water temperature monitoring locations for the summer data collection are summarized in (Table 1). In 2010, water temperatures were recorded at seven locations in the Stanislaus River from April through September to characterize water temperature conditions for the spring and summer periods. Water temperatures were recorded at four locations on the Middle Fork Stanislaus River upstream of the North Fork Confluence (Sand Bar Dam Reach), and at three locations on the Stanislaus River below the confluence (Camp Nine Reach) (Table 1).

Table 1. Water Temperature Monitoring Locations and Unit Serial Numbers for Spring Gap Stanislaus, 2010.

Physical Location	Reach	GPS Coordinates (UTM Zone 10S NAD 83, Meters)	Unit A (Serial No.)	Unit B (Serial No.)
Middle Fork Stanislaus River downstream of Sandbar Dam Diversion	Sand Bar Dam Reach	0748773/4229900	9724431	9724432
Middle Fork Stanislaus River Site 182 - Side Channel	Sand Bar Dam Reach	0734150/4228482	9724433	9724434
Middle Fork Stanislaus River Site 182 - Main Channel	Sand Bar Dam Reach	0734149/4228503	9724435	9724436
Middle Fork Stanislaus River upstream of North Fork confluence	Sand Bar Dam Reach	0731819/4226251	9724437	9724438
Stanislaus River upstream of Collierville powerhouse	Camp Nine Reach	0730049/4225113	9724439	9724440
Stanislaus River downstream of Collierville powerhouse	Camp Nine Reach	0730022/4224794	9724441	9724442
Stanislaus River downstream of Stanislaus powerhouse	Camp Nine Reach	0730289/4224297	9724443	9724444

In situ[1] stream temperatures in the Stanislaus River were recorded at half-hour intervals with Onset temperature recorders. Water temperature monitoring locations were selected to have well-mixed flows, to avoid groundwater influence, and to deter tampering of the recorders, to the extent feasible. Redundant recorders were installed at all locations. A calibration hack (check) was made each time the recorders were reset. The calibration hacks consist of measuring water temperature at the location of the instrument transducer with a calibrated thermometer whose calibration is traceable to a recognized standard; the date, time, and temperature were recorded in each case and compared to the corresponding temperature measured by the electronic recorder. Recorders were well hidden and examined for tampering during each hack. Water temperature loggers were checked periodically to reduce potential data loss from equipment malfunction and tampering. The data were downloaded onto a laptop computer and exported to spreadsheets for analysis. Daily mean temperature, maximum daily temperature, and minimum daily temperature were calculated. All data calculations were subject to Quality Control (QC) verification.

2.3 SNORKEL SURVEYS

A crew of four fisheries biologists experienced at identifying and counting hardhead conducted single pass snorkel surveys at three locations: two in the Sand Bar Dam Reach and one within the Camp Nine Reach during early fall. The schedule for conducting this work in early fall was based on comments from the Forest Service to address potential changes in abundance and distribution in the reach. Each snorkel site (approximately 91-152 m [300-500 feet] long) encompassed a large pool and associated upstream or downstream fastwater habitat. The survey assessed habitat use and distribution of hardhead within the three locations. It was anticipated that mixed schools of small cyprinids (hardhead, Sacramento pikeminnow, and California roach) might be observed. These are recorded as unidentified cyprinids. At each location, habitat was qualitatively assessed. Specific parameters evaluated included pool length, average width, average and maximum depth, substrate, cover, and habitat complexity. Several water quality

[1] Before deployment, quality control calibrations were performed on each water temperature recorder. Records of these calibration checks are included in the appendix.

parameters were recorded, including water clarity, surface and bottom water temperature, and dissolved oxygen concentrations. A detailed snorkeling methodology is provided in Appendix B.

2.4 HARDHEAD TRACKING

Hardhead radio tagging took place during September 15-17, 2010. The target number for tagging was 20 fish. Based on experiences in other watersheds, hook and line techniques were the preferred method for capturing adult hardhead. However, during the hardhead tagging, species other than hardhead were aggressively feeding and prevented the capture of sufficient adult hardhead to reach our goal of 20 adults. Six adult hardhead from the Camp Nine Reach were radio tagged. These fish will be tracked in 2011 to help determine if hardhead are utilizing the lower Sand Bar Dam Reach or are only utilizing the Camp Nine Reach and New Melones Reservoir. Detailed methodology is provided in Appendix A and was derived from an ongoing hardhead tracking study being performed for Southern California Edison's (SCE) Big Creek 4 Hydroelectric Project (SCE 2008). Radio tags with an expected life of at least one year were attached to the adult hardhead. Field teams will use a portable radio receiver that can identify individual tags to track the fish. Tracking will be performed for two days each month from March to July 2011 by helicopter. Global Positioning System (GPS) coordinates of all observed locations of tagged fish will be recorded.

2.5 ALGAL MONITORING

In 2010, surveys of algal distribution and density were performed at each site where snorkel surveys were conducted. These studies documented the areal extent of algal growth within each site and the habitat characteristics associated with this growth. The methods used were the same as the qualitative algal surveys performed as part of the Spring Gap-Stanislaus Project 2003 foothill yellow-legged frog (FYLF) surveys (ECORP 2004). During each survey in each site, the percent submerged 'vegetation' was visually estimated to the nearest 10 percent; and the contribution of algae to this total was determined to be insignificant (0), subdominant (1), co-

dominant (2), or dominant (3) to the overall cover of submerged vegetation. This information was used to evaluate general habitat conditions (including the presence and relative abundance of algae) and potential food availability issues in the lower Sand Bar Dam and Camp Nine reaches. If relative algal density is determined to be likely to be limiting hardhead use in the lower Sand Bar Dam Reach, additional quantitative algae abundance information may be collected in 2011.

If additional monitoring is needed in 2011, quantitative surveys would be performed using the cross-section and quadrat method described in the aforementioned 2003 FYLF report (ECORP 2004).

3.0 RESULTS

3.1 HABITAT

Habitat data were collected to characterize the snorkeling sites (Table 2). For each site and transect, the depth and substrate were characterized at ¼, ½, and ¾ of the stream width. Dominant substrate elements varied by site and transect and ranged from small cobbles to large boulders.

3.2 TEMPERATURE AND STREAM FLOW MONITORING

3.2.1 Stream Discharge

Water year 2010 was classified as an above normal water year (CDWR 2010). Daily mean flows in the MFSR downstream of the Sand Bar Dam Diversion between April 1 and September 30 ranged from a high of 6,653 cfs on June 8 to a minimum of 89 cfs, recorded on several days during April. Flows during June were generally above 1,000 cfs and remained high into the first few days in July. Flows in August and September were generally below 100 cfs. Table 3 presents the monthly mean flows for the 2010 temperature monitoring period. The average daily flow for the MFSR during the monitoring period was just over 500 cfs. Daily mean flows and water temperature data are provided in Appendix D.

Table 2. Spring Gap Stanislaus Hardhead Monitoring Site Locations and Physical Habitat Data for 2010.

Site	Unit Type	GPS Location (UTM)				Unit Length (ft)	Transect	Width (ft)	Thalweg Depth (ft)	Transect Data	Measurement Locations at Fraction of Total Width		
		Upstream		Downstream							1/4	1/2	3/4
		Northing	Easting	Northing	Easting								
Upper Sandbar Site	**Pool**	**734249**	**4228437**	**734111**	**4228483**	**472**	**1**	**78**	**3.8**	**Station (ft)**	**19.5**	**39.0**	**58.5**
										Depth (ft)	2.0	2.5	3.4
										Substrate	Small Cobble	Small Cobble	Small Cobble
							2	127	13.2	Station (ft)	31.8	63.5	95.3
										Depth (ft)	6.5	13.0	6.8
										Substrate	Small Cobble	Small Cobble	Small Cobble
							3	75	14.5	Station (ft)	18.8	37.5	56.3
										Depth (ft)	8.5	13.0	14.5
										Substrate	Small Boulder	Small Boulder	Bedrock
							4	47	15	Station (ft)	11.8	23.5	35.3
										Depth (ft)	3.5	4.5	5.0
										Substrate	na	na	na
	Fastwater	734609	4228519	734547	4228492	221	1	67	2.3	Station (ft)	16.8	33.5	50.3
										Depth (ft)	1.8	1.8	1.3
										Substrate	Small Boulder	Small Boulder	Small Boulder
							2	73	2	Station (ft)	18.3	36.5	54.8
										Depth (ft)	1.4	1.5	1.8
										Substrate	Small Boulder	Small Boulder	Cobble

Table 2. Spring Gap Stanislaus Hardhead Monitoring Site Locations and Physical Habitat Data for 2010(continued).

Site	Unit Type	GPS Location (UTM)				Unit Length (ft)	Transect	Width (ft)	Thalweg Depth (ft)	Transect Data	Measurement Locations at Fraction of Total Width		
		Upstream		Downstream							1/4	1/2	3/4
		Northing	Easting	Northing	Easting								
							3	65	2.9	Station (ft)	16.3	32.5	48.8
										Depth (ft)	1.6	2.0	2.5
										Substrate	Small Boulder	Large Cobble	Small Boulder
Lower Sandbar Site	Pool	732921	4226913	732856	4226936	230	1	51.5	3.8	Station	12.9	25.8	38.6
										Depth	2.6	3.0	3.8
										Substrate	Small Boulder	Large Boulder	Bedrock
							2	48	5	Station	12.0	24.0	36.0
										Depth	2.9	4.8	5.0
										Substrate	Small Cobble	Small Boulder	Large Boulder
							3	56	7.5	Station	14.0	28.0	42.0
										Depth	6.5	8.0	3.8
										Substrate	Large Boulder	Large Boulder	Bedrock
							4	38	5	Station	9.5	19.0	28.5
										Depth	4.7	5.5	3.9
										Substrate	Large Boulder	Large Boulder	Small Boulder
	Fastwater	732805	4226868	732771	4226822	191	1	62.5	1.9	Station	15.6	31.3	46.9
										Depth	1.1	1.6	1.5
										Substrate	Small Cobble	Small Boulder	Large Cobble

Table 2. Spring Gap Stanislaus Hardhead Monitoring Site Locations and Physical Habitat Data for 2010(continued).

Site	Unit Type	GPS Location (UTM)				Unit Length (ft)	Transect	Width (ft)	Thalweg Depth (ft)	Transect Data	Measurement Locations at Fraction of Total Width		
		Upstream		Downstream							1/4	1/2	3/4
		Northing	Easting	Northing	Easting								
							2	67.5	3.1	Station	16.9	33.8	50.6
										Depth	3.0	3.2	1.8
										Substrate	Large Cobble	Small Boulder	Large Boulder
							3	66.7	2.9	Station	16.7	33.4	50.0
										Depth	2.4	2.3	2.3
										Substrate	Small Boulder	Small Boulder	Small Boulder
							4	40.5	2.8	Station	10.1	20.3	30.4
										Depth	2.5	3.5	2.6
										Substrate	Small Boulder	Small Boulder	Small Boulder
Camp Nine Site	Pool	731139	4226134	730964	4226108	588	1	140	5.2	Station	35.0	70.0	105.0
										Depth	1.5	3.2	5.2
										Substrate	Large Gravel	Gravel	Sand
							2	120	9.5	Station	30.0	60.0	90.0
										Depth	3.2	9.5	6.3
										Substrate	Sand	Sand	Sand
							3	51	23	Station	12.8	25.5	38.3
										Depth	16.0	19.0	23.0
										Substrate	Bedrock	Bedrock	Bedrock
							4	69	8.8	Station	17.3	34.5	51.8
										Depth	9.0	5.3	5.0
										Substrate	Bedrock	Large Boulder	Small Boulder

Table 2. Spring Gap Stanislaus Hardhead Monitoring Site Locations and Physical Habitat Data for 2010 (continued).

Site	Unit Type	GPS Location (UTM)				Unit Length (ft)	Transect	Width (ft)	Thalweg Depth (ft)	Transect Data	Measurement Locations at Fraction of Total Width		
		Upstream		Downstream							1/4	1/2	3/4
		Northing	Easting	Northing	Easting								
	Fastwater	730854	4226082	730780	4226070	246	1	87	2	Station	21.8	43.5	65.3
										Depth	2.2	2.6	3.8
										Substrate	Large Boulder	Large Boulder	Large Boulder
							2	67.5	na	Station	16.9	33.8	50.6
										Depth	1.0	0.8	2.0
										Substrate	Large Cobble	Large Boulder	Small Boulder
							3	75.8	3	Station	19.0	37.9	56.9
										Depth	2.5	2.8	1.1
										Substrate	Large Boulder	Small Boulder	Small Boulder

Table 3. Monthly Mean, Maximum, and Minimum Water Temperature and Average Monthly Flow for the Stanislaus River during April through September 2010.

	Sand Bar Reach												Camp Nine Reach									
Month	Middle Fork Stanislaus River Downstream of Sand Bar Dam Diversion[1]			Middle Fork Stanislaus River, Site 182 (Side Channel)[2]			Middle Fork Stanislaus River, Site 182 (Main Channel)[2]			Middle Fork Stanislaus River Upstream of North Fork Confluence[2]			Stanislaus River Upstream of Collierville Powerhouse[3]			Stanislaus River Downstream of Collierville Powerhouse[3]			Stanislaus River Downstream of Stanislaus Powerhouse[3]			Middle Fork Stanislaus River Sand Bar Dam Diversion
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean Flow
April	8.1	6.5	10.0	11.2	7.5	15.6	11.2	7.5	15.7	11.6	7.7	17.0	9.7	5.8	13.3	7.2	3.7	10.9	7.5	4.2	10.5	92
May	8.2	6.8	9.7	11.3	7.3	16.1	11.4	7.3	16.1	11.8	7.7	17.6	11.1	6.5	14.1	7.9	4.0	11.6	8.4	4.8	11.4	192
June	10.9	7.9	13.5	12.8	10.0	16.3	12.8	10.1	16.4	13.0	10.4	16.5	13.6	10.5	17.3	12.4	9.6	16.2	12.6	9.9	16.2	2,456
July	11.4	10.2	13.3	15.5	12.1	18.5	15.5	12.2	18.5	16.1	12.4	19.0	17.3	12.7	20.2	16.8	12.8	20.0	16.1	12.7	19.1	338
August	11.3	10.3	12.2	17.2	13.6	21.2	17.2	13.7	21.1	18.0	14.2	22.4	19.1	15.4	22.2	18.6	15.2	21.2	17.0	13.1	21.4	112
September	11.8	10.9	12.9	16.2	12.4	19.3	16.2	12.5	19.3	16.8	12.9	20.8	17.4	14.3	20.5	15.5	13.7	18.8	15.0	13.1	18.4	95

[1] - Temperature data from April 6 through September 25 are available for the Sandbar Dam Diversion site.

[2] - Temperature data from April 6 through September 30 are available for these sites.

[3] - Temperature data from April 9 through September 30 are available for these sites.

3.2.2 Water Temperature

Mean, minimum and maximum water temperatures for the seven monitoring locations, along with mean flows in the Middle Fork Stanislaus River are reported by month in Table 3. Daily mean water temperatures for all seven monitoring locations, along with mean daily flows for the Middle Fork Stanislaus River during the monitoring period are plotted in Figure 3 and presented in tabular form in Appendix D. Daily mean, minimum, and maximum water temperature recorded at each of the seven monitoring sites are plotted in Figures 4-10.

Water temperatures in the Sand Bar Dam Reach ranged from a monthly minimum of 6.5°C in April to a monthly maximum of 22.4°C in August and are listed in Table 3. Downstream of the North Fork confluence, water temperatures in the Camp Nine Reach ranged from a monthly minimum of 3.7°C in April up to a monthly maximum of 22.2°C in August (Table 3). Among the seven monitoring sites, mean water temperatures were coolest downstream of Collierville powerhouse during April and May and directly downstream of the Sand Bar Dam Diversion from June through September. Monthly mean water temperatures directly downstream of the Sand Bar Dam Diversion showed a relatively narrow range of 3.7°C from 8.1°C in April up and up to 11.8°C in September. Monthly mean water temperatures downstream of Collierville powerhouse ranged 11.4°C, from 7.2°C in April to 18.6°C in August.

Monthly minimum water temperatures directly downstream of the Sand Bar Dam Diversion ranged 4.4°C, from 6.5°C in April to 10.9°C in September. Monthly water minimum temperatures downstream of Collierville Powerhouse ranged 11.5°C, from 3.7°C in April to 15.2°C in August.

Monthly maximum water temperatures directly downstream of the Sand Bar Dam Diversion ranged 3.8°C, from 9.7°C in May to 13.5°C in June. Monthly maximum water temperatures downstream of Collierville Powerhouse ranged 10.3°C, from 10.9°C in April to 21.2°C in August.

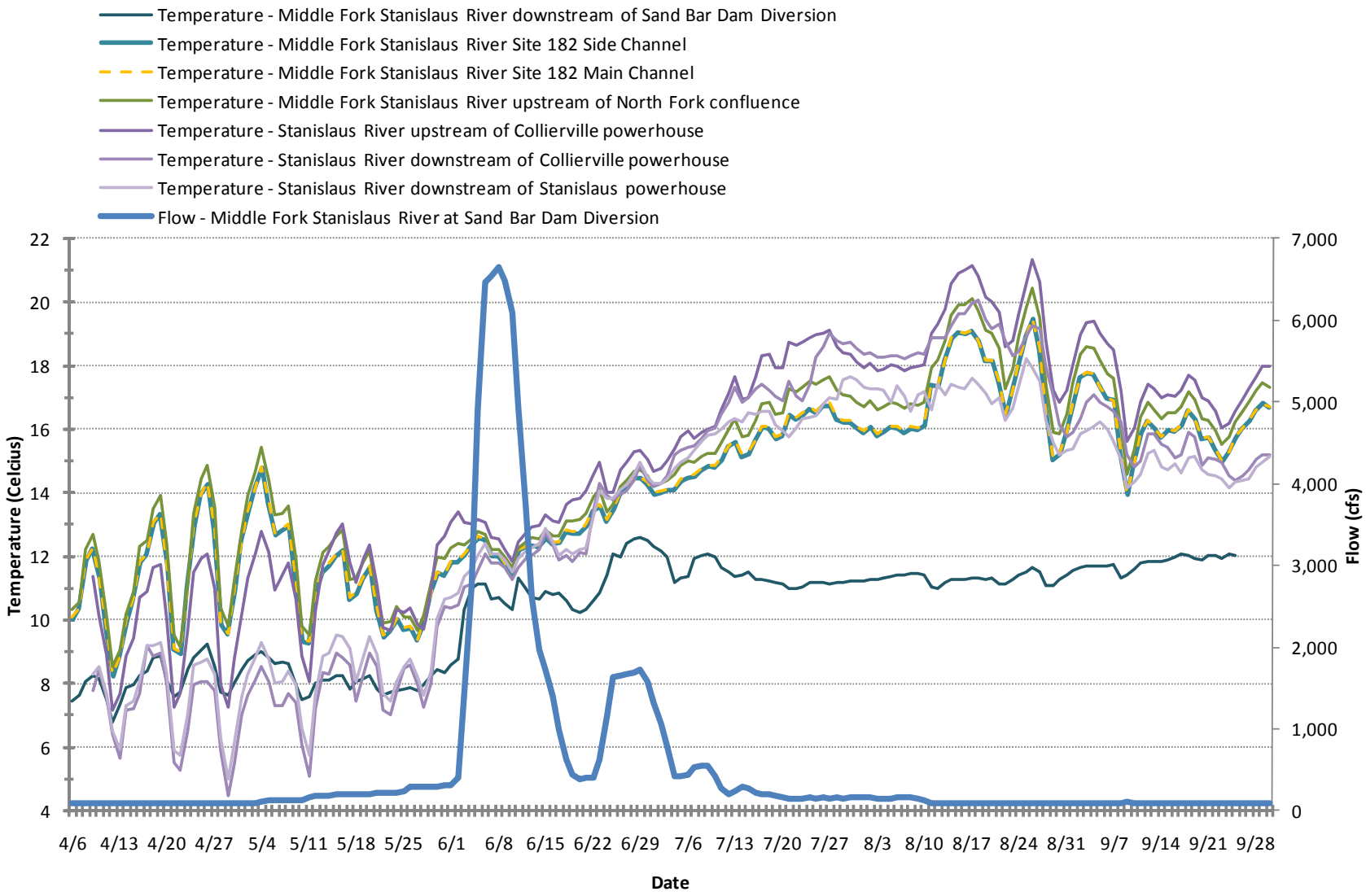


Figure 3. Spring and summer daily streamflow and temperature on the Spring Gap Stanislaus Project in 2010.

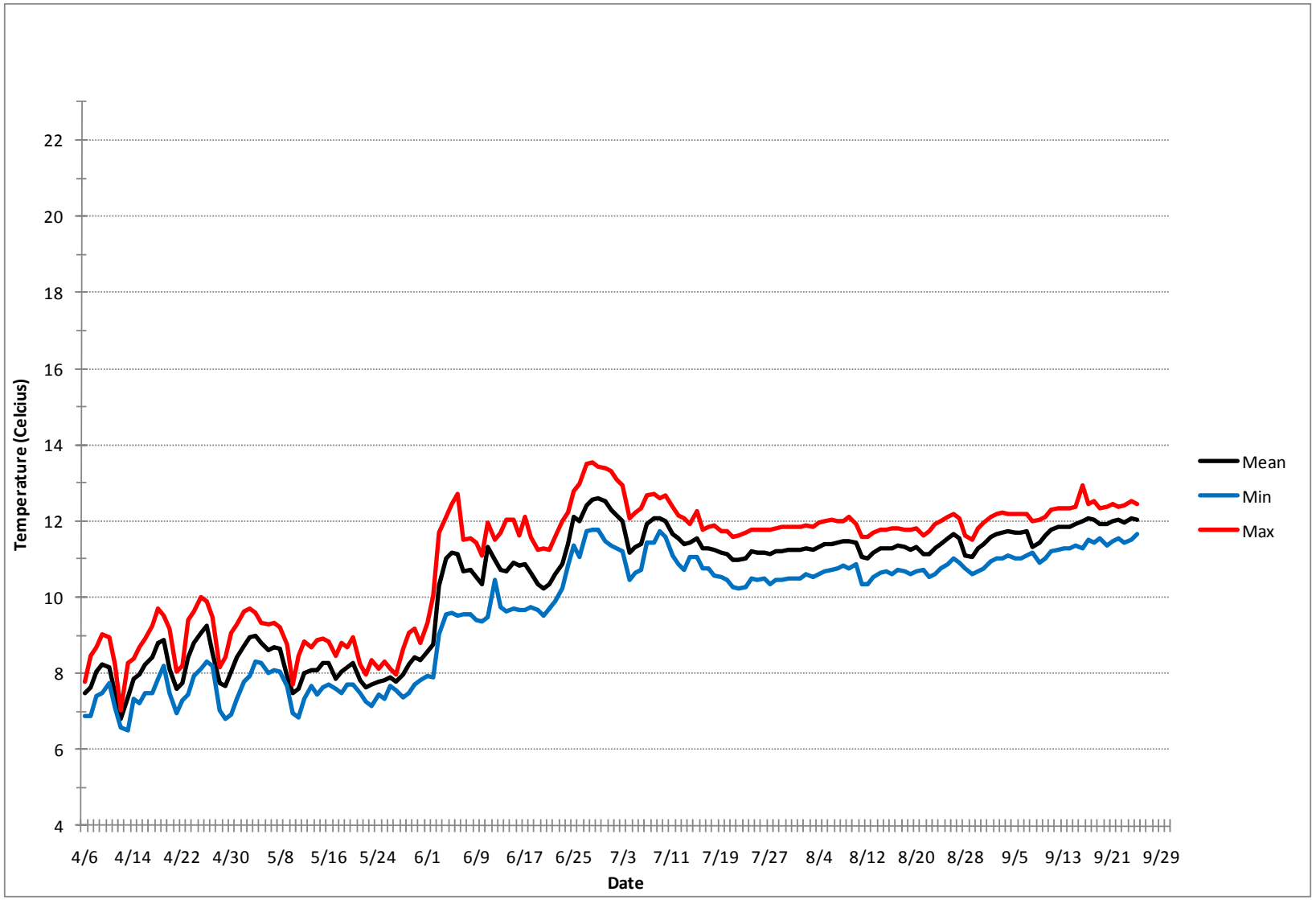


Figure 4. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Middle Fork Stanislaus River, just Downstream of Sand Bar Diversion in 2010.

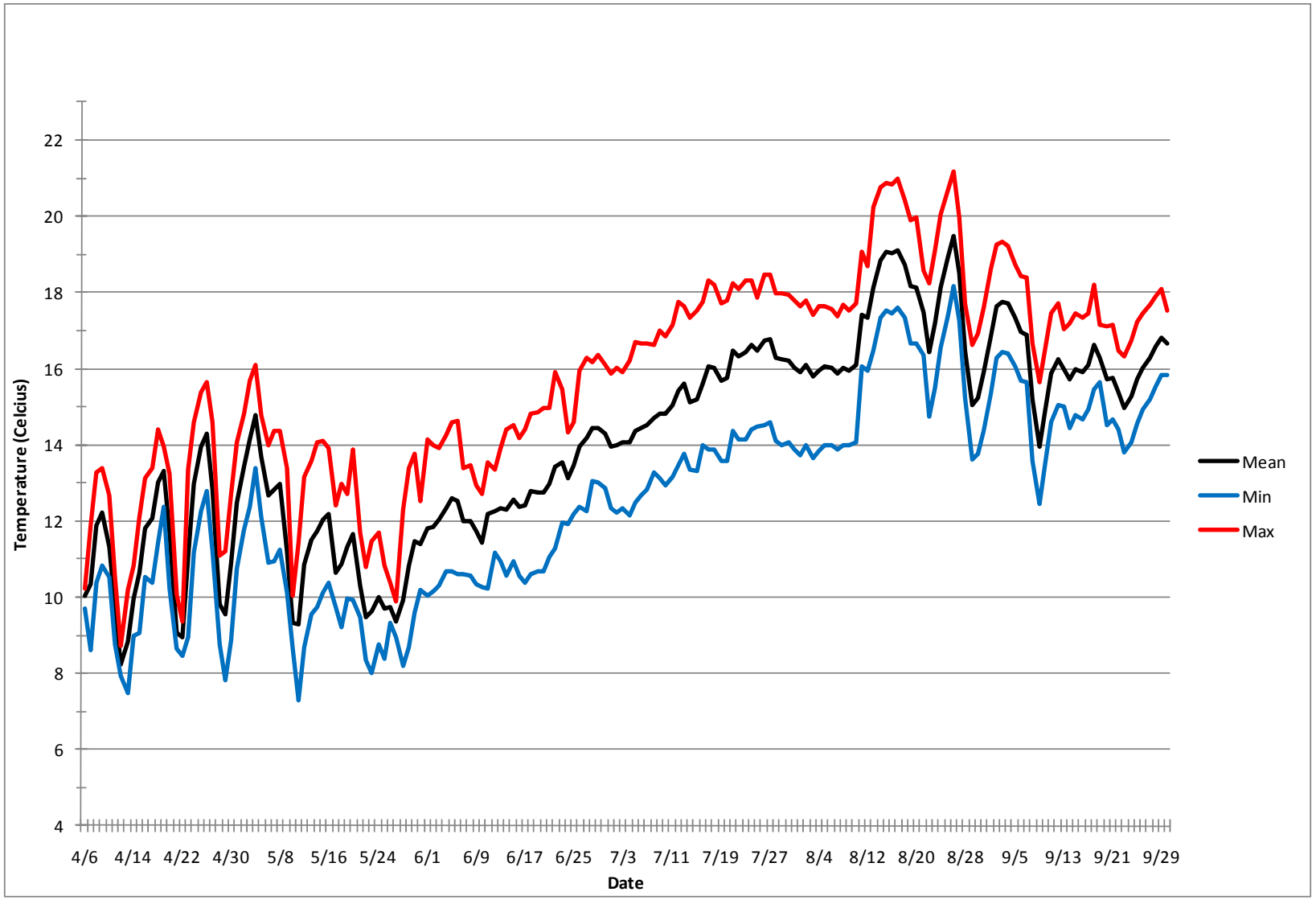


Figure 5. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Middle Fork Stanislaus River, Site 182 Side Channel Habitat in 2010.

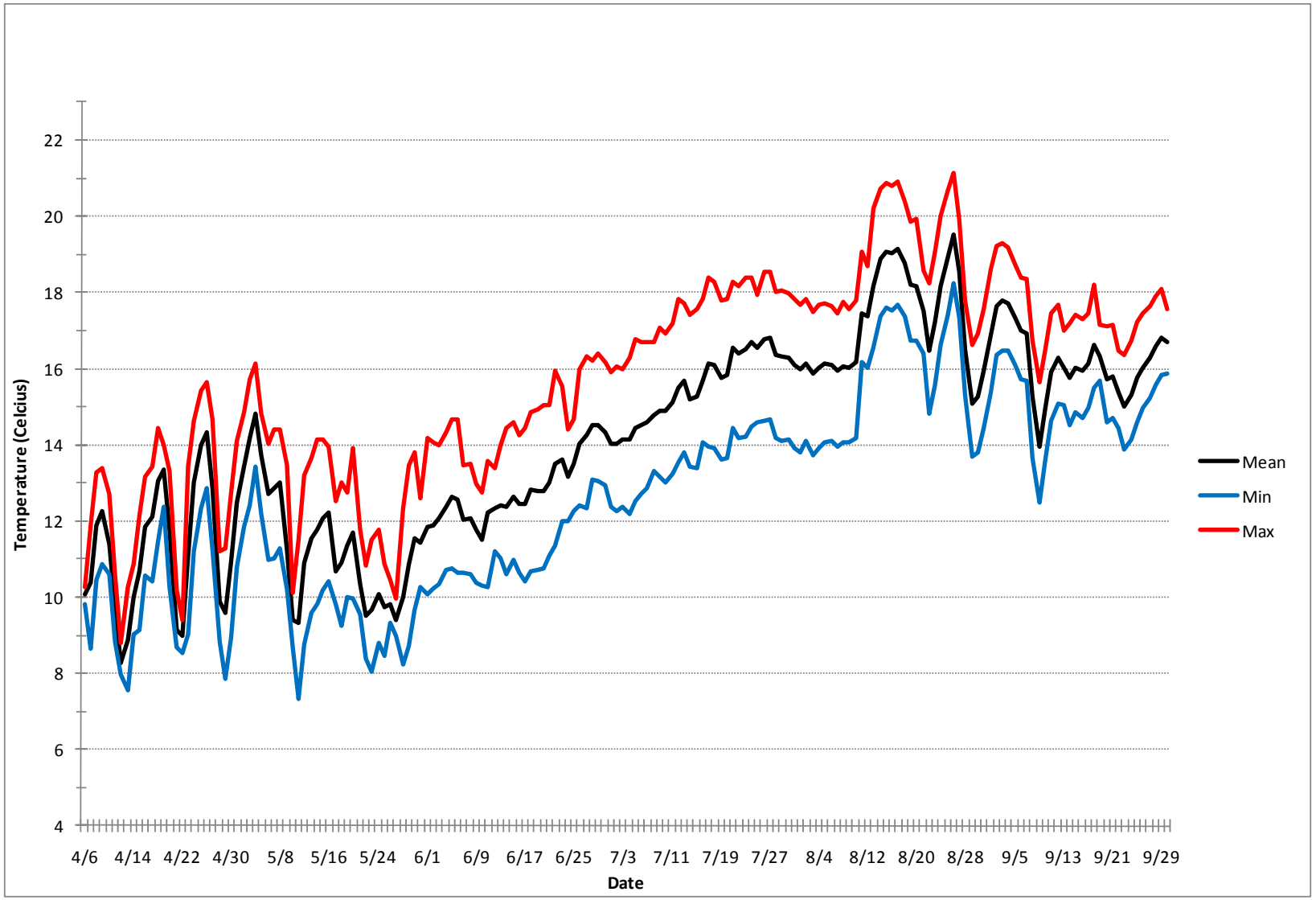


Figure 6. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Middle Fork Stanislaus River, Site 182 Main Channel Habitat in 2010.

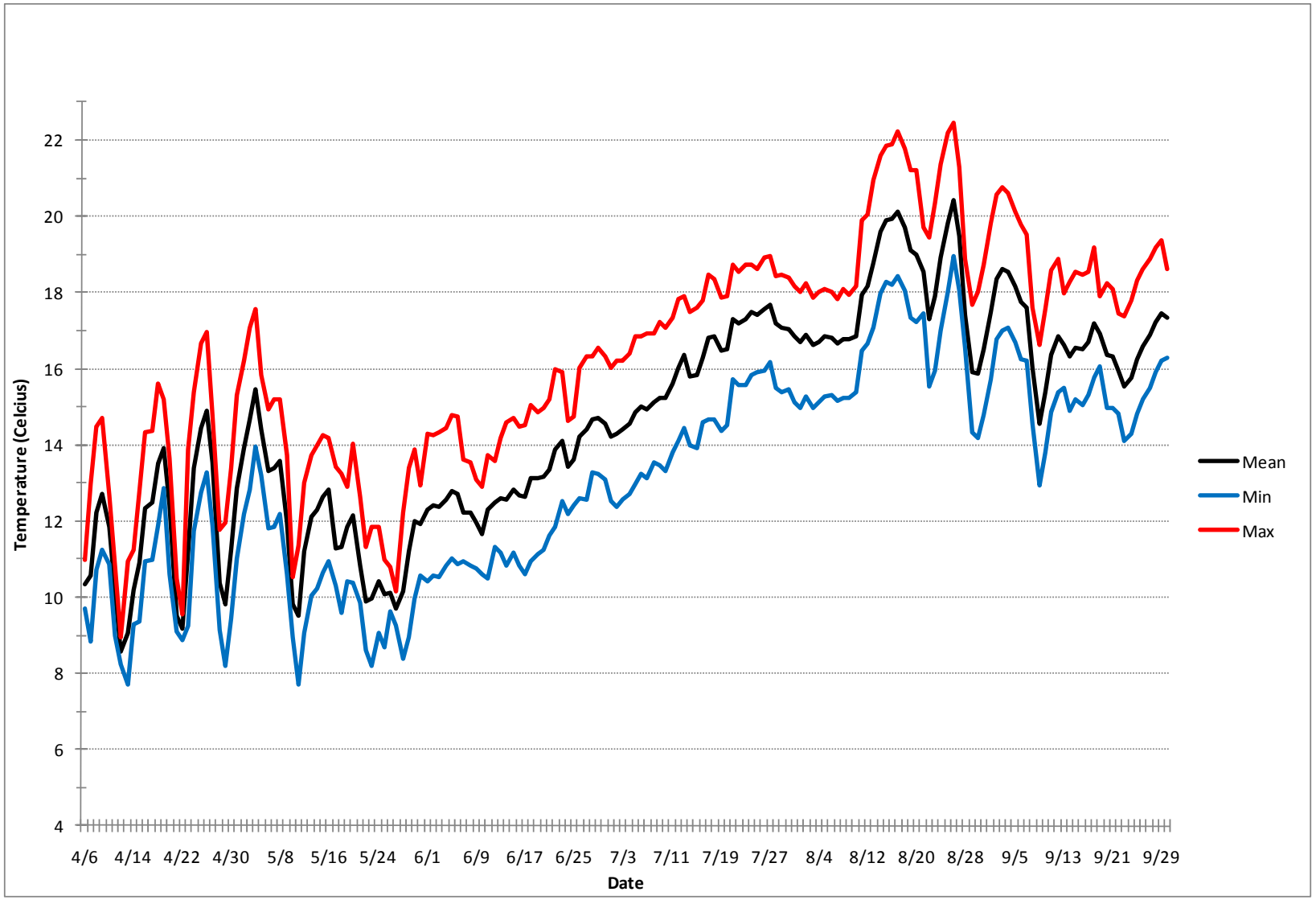


Figure 7. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Middle Fork Stanislaus River, just Upstream of the North Fork Confluence in 2010.

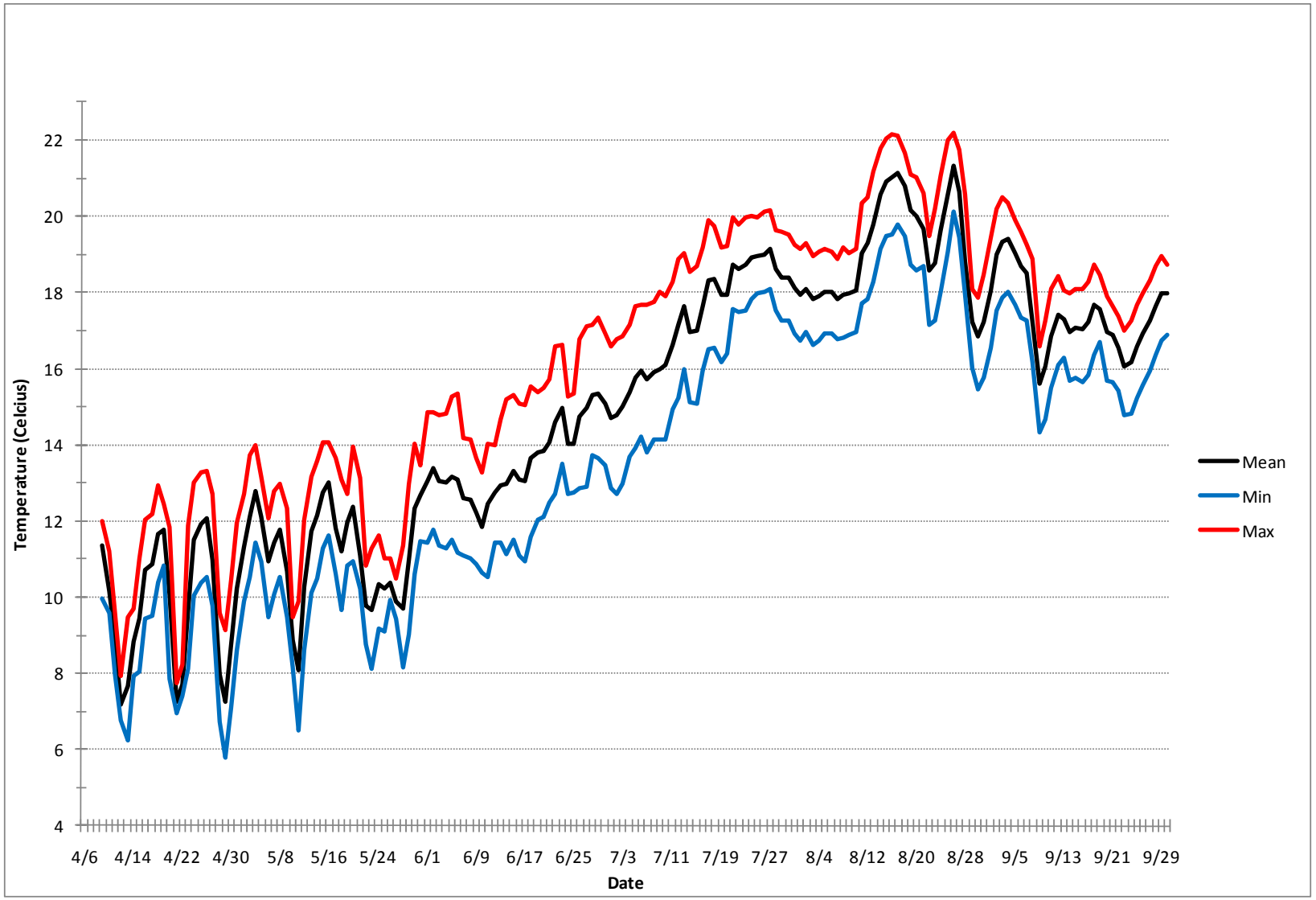


Figure 8. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Stanislaus River, just Upstream of the Collierville Powerhouse in 2010.

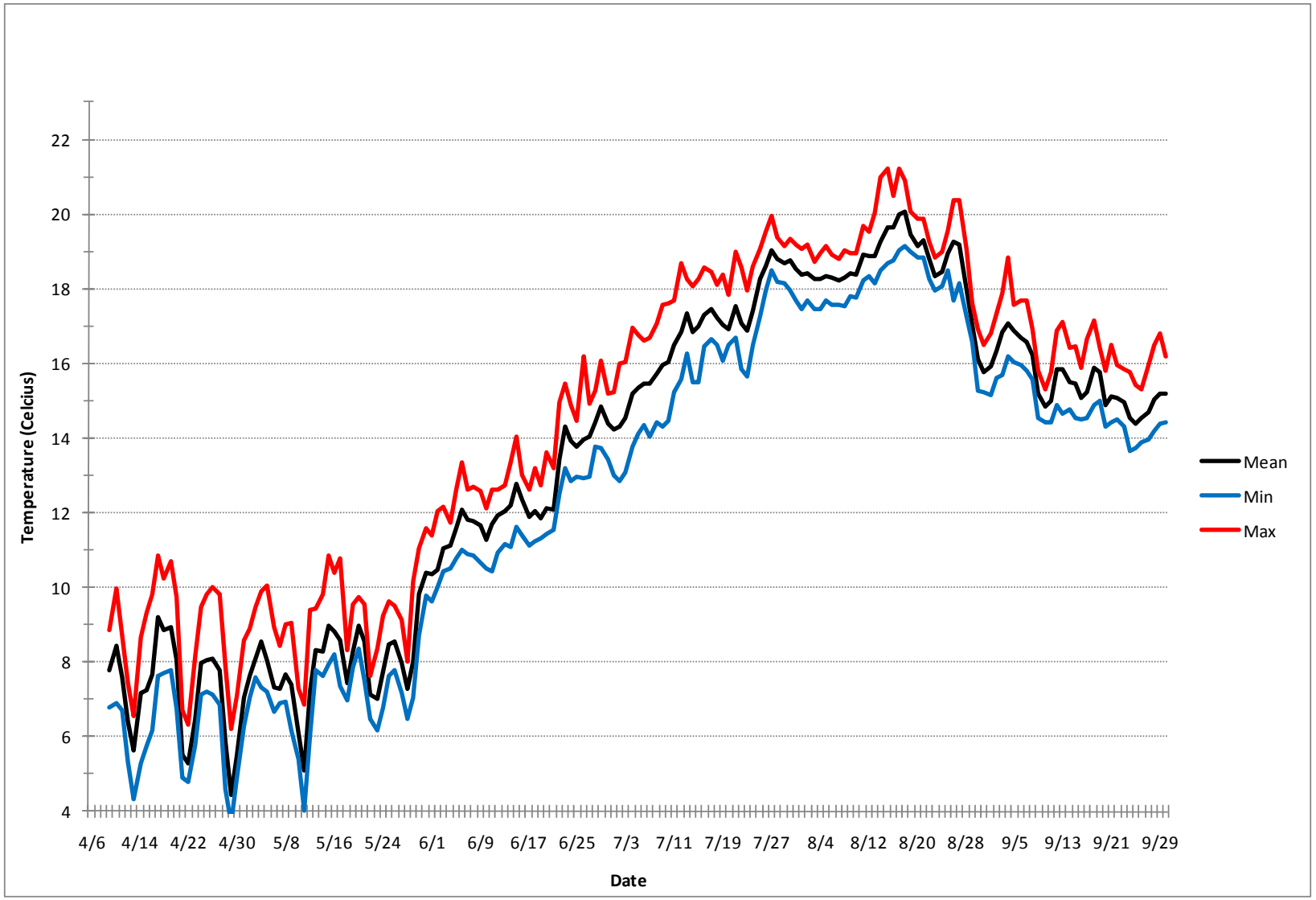


Figure 9. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Stanislaus River, just Downstream of the Collierville Powerhouse in 2010.

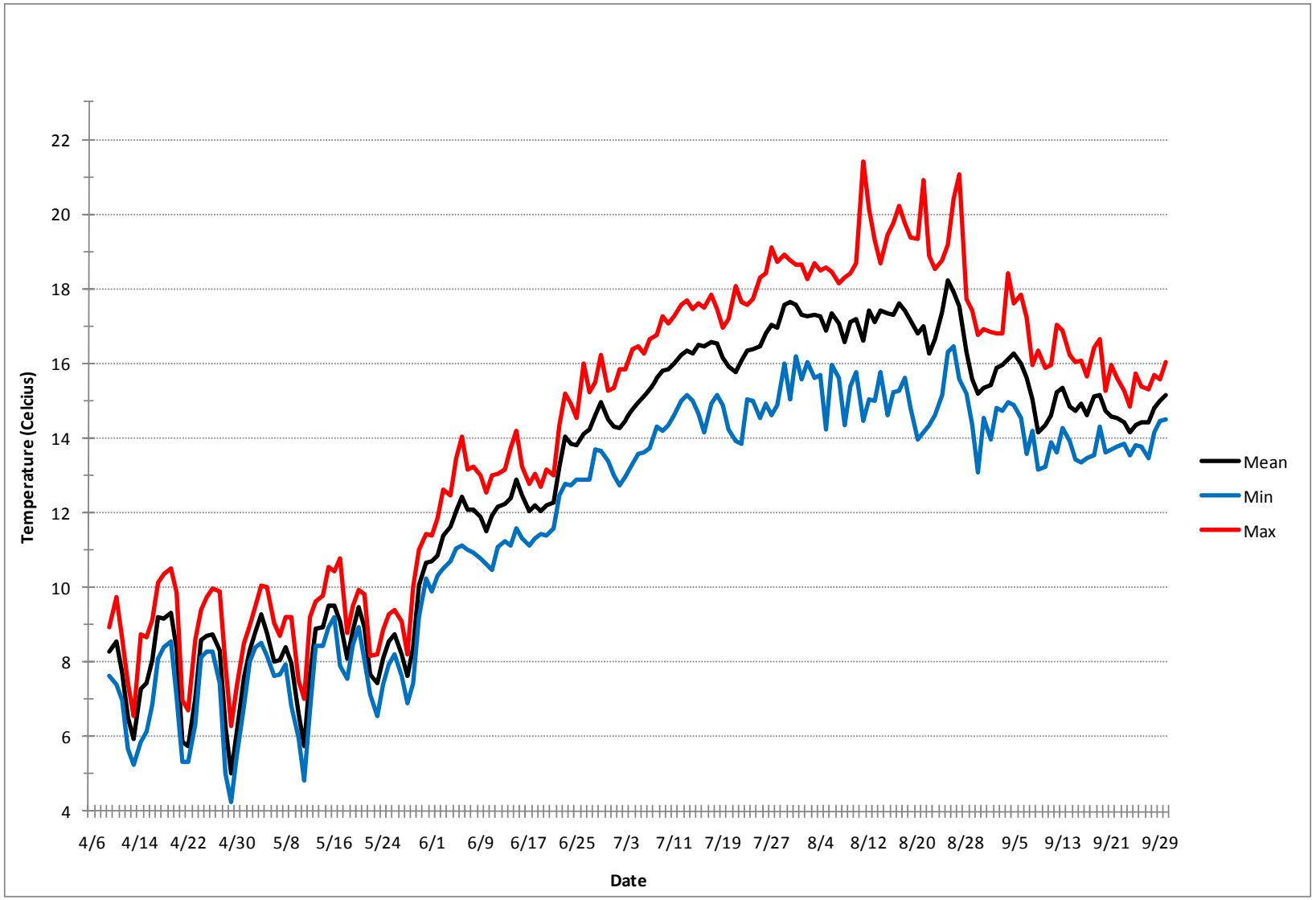


Figure 10. Daily Mean, Minimum, and Maximum Temperatures Recorded at the Stanislaus River, just downstream of the Stanislaus Powerhouse in 2010.

Water temperatures for the Sand Bar Dam Reach were warmest at the most downstream site – just upstream of the North Fork Stanislaus River confluence. The mean monthly water temperature ranged 6.4°C (11.6°C in April increasing to 18°C in August) while the maximum monthly temperatures ranged 5.4°C (17°C in April increasing to 22.4°C in August). The maximum monthly water temperatures at this site decreased in June, presumably caused by the high flows experienced that month (Figure 3; Table 3). Maximum monthly water temperatures recorded for April, May, August, and September at this site were the highest of all seven sites for those months.

Water temperatures for the Camp Nine Reach were warmest at the most upstream site – just upstream of Collierville Powerhouse. The mean monthly water temperature range at this location was 9.4°C (9.7°C in April increasing to just over 19°C in August) while the maximum monthly water temperature range was approximately 9°C (13.3°C in April to just over 22°C in August). Maximum monthly water temperatures recorded for June and July at this site were the highest of all seven sites for those months.

3.3 HARDHEAD TAGGING

The field crew initiated the first year of hardhead tracking on September 15-16, 2010. A total of six adult hardhead, caught within the first three pools above the confluence of the Collierville Powerhouse tailrace and the mainstem of the Stanislaus River (bottom of Camp Nine Reach), were fitted with radio transmitters, each coded with a unique frequency, before being released back into their capture pools (Table 4). These fish will be tracked during spring and summer 2011. Large numbers of smallmouth bass (*Micropterus dolomieu*), fair numbers of rainbow trout (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*) were caught during sampling. Only six suitably sized adult hardhead were collected and radio tagged. Members of the field crew snorkeled all pools sampled and observed many adult hardhead; unfortunately these pools also contained large numbers of the other species, which took the fishing gear more aggressively.

Table 4. 2010 Radiotagged Hardhead on Spring Gap Stanislaus for 2011 Tracking.

Sample No.	Date	Site Description	UTM Zone	Easting	Northing	No.	Weight (g)	Fork Length (mm)
1	10/15/2010	2nd pool u/s of the confluence	10N	731737	4226231	8.054	410	320
2	10/15/2010	2nd pool u/s of the confluence	10N	731737	4226231	8.222	185	240
3	10/15/2010	2nd pool u/s of the confluence	10N	731737	4226231	8.032	187	255
4	10/15/2010	1st pool u/s of the confluence	10N	731906	4226236	8.011	184	245
5	10/15/2010	3rd pool u/s of the confluence	10N	731624	4226228	8.305	197	253
6	10/16/2010	2nd pool u/s of the confluence	10N	731737	4226231	8.162	182	243

3.4 SNORKEL SURVEYS

3.4.1 Overview

Five species were observed in the 2010 snorkel survey: rainbow trout, brown trout, Sacramento sucker, Sacramento pikeminnow, and hardhead. Schools of young cyprinids less than three inches in length that were largely young of the year or yearling Sacramento pikeminnow and hardhead were difficult to identify while snorkeling. These were denoted as unidentified cyprinids. Large numbers of unidentified cyprinids were observed at all survey sites, and 1,345 fish or 62.5 percent of the 2,153 total fish observed were unidentified cyprinids (Table 5). Hardhead were the most abundant identifiable species with 316 individuals observed, comprising 14.7 percent of the total fish observations with unidentified cyprinids included. Of the 316 hardhead identified, 70 percent had lengths between six and nine inches and 21 percent had lengths between nine and twelve inches. Species composition and abundance varied between reach and survey sites, which were representative of their respective reaches (Figure 11).

3.4.2 Upper Sand Bar Site

The Upper Sand Bar Site was established at the upstream extent of the Lower Sand Bar Dam Reach. GPS positions and photos detailing the survey location were recorded (Appendix E). A total of 177 fish were observed at the Upper Sand Bar Site (Table 5). Five identifiable species and unidentified cyprinids were observed. Unidentified cyprinids were the most abundant group and made up 35 percent of the total with 62 individuals (Figure 12). Hardhead were the most abundant identified species and made up 44 percent of observations with 52 individuals (Figure 13). Fifty four percent of all hardhead observed were between six and nine inches, 33 percent were between nine and twelve inches (Figure 11). Rainbow trout were the second most abundant positively identified species and made up 43 percent of the positively identified observations with 49 individuals (Table 5). Figure 14 presents the overall length-frequency distribution for rainbow trout. Visibility during the survey was measured at nine feet and water temperature was 14.8°C, and dissolved oxygen was 9.54 mg/l (Table 6). The study site was comprised of 472 feet of deep pool and 221 feet of associated fastwater (Table 2). Average channel width was 76

Table 5. Spring Gap Stanislaus Snorkeling Data, 2010.

Site	Unit Type	Species	Size Ranges (inches)					Species Totals
			0-3	3-6	6-9	9-12	12+	
Camp Nine Site	Pool	rainbow trout				1		1
		Sacramento sucker	15			200		215
		Sacramento pikeminnow		35	40	11	3	89
		hardhead		20	194	50		264
		unidentified cyprinids	1021					1021
	Fastwater	rainbow trout	4	20	19	6	2	51
		brown trout				1		1
		Sacramento sucker	8					8
		unidentified cyprinids	145					145
Lower Sand Bar Site	Pool	rainbow trout		6	17	5	1	29
		brown trout			2		1	3
		Sacramento sucker	13					13
		Sacramento pikeminnow	12					12
		unidentified cyprinids	60					60
	Fastwater	Sacramento sucker	7					7
		unidentified cyprinids	57					57
Upper Sand Bar Site	Pool	rainbow trout		4	1	4	2	11
		Sacramento sucker				1	1	2
		Sacramento pikeminnow			2	3	4	9
		hardhead		2	28	17	5	52
		unidentified cyprinids	62					62
	Fastwater	rainbow trout		13	8	8	9	38
		brown trout	1				2	3

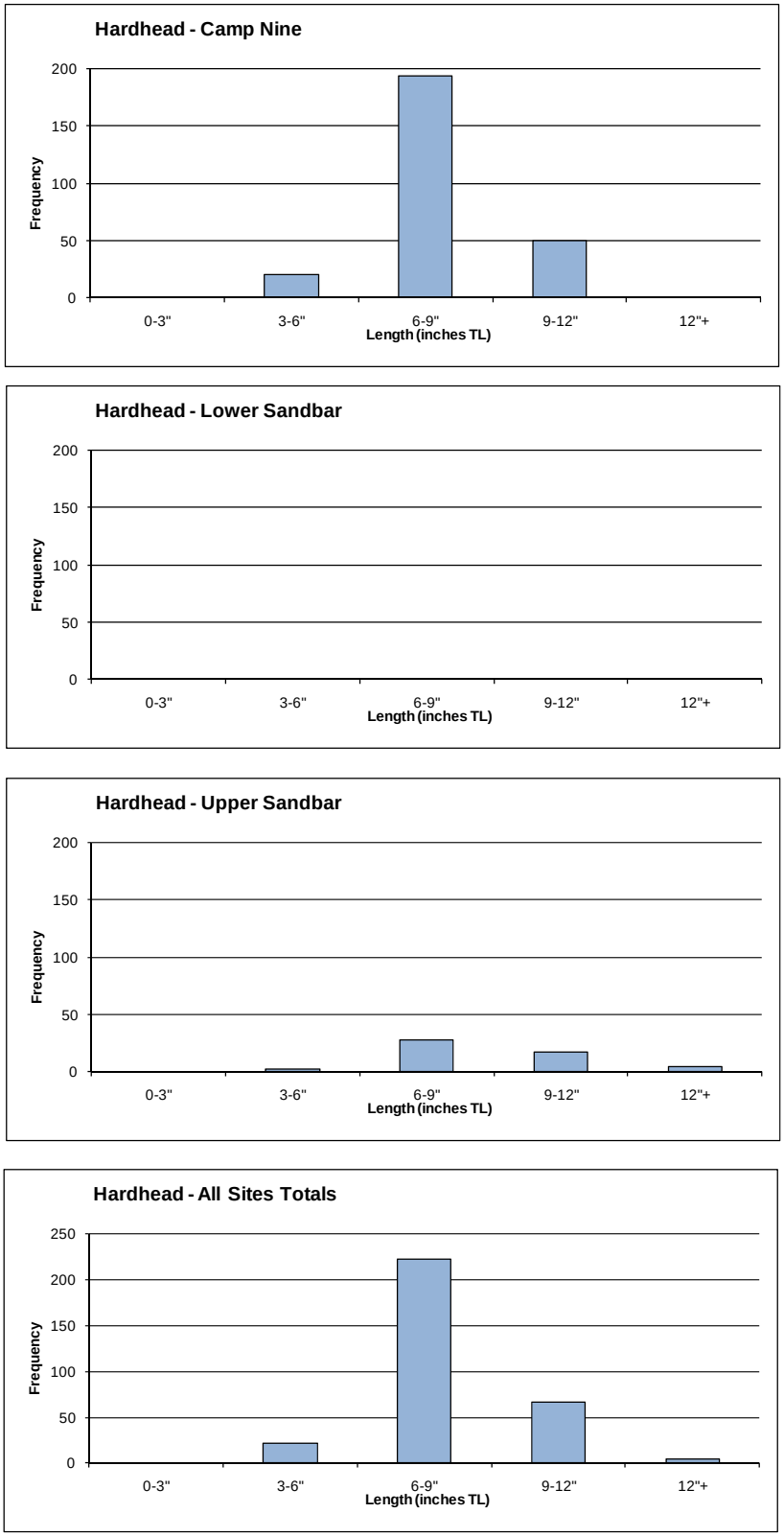
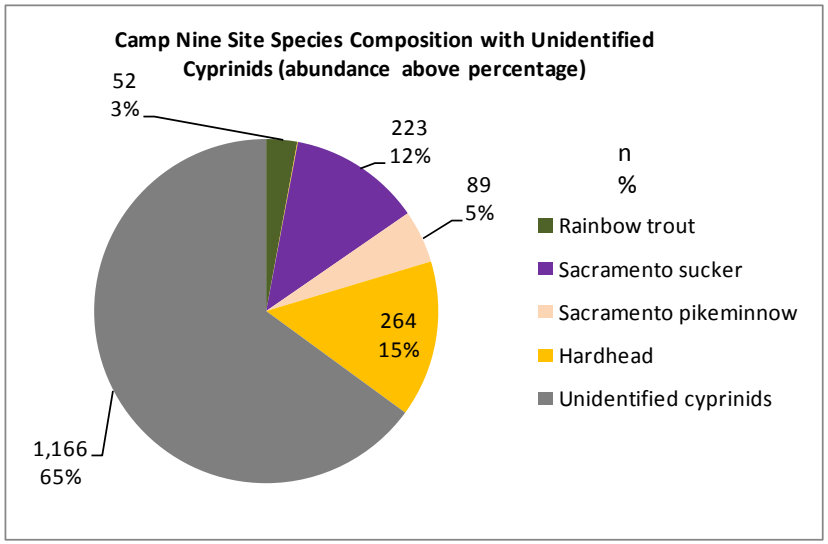
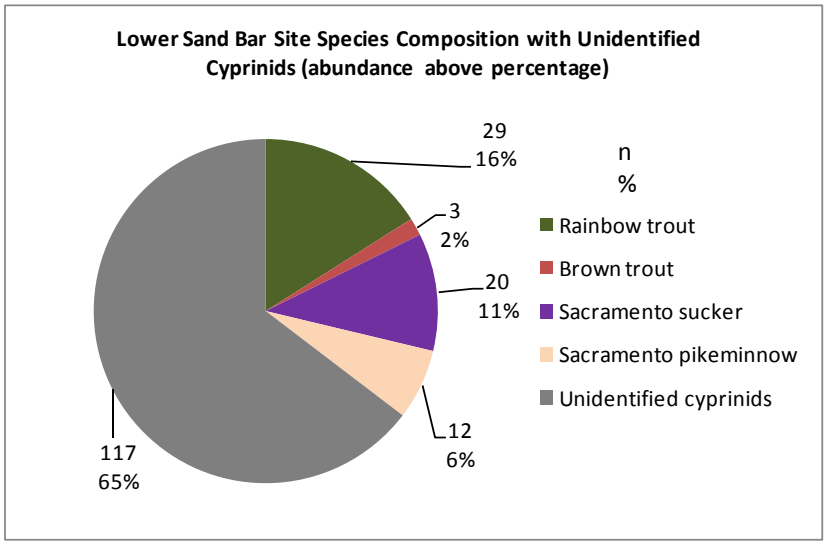
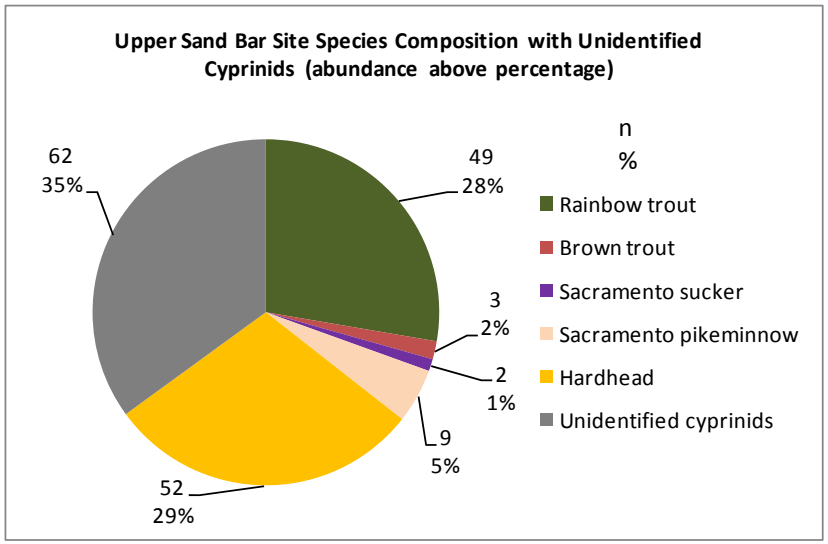
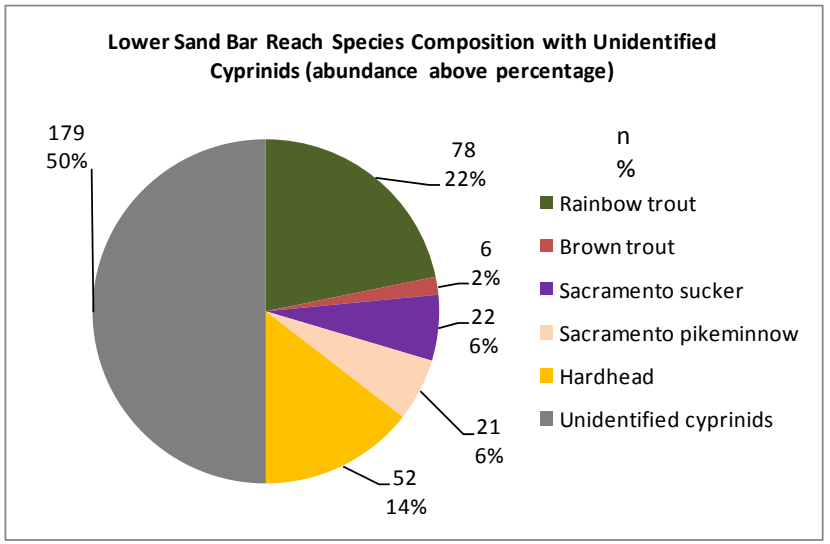


Figure 11. Hardhead Length-Frequencies by Site and for all Sites, 2010.



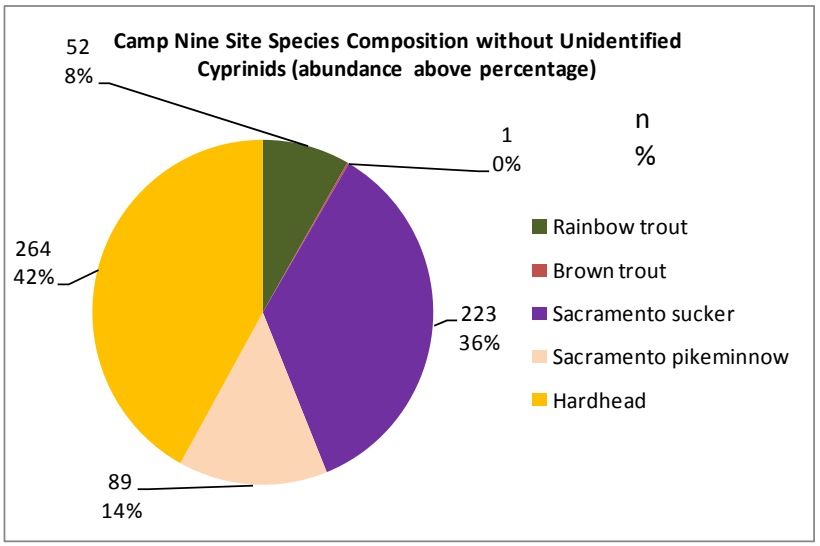


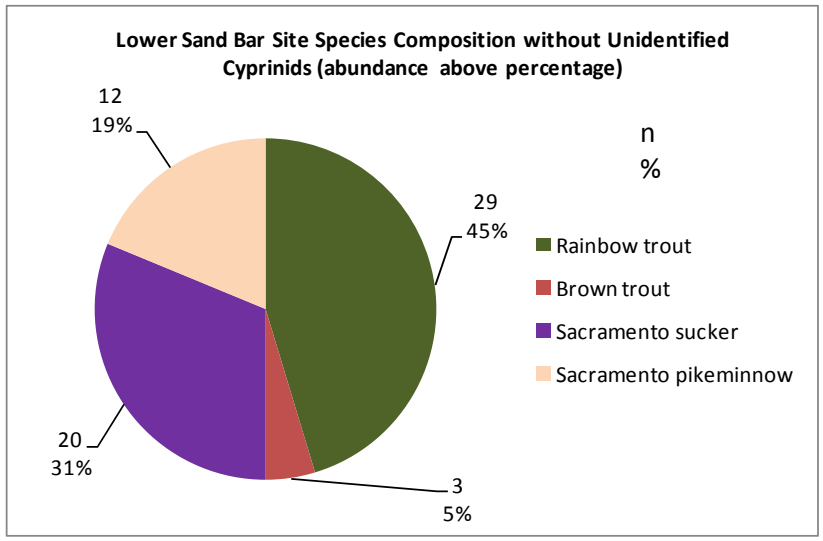


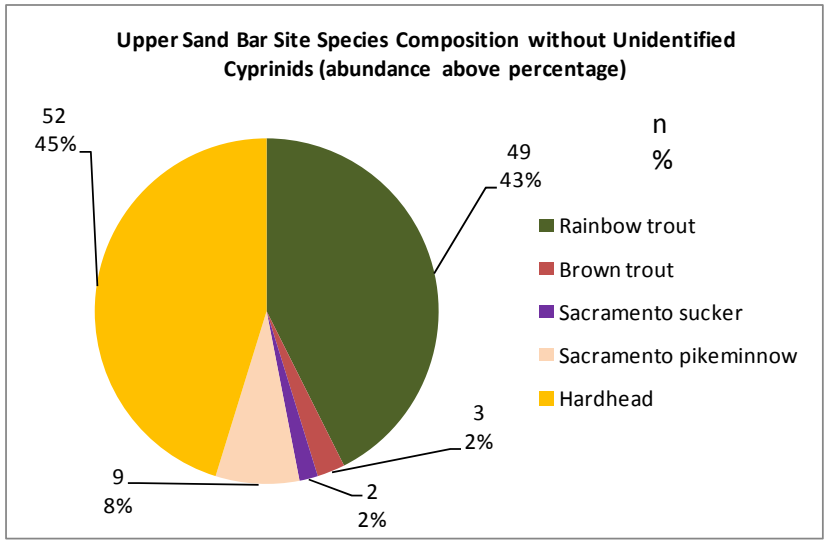


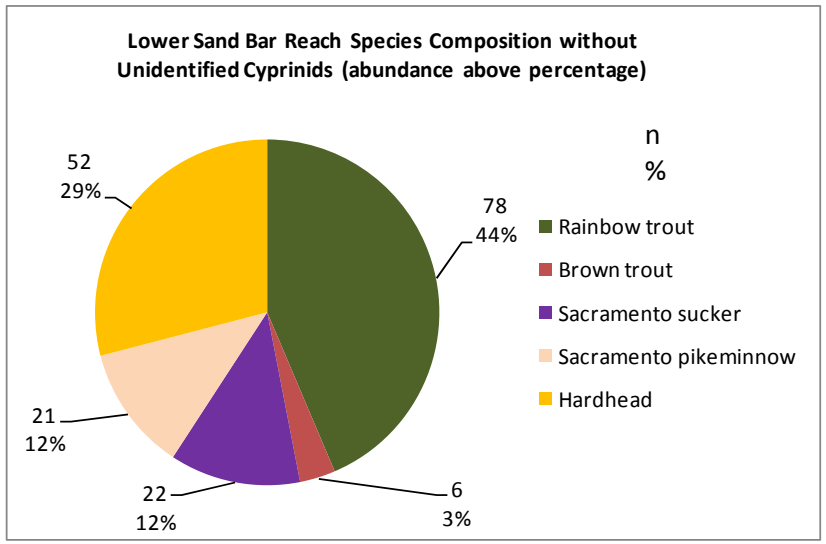
Note: n = number % = percent of total

Figure 12. Species Composition with Unidentified Cyprinids by Site and Reach, 2010.









Note: n = number % = percent of total

Figure 13. Species Composition without Unidentified Cyprinids by Site and Reach, 2010.

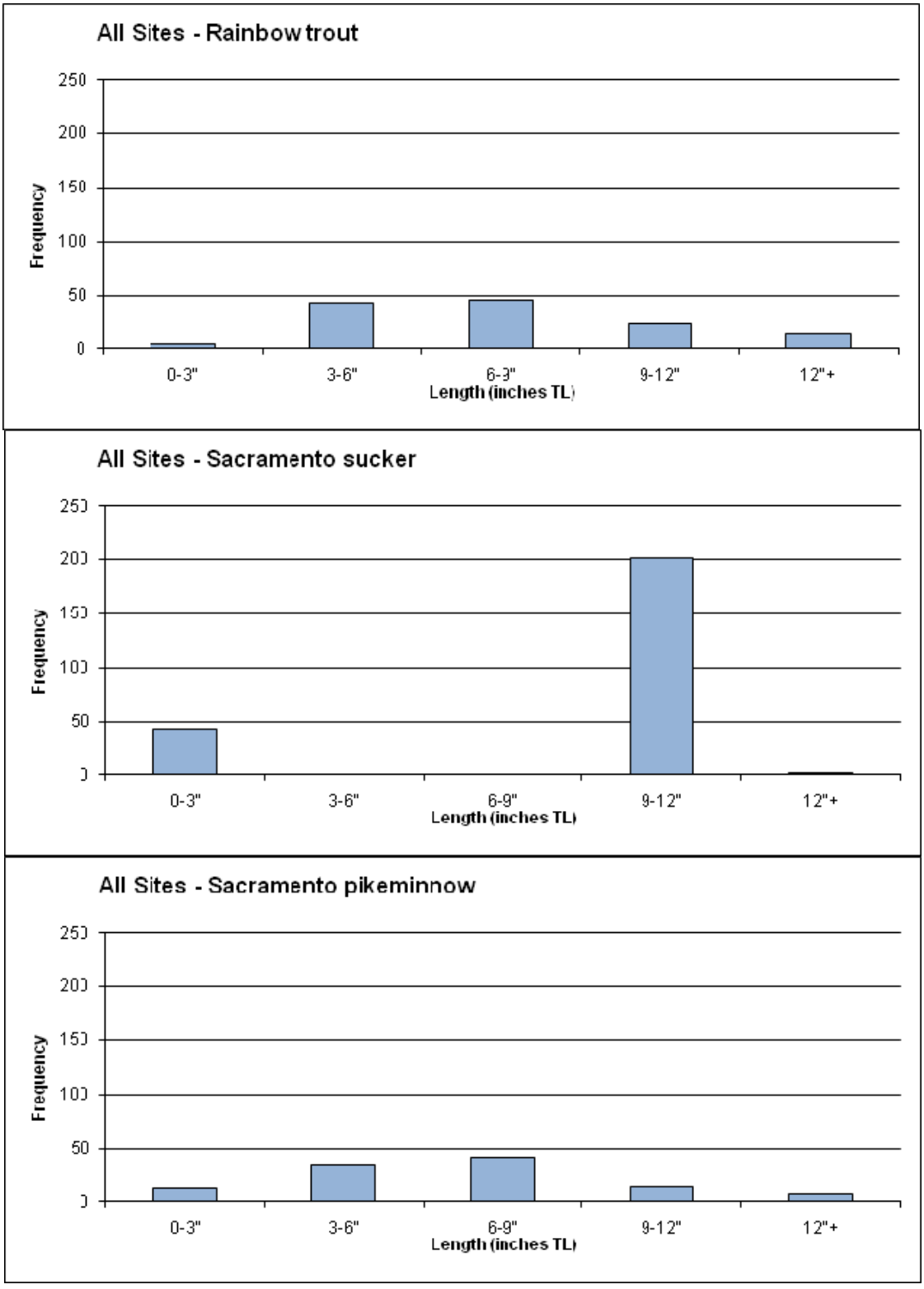


Figure 14. Length-Frequencies for Abundant Species for all Sites, 2010.

Table 6. Physical Measurements by Site, 2010.

Site	Surface Temperature (°C)	Dissolved Oxygen (mg/l)	pH	Visibility (ft)
Upper Sand Bar Site	14.80	9.54	7.59	9
Lower Sand Bar Site	15.72	9.14	7.78	9
Camp Nine Site	14.43	9.87	7.73	12

feet. Substrate data collected shows this site to be boulder dominant and cobble subdominant with an average depth of 4.7 feet and a maximum depth of 14.5 feet (Table 2).

3.4.3 Lower Sand Bar Site

The Lower Sand Bar Site was established at the downstream extent of the Lower Sand Bar Dam Reach. GPS points and photos detailing the survey location are presented in (Appendix E). A total of 117 fish were observed at the Lower Sand Bar Site (Table 5). Four species were identified along with unidentifiable cyprinids. Unidentified cyprinids were the most abundant and made up 64 percent of the total with 117 individuals (Figure 12). Rainbow trout were the most abundant identified species and made up 45 percent of the positively identified observations with 29 individuals (Figure 13). No hardhead was identified. Most rainbow trout were between six and nine inches in length (Table 5), the overall length frequency for rainbow trout is presented in Figure 14. Visibility during the survey was measured at nine feet and water temperature was 15.7°C, and dissolved oxygen was 9.14 mg/l (Table 6). The study site was comprised of 230 feet of deep pool and 191 feet of associated fastwater (Table 2). Average channel width was 48 feet. Substrate data collected shows this site to be largely boulder dominant but with some cobble and bedrock also present. The study site was measured to have an average depth of 3.4 feet and a maximum depth of eight feet (Table 2).

3.4.4 Camp Nine Reach

The Camp Nine Reach had one survey site established at the upstream extent of the reach just downstream of the North Fork and Middle Fork Stanislaus River confluence. GPS points and photos detailing the survey location are presented in (Appendix E). Five fish species were positively identified at the Camp Nine Site. A total of 1,795 individual fish were observed (Table 5). Schools of unidentified cyprinids were part of this total and made up 65 percent of all fish observed at the site (Figure 12). Of the 690 fish that were positively identified, hardhead was the most abundant species; comprising 43 percent of all conclusive observations with 264 individuals present (Figure 13). Seventy four percent of all hardhead observed were between six

and nine inches, 19 percent were between nine and twelve inches (Figure 11). Sacramento sucker were the second most abundant identifiable species making up 35 percent of all positive identifications (Figure 13). Visibility during the survey was measured at 12 feet; water temperature was 14.4°C, and dissolved oxygen was 9.87 mg/l (Table 6). The study site in this reach was 834 feet in length with 588 feet deep pool and 246 feet associated fastwater habitat (Table 2). Average channel width at the site was 87 feet. Substrate data collected shows this reach to be boulder dominant and sand and bedrock sub dominant. Average depth for the site was 4 feet and maximum depth was 11.3 feet (Table 2).

3.5 ALGAL MONITORING

Algal abundance transects established at all three sites provide a baseline for the condition and density of algae available to hardhead in the Camp Nine and Lower Sand Bar Reaches. Transect GPS locations width and unit type are presented in Table 7. Condition refers to the state that the present algae is in and ranges from zero, being the poorest condition to 5, being the healthiest condition. Density refers to the surficial cover of substrate by algae regardless of its condition and has a similar scale ranging from zero, or none detected to five, substrate completely obscured. In addition to condition and density determinations, algal filament height was measured. Algal abundance data is summarized in Table 8 and an overall description of each site follows below.

The Upper Sand Bar Site algal condition ranged from level 1, detritus with a few recognizable elements, to level 3, discolored green, yellow, or rusty with epiphyte or silt loads, with the average condition of level 2, pale, weak, senescent in appearance. Algal density at the Upper Sand Bar Site ranged from level 1, a few filaments or small isolated patches, to level 4, greater than 25 percent cover, with the average density being level 3, 10-25 percent cover. Algal filament heights were generally 1 cm but one quadrat had filaments averaging 10 cm. Average filament heights were 1.7 cm at the Upper Sand Bar Site.

The Lower Sand Bar Site algal condition ranged from level 1, detritus with a few recognizable elements, to level 3, discolored green, yellow, or rusty with epiphyte or silt loads, with the

Table 7. Spring Gap Stanislaus 2010 Algae Survey Transect Locations.

Site	Transect	Habitat Type	Transect Width	GPS Location (UTM)	
				Northing	Easting
Sand Bar Upstream	1	Pool	66	734125	4228484
	2	Pool	85.5	734157	4228466
	3	Flat Water	68	734586	4228512
Sand Bar Downstream	1	Flat Water	56	732802	4226843
	2	Pool	54	732857	4226930
	3	Pool	55	732771	4226822
Camp Nine	1	Flat Water	64	730854	4226082
	2	Pool	64	730962	4226112
	3	Pool	120	730976	4226108

Table 8. Spring Gap Stanislaus 2010 Algae Survey Data.

Site	Transect	Quadrat	Condition[1]	Density[2]	Filament Height (cm)	Mean Depth (ft)	Mean Velocity (ft/sec)
Upper Sand Bar Site	1	Left Bank	1	1	1	0.93	0.4
		Left Center	2	2	1	0.9	0.59
		Center	2	4	1	1.3	0.86
		Right Center	2	4	1	1.13	1.02
		Right Bank	2	3	1	1.23	0.31
	2	Left Bank	2	3	1	1.2	0.25
		Left Center	2	2	1	3.47	0.41
		Center	2	2	1	3	0.4
		Right Center	2	2	1	2.7	0.3
		Right Bank	3	2	10	0.77	0.17
	3	Left Bank	3	3	2	2.8	-0.16
		Left Center	2	2	1	3.97	0.77
		Center	2	2	1	1.67	0.37
		Right Center	3	4	1	2.97	0.54
		Right Bank	3	2	1	0.77	0.06
	Site Averages		2	3	1.7	1.92	0.42
Lower Sand Bar Site	1	Left Bank	2	1	1	1	0
		Left Center	3	4	1	2.57	0.59
		Center	3	4	1	2.67	0.64
		Right Center	3	4	1	2.6	0.5
		Right Bank	1	1	1	2	0.07
	2	Left Bank	2	2	1	0.7	0.31
		Left Center	2	1	1	0.7	1.09
		Center	3	3	1	1.93	0.91
		Right Center	2	3	1	1.03	1.28
		Right Bank	2	1	1	0.33	0.22
	3	Left Bank	1	1	1	0.27	0
		Left Center	2	2	1	2.43	0.36
		Center	1	1	1	3	0.77
		Right Center	1	1	1	1.97	0.4
		Right Bank	3	3	2	1.43	0
	Site Averages		2	2	1.1	1.64	0.48

Table 8. Spring Gap Stanislaus 2010 Algae Survey Data (continued).

Site	Transect	Quadrat	Condition[1]	Density[2]	Filament Height (cm)	Mean Depth (ft)	Mean Velocity (ft/sec)
Camp Nine Site	1	Left Bank	2	3	1	1.47	0.36
		Left Center	3	4	2	1.87	0.18
		Center	3	3	1	3	1.09
		Right Center	3	3	1	1.37	-0.06
		Right Bank	3	4	1	0.77	0.45
	2	Left Bank	4	4	8	0.53	0.29
		Left Center	3	4	1	2.53	0.77
		Center	3	4	2	3.67	0.71
		Right Center	3	3	1	2.73	0
		Right Bank	3	4	2	1.5	0.31
	3	Left Bank	3	4	1	0.57	0
		Left Center	3	4	18	0.8	0.24
		Center	3	3	1	0.87	0.66
		Right Center	3	1	1	3.47	0.91
		Right Bank	3	3	1	3.77	0
	Site Averages		3	3	2.8	1.93	0.39

[1] Algal condition was determined to be detritus (0), detritus with a few recognizable elements (1), pale, weak, senescent in appearance (2), discolored green, yellow, or rusty with epiphyte or silt loads (3), more green, filaments more robust (4), or deep, bright green with fresh-appearing growth (5).

[2] Density was ranked as none detected (0), a few filaments or small isolated patches (1), <10 percent canopy cover (2), 10-25 percent canopy cover (3), >25 percent canopy cover (4), or substrate completely obscured by algal canopy (5).

average condition of level 2, pale, weak, senescent in appearance. Algal density at the Upper Sand Bar Site ranged from level 1 a few filaments or small isolated patches to level 4, greater than 25 percent cover, with the average density being level 2 less than 10 percent cover. Algal filament heights were generally 1 cm but one quadrat had filaments averaging 2 cm. Average filament height was 1.1 cm at the Lower Sand Bar Site.

The Camp Nine Site algal condition ranged from level 2, pale, weak, senescent in appearance, to level 4, more green, filaments more robust, with the average condition of 3, discolored green, yellow, or rusty with epiphyte or silt loads. Algal density at the Upper Sand Bar Site ranged from level 1, a few filaments or small isolated patches, to level 4, greater than 25 percent cover, with the average density being level 3, 10-25 cover. Algal filament heights were generally 1 to 2 cm but two quadrats had filaments averaging 8 and 18 cm respectively. Average filament height was 2.8 cm at the Camp Nine Site.

4.0 RECOMMENDATIONS

4.1 HARDHEAD TAGGING

The tagging effort during 2010 fell short of the goal of 20 adult hardhead tagged for 2011 tracking. Other fish species were much more active and aggressively feeding relative to adult hardhead. Interference from other fish species likely affected the number adult hardhead captures despite large numbers of adult hardhead present. Sampling a few weeks earlier when water temperatures were warmer may eliminate interference from other species. Hardhead are more active at higher temperatures. Sampling during two visits instead of one will likely increase the chances of capturing adult hardhead. In addition, expanding the number of habitats sampled below the confluence with the Collierville Powerhouse tailrace and farther upstream on the mainstem of the Stanislaus River should greatly increase the opportunities to capture adult hardhead for tagging and tracking.

4.2 ALGAL MONITORING

We do not recommend further algal monitoring within the study area based on our results in 2010. Algae were relatively plentiful in the Camp 9 Reach compared to the Upper and Lower Sand Bar reaches. However, algae were observed consistently throughout all three reaches in fall. It does not appear likely, that the amount of algae is a limiting factor for any of the native fish species distribution in the areas studied.

5.0 REFERENCES

California Department of Water Resources (CDWR). 2010. Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classification Indices. Accessed on January 21, 2011. Available at http://cdec.water.ca.gov/cgi-progs/iodir/WSIHIST

Campbell, R.F., and J.H. Neuner. 1985. Seasonal and diurnal shifts in habitat utilized by resident rainbow trout in western Washington Cascade Mountain streams. Pages 39-48 *in* F.W, Olson, R.G. White and R.H. Hamre, editors. *Symposium on small hydropower and fisheries*. Bethesda, MD: American Fisheries Society.

ECORP Consulting, Inc. (ECORP). 2004. Results of 2003 foothill yellow-legged frog (*Rana boylii*) and mountain yellow-legged frog (*Rana muscosa*) studies at the Spring Gap-Stanislaus Project (FERC Project No. 2130).

Fausch, K.D. and R.J. White. 1981. Competition between brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) for positions in a Michigan stream. Canadian Journal of Fisheries and Aquatic Sciences 38:1220-1227.

Griffith, J.S., Jr. 1972. Comparative behavior and habitat utilization of brook trout (*Salvelinus fontinalis*) and cutthroat trout (*Salmo clarki*) in small streams in northern Idaho. Journal of Fishery Research Board of Canada 29:265-273.

Hankin, D.G. and G.H. Reeves. 1988. Estimation total fish abundance and total habitat area in N.R.N. Watson. 1985. Seasonal changes in abundance of brown trout (*Salmo trutta*) and rainbow trout (*S. gairdnerii*) assessed by drift diving in the Rangitikei River, New Zealand. New Zealand Journal of Marine and Freshwater Research. 19:1-10.

Hicks, B.J. and N.R.N. Watson. 1985. Seasonal changes in abundance of brown trout (*Salmo trutta*) and rainbow trout (*S. gairdnerii*) assessed by drift diving in the Rangitikei River, New Zealand. *New Zealand Journal of Marine and Freshwater Research 19*:1-10.

Hillman, T.W., J.W. Mullan, and J.S. Griffith. 1992. Accuracy of underwater counts of juvenile chinook salmon, coho salmon, and steelhead. North American Journal of Fisheries Management 12:596-603.

Pacific Gas and Electric Company (PG&E). 2010a. Hardhead Monitoring Plan. Spring Gap-Stanislaus Project (FERC Project No. 2130). June 2010. San Francisco, CA.

PG&E. 2010b. Foothill Yellow-legged Frog (*Rana boylii*) Monitoring Plan. Spring Gap-Stanislaus Project (FERC Project No. 2130). June 2010. San Francisco, CA.

Platts, W.S., W.F. Megahan, and G.W. Minshall. 1983. Methods for evaluating stream, riparian, and biotic conditions. USDA For. Serv. Gen. Tech. Rep. INT-138.

Southern California Edison (SCE). 2008. Final Native Aquatic Species Management Plan (NASMP). Big Creek, CA.

APPENDIX A

HARDHEAD RADIOTAGGING DETAILED METHODS

Capture of Hardhead

A crew of three fishery biologists captured and tagged six adult hardhead (>180g) using hook and line with artificial lures and bait. All samplers had a valid CDFG scientific collection permit or a California fishing license. All hook barbs were crimped to minimize hook injury and aid in removal of hooks after capture. All field personnel handling fish wore fishing gloves and used needle nose pliers to minimize harm to fish and handling time. Adult hardhead were placed into aerated insulated coolers prior to processing. Each member of the field crew carried his/her own bucket and immediately transferred all captured hardhead to the aerated cooler(s). The cooler(s) were sanitized with disinfectant prior to use. No water containing hardhead or Sacramento pikeminnow was returned directly to the stream. This was done to avoid introduction of *Schreckstoff* (a chemical produced by captured/stressed minnows that creates an alarm response in other minnows) into the sample site. The field crew immediately released trout and spotted and smallmouth bass caught incidentally. Preparation for implanting tags PG&E, proposed to use radio transmitters manufactured by Advanced Telemetry Systems Inc. (ATS or equivalent) with a projected battery life in excess of one-year. Transmitters weighed approximately 4.3 grams before attachment to fish, but lost at least 0.7 grams after they were custom fit for attachment. The final weight of the transmitter and harness included the addition of brass wire beads and plastic discs. Based on the size of the transmitter, all hardhead utilized for radio telemetry weigh at least 180 grams to meet the typical nominal <2 percent transmitter-to-body weight ratio. Captured hardhead under this weight were not be fitted with a radio tag and were held for eventual release after collection of suitable samples. All tagged fish were measured for both fork and total length prior to the tag attachment procedure. The condition of the fish prior to and after tagging were noted. Any lesions, parasites, or injuries were recorded and photographed. Global Positioning System (GPS) coordinates in Universal Transverse Mercator (UTM) were recorded for all capture locations for utilized hardhead. In addition, sexual maturity indicators were noted when encountered. All tagged fish were photographed and referenced to their specific radio tag frequency.

All containers and tools for processing fish were disinfected and/or sterilized prior to, and after, each use. Tubing, attachment wires, plastic disks, and beads used to attach the tags were sterilized with isopropyl alcohol or Betadine. Fish captured for tagging were placed in a cold water bath initially and then moved to a cooler bath to reduce their metabolism, immediately prior to being anesthetized with carbon dioxide.

Adult hardhead greater than 180 grams, were wetted-down and checked for anesthesia recovery (movement or increased pumping of opercles) and suitability for tagging. These fish were placed in a plastic open ended cylinder cradle for tag attachment. Small holes were made through the posterior beneath the dorsal fin, using a template for a guide and surgical pick. The template was aligned in the musculature immediately below the dorsal fin close to the dorsal centerline. Meanwhile, another team member disinfected a tagging gun needle with Betadine. The tagging gun was used for guiding the tag fastening wires. The surgical pick and other tools were sterilized using isopropyl alcohol before and after tagging each individual hardhead.

Attaching the External Radio Transmitter

The tag number and transmitter frequency was recorded with length and weight information for each fish tagged. The radio tag receiver (ATS Model R2100 or equivalent) was tuned to the transmitter frequency and the operation of the transmitter confirmed prior to attachment. A tag gun (or equivalent needle) was inserted through the incision (hole) made with the surgical pick, with the needle extending through each side of the fish. Small gauge plastic tubing was strung on the attachment wire of the tag prior to threading through the tagging needle and incision. The anterior attachment wire of the transmitter was threaded through the body on anterior side of the dorsal fin. Next, a plastic disc and metallic bead was seated on the cable and secured against the fish. The metallic bead was crimped as soon as the cable was fastened onto the fish correctly. Then, a knot was tied next to the outside of the bead. This process was repeated to the posterior incision below the dorsal fin. The crimped beads and knots were coated and secured with crazy glue and excess cable trimmed to complete the process. Fish were irrigated with water from a spray bottle during tagging, to prevent dehydration. In addition, a Floy tag was implanted beneath the dorsal fin to extend from the opposite side of the fish from the transmitter. Fish were placed back into an aerated cooler filled with fresh water and allowed to recover. Tagged fish were released to the capture site (habitat) after they had regained equilibrium for at least five

minutes. The GPS location of each capture site and release site habitat was recorded. The water in the anesthesia and recovery coolers were replaced at a minimum of every half hour to avoid ammonia buildup. Water temperature was monitored at the start of sampling and as the fish were released.

APPENDIX B

SNORKEL SURVEY DETAILED METHODS

Direct observation of fish by snorkel surveys were conducted to determine distribution, relative abundance, and size distribution of hardhead in the Camp Nine and lower Sand Bar Dam reaches. Each sample unit was stratified into swimming lanes parallel to the direction of stream flow using weighted rope as lane markers. Underwater clarity was used to determine lane width (Hillman et al. 1992) and was measured prior to installing lane markers. It was anticipated that stream flow velocity and depth in some sample units would exceed the divers' ability to crawl along the bottom or swim at the water surface. In these units, pull ropes for assisting the upstream movement of divers was used. One rope (main rope) was positioned at the upper most boundary of the sample unit, perpendicular to the flow. Pull ropes (number of pull ropes depended on the number of divers) were attached to, and spaced evenly along, the main rope and allowed to float at the water surface parallel with the flow. The pull ropes extended from the main rope downstream to about the lowermost boundary of the sample unit.

Divers used the pull ropes to aid their movement upstream. Lane markers and pull ropes were positioned at least two hours prior to each direct underwater observation survey. This delay minimized the influence of disturbance on the fish community (Hankin and Reeves 1988).

Direct underwater observation methods were used to identify and count fish. Methods were generally be similar to those presented in Griffith (1972), Platts et al. (1983), Hicks and Watson (1985), Hankin and Reeves (1988), and Hillman et al. (1992). Surveys were performed between 0900 to 1600 hours (Hankin and Reeves 1988) to maximize the likelihood that light intensity was suitable for observing fish. Surveys were not conducted on overcast days (Platts et al. 1983).

Divers using masks and snorkels entered slightly below the downstream end of the sample unit (Hankin and Reeves 1988). Divers moved directly across and slightly below the lower most boundary of the sample unit into their designated swimming lane. When in position, the divers moved upstream to the lowermost boundary of the sample unit. From a fixed position and prior to moving upstream (Campbell and Neuner 1985), the divers looked ahead to locate fish on the fringe of vision (Platts et al. 1983). The coloration of fish allowed them to blend into the

surrounding background. Because of this, looking ahead from a fixed position allowed the divers to see fish that may not have noticed if the divers had been simultaneously moved about to looked for fish. Divers identified and counted fish in their lane while they moved slowly upstream at a uniform, even, pace with no abrupt movements. Fish were counted as they passed below or to the side of an observers. Cover for fish such as interstitial spaces between substrate particles, woody debris, bubble screen, crannies in bedrock and along stream margins were inspected closely for concealed fish (Fausch and White 1981; Hicks and Watson 1985). Methods presented in Hicks and Watson (1985) were followed when identifying and counting fish in habitats where the bottom could not be seen from the surface. One diver dove while the others remained at the surface. Once the diver returned to the surface, the diver to the near right dove while the others remained at the surface. After each diver had surveyed the pool bottom in their lane, they moved upstream. The procedure was repeated until the pool became shallow so the bottom could be seen from the surface.

Pockets of high water velocities, or channel morphology, influenced diver movements and interrupted the dive line. As a result, the dive team did not move upstream uniformly in an even line across the stream, because divers moving ahead of others may have startled the fish. An observer monitored and orally maintained diver distribution and sampling rate.

Hardhead were enumerated by size category (0-10, 11-20, 21-30, 31-40, and >41 cm). Sizes were visually estimated and confirmed periodically using a calibration cord. The calibration cord was a piece of thin diameter rope with size length categories marked on it. In addition to the fish length calibration cord, all divers were experienced in estimating fish lengths, so estimates of fish length were accurate. Tallies were made on standardized matrix on wrist-mounted underwater dive slates. At the end of each dive, the data was transferred from the dive slates to the field notebook, and the dive slates were wiped clean. During snorkel surveys, it was anticipated that schools of mixed cyprinids (young of the year and yearling hardhead, Sacramento pikeminnow, and California roach) would be encountered. However, sampling the mixed schools was not performed to determine species proportions.

Physical Habitat Assessment

Physical habitat information was collected at each sample unit. Measurements of length and width was recorded along with an estimation of maximum depth and average depth at the site. Observations were made to characterize the habitat at each sample site. These observations included characterization of substrate, riparian conditions, presence of suitable spawning areas for certain species, and presence of woody debris or other cover. Habitat types used to describe each site were be selected from the following categories:

1. Boulder Pocket Water: moderate and high-gradient stream sections containing large closely-spaced boulders which cause uneven water surface elevations, multi-directional flow patterns, small cascades, strong eddy currents and backwater zones.
2. Boulder Run: low to moderate gradient stream reach containing sparsely-spaced boulders and cobbles. Water surface elevations are generally flat and of a uniform gradient through the habitat unit. The large streambed particles disrupt vertical and horizontal velocity profiles often causing high velocity zones to occur adjacent to low velocity areas.
3. Cascade: steep gradient habitat unit with a vertical change or series of changes in the water surface elevation of more than one foot.
4. Deep Pools: low gradient habitat unit with a flat water surface, low velocities and depths greater than three feet.
5. Shallow Pools: low gradient habitat unit with a flat water surface, low velocities, and depths less than three feet.
6. Runs: low to moderate gradient habitat unit with a relatively uniform water surface gradient, moderate velocities, and relatively uniform depths.
7. Riffles: moderate to steep gradient habitat unit of shallow depth, high velocity and irregular water surface elevation.

The riverbed at each station will be evaluated to determine the surficial substrate composition. Substrate composition will be visually estimated as the percentage of surface area covered by substrate in the following categories:

1. fines

2. sand (4 mm – 8 mm)

3. gravel (8 mm – 75 mm)

4. rubble (75 mm - 600 mm)

5. boulder (>600 mm)

6. bedrock

At each sampling station, the reach length was measured. Wetted widths were measured at four cross sections within the reach. The cross sections were located: at the downstream end of the site, 1/3 of the site length upstream of the bottom of the site, 2/3 of the site length upstream of the bottom of the site, and just below the upstream end of the site. Along each transect, four depths were recorded, at 1/4, 1/2, and 3/4 the distance across the river as well as in the thalweg. Measurements were made at each sampling station of air and water temperatures, specific conductance, turbidity, and dissolved oxygen using a multi-parameter water quality meter (Quanta or equivalent). This meter was calibrated prior to the trip. The time at which these observations were made were recorded along with the measurements. Global Positioning System (GPS) coordinates were recorded for the top and bottom of each sampling site. Photographs were taken of each sample site to document physical characteristics. These data will provide useful information for characterizing sampling conditions between this and subsequent monitoring periods. Underwater clarity was measured at each snorkel sample site using a standardized technique (e.g., Platts et al. 1983). A small object (about 75 mm total length) similar in size and shape to a small bass was placed in the river. The distance at which the object in the stream disappeared from a divers view was measured and recorded. These measurements will facilitate comparisons between sites and identify any physical changes at the sites over time. This may help explain differences in relative abundance or size distribution. Data were entered into computer databases and verified by comparing with original data sheets.

Algal Surveys

The purpose of these surveys is to “determine relative food availability and evaluate if algae is limiting hardhead use of the lower Sand Bar Dam Reach” (Forest Service 4(e) conditions and

State Water Board 401 Water Quality Certification Terms and Conditions). PG&E is not aware of any published literature on primary production as a limiting factor in hardhead abundance, but will review relevant hardhead literature and consult with experts to determine if such information exists. PG&E will talk with Forest Service to obtain any information they have on this subject. Within each site, algal surveys will be collected using the same methods used in the 2003 FYLF surveys (ECORP 2004). These methods are described below.

Within each site, three (3) cross-sections were established perpendicular to the channel. At each cross-section location, algal cover was assessed in five locations, distributed equidistantly across the active channel using a 1-meter square quadrat made of 1-inch PVC pipe. A tape measure was stretched across the main channel and secured. The quadrat was placed so that it floated on the waters surface, and algae present within the quadrat was visually assessed and recorded on standardized field data sheets.

The following parameters were measured: Algal condition was determined to be detritus (0), detritus with a few recognizable elements (1), pale, weak, senescent in appearance (2), discolored green, yellow, or rusty with epiphyte or silt loads (3), more green, filaments more robust (4), or deep, bright green with fresh-appearing growth (5). Densities were ranked as none detected (0), a few filaments or small isolated patches (1), <10 percent canopy cover (2), 10-25 percent canopy cover (3), >25 percent canopy cover (4), or substrate completely obscured by algal canopy (5). The height of algal filaments were measured to the nearest centimeter and the overall percent algal cover was estimated to the nearest five percent. In addition, the mean water depth and mean surface velocity were calculated from a minimum of three measurements taken across the width of each quadrat.

APPENDIX C

WATER TEMPERATURE MONITORING DETAILED METHODS

The new license requires that stream temperature monitoring be conducted for both the Hardhead Monitoring Plan (Plan) and the Foothill Yellow-legged Frog (*Rana boylii*) Monitoring Plan (FYLF Plan). Proceeding from upstream to downstream, the FYLF Plan water temperature monitoring locations are:

1. at the Sand Bar Diversion Dam;
2. mid-Sand Bar Dam Reach, co-located at a known FYLF breeding site;
3. a side channel or backwater area adjacent to the site above; and
4. above the confluence of the Middle and North Forks of the Stanislaus River.

The Plan water temperature monitoring locations are:

1. Middle Fork Stanislaus River above North Fork Stanislaus River,
2. Stanislaus River above Collierville Powerhouse,
3. Stanislaus River below Collierville Powerhouse,
4. Stanislaus River below Stanislaus Powerhouse.

Note the overlap between the two plans in the most downstream site for the FYLF Plan and the most upstream site of the Plan. These efforts were conducted jointly and the methods described below apply to both studies.

Water Temperature Recorders

Thermographs (data recorders) were deployed in mid-March, prior to the onset of FYLF breeding and before peak runoff. Monitoring continued through September. The monitoring is proposed to continue for five years consistent with FYLF and hardhead sampling. Two data recorders were deployed at each location to minimize the potential for data loss. Data recorders were deployed inside a protective metal housing secured with chain and locks.

APPENDIX D

TEMPERATURE AND HYDROLOGY DATA

Table D-1. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, April 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
4/1/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/2/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/3/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/4/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/5/10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4/6/10	7.5	6.9	7.8	10.0	9.7	10.2	10.1	9.8	10.2	10.3	9.7	11.0	-	-	-	-	-	-	-	-	-	89
4/7/10	7.6	6.9	8.4	10.3	8.6	11.9	10.4	8.6	11.9	10.6	8.8	13.0	-	-	-	-	-	-	-	-	-	90
4/8/10	8.1	7.4	8.7	11.9	10.4	13.3	11.9	10.4	13.3	12.2	10.7	14.5	-	-	-	-	-	-	-	-	-	90
4/9/10	8.2	7.5	9.0	12.2	10.8	13.4	12.3	10.9	13.4	12.7	11.2	14.7	11.4	10.0	12.0	7.8	6.8	8.8	8.3	7.6	8.9	92
4/10/10	8.1	7.7	9.0	11.3	10.5	12.7	11.4	10.6	12.7	11.9	10.9	12.7	10.2	9.6	11.2	8.4	6.9	10.0	8.6	7.4	9.8	90
4/11/10	7.5	7.1	8.2	9.7	8.7	10.5	9.8	8.8	10.6	10.1	9.0	10.8	8.9	8.0	9.6	7.6	6.7	8.7	7.7	7.0	8.6	90
4/12/10	6.8	6.6	7.0	8.2	7.9	8.7	8.3	8.0	8.8	8.6	8.2	8.9	7.2	6.8	7.9	6.4	5.3	7.4	6.5	5.7	7.4	90
4/13/10	7.4	6.5	8.3	8.8	7.5	10.2	8.9	7.5	10.2	9.1	7.7	11.0	7.7	6.2	9.5	5.6	4.3	6.5	5.9	5.3	6.6	90
4/14/10	7.9	7.3	8.4	9.9	9.0	10.8	10.0	9.0	10.9	10.2	9.3	11.2	8.9	7.9	9.7	7.2	5.3	8.7	7.3	5.8	8.7	90
4/15/10	8.0	7.2	8.7	10.7	9.1	12.1	10.7	9.1	12.1	10.9	9.4	12.8	9.5	8.0	11.0	7.2	5.7	9.3	7.4	6.1	8.7	90
4/16/10	8.2	7.5	8.9	11.8	10.5	13.1	11.9	10.6	13.2	12.3	10.9	14.3	10.7	9.4	12.1	7.7	6.2	9.8	8.1	6.9	9.1	89
4/17/10	8.4	7.5	9.3	12.1	10.4	13.4	12.1	10.4	13.4	12.5	11.0	14.4	10.9	9.5	12.2	9.2	7.6	10.9	9.2	8.1	10.1	90
4/18/10	8.8	7.9	9.7	13.0	11.4	14.4	13.1	11.5	14.4	13.5	11.9	15.6	11.6	10.4	12.9	8.8	7.7	10.2	9.2	8.4	10.3	92
4/19/10	8.9	8.2	9.5	13.3	12.4	14.0	13.4	12.4	14.0	13.9	12.8	15.2	11.8	10.8	12.4	8.9	7.8	10.7	9.3	8.5	10.5	92
4/20/10	8.1	7.5	9.2	11.7	10.2	13.2	11.8	10.3	13.3	12.4	10.6	13.7	10.1	7.8	11.8	8.0	6.8	9.8	8.4	7.1	9.9	96
4/21/10	7.6	7.0	8.0	9.1	8.6	10.1	9.1	8.7	10.2	9.5	9.1	10.5	7.2	6.9	7.7	5.5	4.9	6.7	5.9	5.3	7.0	100
4/22/10	7.8	7.3	8.2	8.9	8.5	9.4	9.0	8.5	9.4	9.2	8.9	9.5	7.7	7.4	8.2	5.3	4.8	6.3	5.7	5.3	6.7	97
4/23/10	8.4	7.4	9.4	11.1	9.0	13.4	11.1	9.0	13.4	11.2	9.2	13.9	9.7	8.1	11.9	6.5	5.8	8.2	7.0	6.3	8.6	96
4/24/10	8.8	7.9	9.6	13.0	11.2	14.6	13.0	11.2	14.6	13.4	11.7	15.4	11.5	10.1	13.0	8.0	7.1	9.5	8.6	8.1	9.4	91
4/25/10	9.1	8.1	10.0	13.9	12.3	15.4	14.0	12.3	15.4	14.4	12.8	16.7	11.9	10.4	13.3	8.0	7.2	9.8	8.7	8.3	9.8	91
4/26/10	9.2	8.3	9.9	14.3	12.8	15.6	14.3	12.8	15.7	14.9	13.3	17.0	12.1	10.5	13.3	8.1	7.1	10.0	8.8	8.3	10.0	91
4/27/10	8.6	8.2	9.5	12.8	11.2	14.6	12.9	11.2	14.6	13.5	11.9	14.8	11.0	9.8	12.7	7.8	6.9	9.8	8.3	7.4	9.9	95
4/28/10	7.7	7.0	8.2	9.8	8.8	11.1	9.9	8.8	11.2	10.4	9.1	11.8	8.0	6.7	9.6	5.9	4.6	7.9	6.3	5.0	7.9	92
4/29/10	7.7	6.8	8.4	9.6	7.8	11.2	9.6	7.9	11.3	9.8	8.2	12.0	7.3	5.8	9.1	4.4	3.7	6.2	5.0	4.2	6.3	99
4/30/10	8.0	6.9	9.1	10.9	8.9	12.7	11.0	8.9	12.8	11.2	9.4	13.4	8.8	7.1	10.5	5.5	4.9	7.1	6.1	5.5	7.4	92

- Temperature units were not deployed until 4/6 for Sand Bar Reach sites and 4/9 for Camp Nine Reach sites. Temperature data is therefore unavailable before these dates.

Table D-2. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, May 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
5/1/10	8.4	7.3	9.3	12.5	10.7	14.1	12.5	10.8	14.1	12.8	11.0	15.3	10.2	8.6	12.0	7.0	6.3	8.6	7.6	6.8	8.5	89
5/2/10	8.7	7.8	9.6	13.4	11.8	14.8	13.4	11.8	14.8	13.9	12.2	16.2	11.3	9.9	12.7	7.6	7.1	8.9	8.3	8.0	9.0	91
5/3/10	8.9	7.9	9.7	14.1	12.4	15.7	14.2	12.4	15.7	14.7	12.8	17.1	12.1	10.5	13.7	8.1	7.6	9.5	8.8	8.4	9.5	91
5/4/10	9.0	8.3	9.6	14.8	13.4	16.1	14.8	13.4	16.1	15.4	14.0	17.6	12.8	11.4	14.0	8.6	7.3	9.9	9.3	8.5	10.1	108
5/5/10	8.8	8.3	9.3	13.7	12.1	14.8	13.7	12.2	14.8	14.4	13.2	15.8	12.1	10.9	13.2	8.0	7.2	10.1	8.8	8.2	10.0	120
5/6/10	8.6	8.0	9.3	12.7	10.9	14.0	12.7	11.0	14.0	13.3	11.8	14.9	10.9	9.5	12.1	7.3	6.7	8.9	8.0	7.6	9.1	121
5/7/10	8.7	8.1	9.3	12.8	11.0	14.4	12.9	11.0	14.4	13.4	11.9	15.2	11.4	10.1	12.8	7.3	6.9	8.4	8.0	7.7	8.7	124
5/8/10	8.6	8.0	9.2	13.0	11.2	14.4	13.0	11.3	14.4	13.6	12.2	15.2	11.8	10.5	13.0	7.7	6.9	9.0	8.4	7.9	9.2	128
5/9/10	7.9	7.7	8.7	11.2	10.1	13.4	11.3	10.2	13.4	11.9	10.6	13.7	10.7	9.5	12.3	7.4	6.2	9.0	8.0	6.8	9.2	131
5/10/10	7.5	7.0	7.7	9.3	8.6	10.1	9.4	8.7	10.1	9.8	9.0	10.5	8.9	8.1	9.5	6.1	5.4	7.3	6.6	6.0	7.5	138
5/11/10	7.6	6.8	8.5	9.3	7.3	11.4	9.3	7.3	11.5	9.5	7.7	11.3	8.1	6.5	9.9	5.1	4.0	6.9	5.7	4.8	7.0	159
5/12/10	8.0	7.3	8.8	10.9	8.7	13.2	10.9	8.8	13.2	11.2	9.1	13.0	10.3	8.6	12.1	7.2	6.0	9.4	7.7	6.7	9.2	184
5/13/10	8.1	7.7	8.7	11.5	9.5	13.6	11.5	9.6	13.6	12.1	10.0	13.7	11.7	10.1	13.2	8.3	7.8	9.4	8.9	8.4	9.6	189
5/14/10	8.1	7.4	8.9	11.7	9.8	14.1	11.8	9.8	14.1	12.3	10.2	14.0	12.2	10.5	13.6	8.3	7.6	9.8	8.9	8.4	9.8	190
5/15/10	8.3	7.6	8.9	12.0	10.1	14.1	12.1	10.2	14.1	12.6	10.6	14.2	12.7	11.3	14.1	9.0	7.9	10.8	9.5	8.9	10.5	193
5/16/10	8.3	7.7	8.8	12.2	10.4	13.9	12.2	10.4	14.0	12.8	10.9	14.2	13.0	11.6	14.1	8.8	8.2	10.4	9.5	9.2	10.4	196
5/17/10	7.8	7.6	8.5	10.6	9.8	12.4	10.7	9.8	12.5	11.3	10.3	13.4	11.8	10.6	13.7	8.6	7.3	10.8	9.1	7.9	10.8	198
5/18/10	8.0	7.5	8.8	10.8	9.2	13.0	10.9	9.3	13.0	11.3	9.6	13.2	11.2	9.7	13.1	7.4	7.0	8.3	8.1	7.6	8.8	203
5/19/10	8.1	7.7	8.7	11.3	10.0	12.7	11.4	10.0	12.8	11.8	10.4	12.9	11.9	10.8	12.7	8.3	7.9	9.5	8.9	8.5	9.5	206
5/20/10	8.3	7.7	8.9	11.7	9.9	13.9	11.7	10.0	13.9	12.2	10.4	14.0	12.4	11.0	14.0	9.0	8.4	9.7	9.5	8.9	9.9	210
5/21/10	7.8	7.5	8.2	10.3	9.5	11.7	10.4	9.5	11.8	10.8	9.9	12.6	11.1	10.2	13.1	8.5	7.5	9.6	8.9	8.0	9.8	215
5/22/10	7.6	7.2	8.0	9.5	8.3	10.8	9.5	8.4	10.8	9.9	8.6	11.3	9.8	8.8	10.8	7.1	6.5	7.6	7.7	7.1	8.2	215
5/23/10	7.7	7.1	8.3	9.6	8.0	11.5	9.7	8.0	11.5	10.0	8.2	11.8	9.7	8.1	11.3	7.0	6.2	8.3	7.4	6.5	8.2	216
5/24/10	7.8	7.4	8.1	10.0	8.7	11.7	10.1	8.8	11.8	10.4	9.1	11.9	10.3	9.2	11.6	7.7	6.8	9.2	8.1	7.4	8.9	222
5/25/10	7.8	7.3	8.3	9.7	8.4	10.8	9.7	8.4	10.9	10.1	8.7	11.0	10.2	9.1	11.0	8.5	7.6	9.6	8.5	7.9	9.3	247
5/26/10	7.9	7.7	8.1	9.8	9.3	10.4	9.8	9.3	10.4	10.1	9.6	10.8	10.4	9.9	11.0	8.6	7.8	9.5	8.8	8.2	9.4	296
5/27/10	7.8	7.6	8.0	9.3	8.9	9.9	9.4	9.0	10.0	9.7	9.2	10.1	9.9	9.4	10.5	8.0	7.2	9.1	8.2	7.6	9.1	290
5/28/10	8.0	7.4	8.6	9.9	8.2	12.3	10.0	8.2	12.3	10.2	8.4	12.2	9.7	8.1	11.4	7.3	6.5	8.0	7.6	6.9	8.2	300
5/29/10	8.2	7.5	9.1	10.8	8.7	13.4	10.9	8.7	13.4	11.2	8.9	13.4	11.0	9.0	13.0	8.0	7.0	10.2	8.4	7.4	10.0	294
5/30/10	8.4	7.7	9.2	11.5	9.6	13.8	11.5	9.7	13.8	12.0	10.0	13.9	12.3	10.6	14.0	9.8	8.7	11.0	10.0	9.2	11.0	295
5/31/10	8.4	7.8	8.8	11.4	10.2	12.5	11.4	10.2	12.6	11.9	10.6	12.9	12.7	11.5	13.5	10.4	9.8	11.6	10.6	10.2	11.4	309

Table D-3. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, June 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
6/1/10	8.6	7.9	9.3	11.8	10.0	14.1	11.8	10.1	14.2	12.3	10.4	14.3	13.0	11.4	14.9	10.4	9.6	11.4	10.7	9.9	11.4	319
6/2/10	8.8	7.9	10.1	11.8	10.1	14.0	11.9	10.2	14.1	12.4	10.6	14.2	13.4	11.8	14.9	10.5	10.0	12.1	10.8	10.3	11.8	398
6/3/10	10.3	9.0	11.7	12.0	10.3	13.9	12.1	10.3	14.0	12.4	10.5	14.3	13.1	11.3	14.8	11.1	10.4	12.2	11.4	10.5	12.6	1,442
6/4/10	11.0	9.6	12.1	12.3	10.7	14.2	12.4	10.7	14.3	12.5	10.8	14.5	13.0	11.3	14.8	11.1	10.5	11.7	11.6	10.7	12.5	2,758
6/5/10	11.2	9.6	12.5	12.6	10.7	14.6	12.6	10.8	14.6	12.8	11.0	14.8	13.2	11.5	15.3	11.6	10.8	12.6	12.0	11.0	13.4	4,899
6/6/10	11.1	9.5	12.7	12.5	10.6	14.6	12.6	10.6	14.7	12.7	10.9	14.7	13.1	11.2	15.3	12.1	11.0	13.4	12.4	11.1	14.1	6,464
6/7/10	10.7	9.6	11.5	12.0	10.6	13.4	12.1	10.6	13.5	12.2	10.9	13.6	12.6	11.1	14.2	11.8	10.9	12.6	12.1	11.0	13.1	6,547
6/8/10	10.7	9.5	11.5	12.0	10.6	13.4	12.1	10.6	13.5	12.2	10.8	13.5	12.5	11.0	14.1	11.8	10.8	12.7	12.1	10.9	13.2	6,653
6/9/10	10.5	9.4	11.4	11.7	10.3	12.9	11.8	10.4	13.0	12.0	10.7	13.1	12.2	10.9	13.6	11.7	10.7	12.6	11.9	10.8	13.0	6,480
6/10/10	10.3	9.4	11.1	11.4	10.3	12.7	11.5	10.3	12.8	11.7	10.6	12.9	11.9	10.6	13.3	11.3	10.5	12.1	11.5	10.6	12.6	6,095
6/11/10	11.3	9.5	12.0	12.2	10.2	13.5	12.2	10.3	13.6	12.3	10.5	13.7	12.4	10.5	14.0	11.7	10.4	12.6	11.9	10.5	13.0	4,945
6/12/10	11.0	10.4	11.5	12.3	11.2	13.4	12.3	11.2	13.4	12.5	11.3	13.6	12.7	11.4	14.0	11.9	10.9	12.6	12.2	11.1	13.0	3,705
6/13/10	10.7	9.7	11.7	12.3	11.0	13.9	12.4	11.0	14.0	12.6	11.2	14.2	12.9	11.4	14.6	12.0	11.2	12.7	12.3	11.2	13.2	2,613
6/14/10	10.7	9.6	12.0	12.3	10.6	14.4	12.4	10.6	14.5	12.5	10.8	14.6	13.0	11.1	15.2	12.2	11.1	13.3	12.4	11.1	13.7	1,960
6/15/10	10.9	9.7	12.1	12.6	10.9	14.5	12.6	11.0	14.6	12.8	11.2	14.7	13.3	11.5	15.3	12.8	11.6	14.0	12.9	11.6	14.2	1,723
6/16/10	10.8	9.7	11.6	12.4	10.6	14.2	12.4	10.6	14.3	12.7	10.8	14.5	13.1	11.1	15.1	12.4	11.4	13.0	12.5	11.3	13.2	1,390
6/17/10	10.9	9.7	12.1	12.4	10.4	14.4	12.5	10.4	14.5	12.6	10.6	14.5	13.1	11.0	15.0	11.9	11.1	12.6	12.0	11.1	12.8	990
6/18/10	10.6	9.8	11.6	12.8	10.6	14.8	12.8	10.7	14.9	13.1	10.9	15.0	13.7	11.6	15.5	12.0	11.2	13.2	12.2	11.3	13.0	627
6/19/10	10.3	9.7	11.2	12.7	10.7	14.9	12.8	10.7	14.9	13.1	11.1	14.9	13.8	12.0	15.4	11.8	11.3	12.8	12.1	11.4	12.7	438
6/20/10	10.2	9.5	11.3	12.7	10.7	15.0	12.8	10.7	15.0	13.1	11.2	15.0	13.8	12.1	15.5	12.1	11.4	13.6	12.2	11.4	13.1	393
6/21/10	10.3	9.7	11.2	13.0	11.1	15.0	13.0	11.1	15.1	13.4	11.6	15.2	14.1	12.5	15.7	12.1	11.5	13.2	12.3	11.6	13.0	401
6/22/10	10.6	9.9	11.6	13.4	11.3	15.9	13.5	11.3	16.0	13.9	11.9	16.0	14.6	12.7	16.6	13.4	12.5	15.0	13.2	12.5	14.3	409
6/23/10	10.9	10.2	12.0	13.6	12.0	15.5	13.6	12.0	15.5	14.1	12.5	15.9	15.0	13.5	16.6	14.3	13.2	15.5	14.1	12.8	15.2	626
6/24/10	11.4	10.8	12.2	13.1	11.9	14.3	13.2	12.0	14.4	13.4	12.2	14.6	14.0	12.7	15.3	13.9	12.8	14.9	13.9	12.7	14.9	1,150
6/25/10	12.1	11.3	12.8	13.4	12.2	14.6	13.5	12.2	14.7	13.6	12.4	14.7	14.0	12.8	15.3	13.8	12.9	14.5	13.8	12.9	14.6	1,631
6/26/10	12.0	11.1	13.0	14.0	12.4	15.9	14.0	12.4	16.0	14.2	12.6	16.0	14.7	12.9	16.8	14.0	12.9	16.2	14.1	12.9	16.0	1,649
6/27/10	12.4	11.7	13.5	14.2	12.3	16.3	14.2	12.3	16.3	14.4	12.6	16.3	15.0	12.9	17.1	14.0	13.0	14.9	14.2	12.9	15.2	1,672
6/28/10	12.6	11.8	13.5	14.5	13.0	16.2	14.5	13.1	16.2	14.7	13.3	16.3	15.3	13.7	17.2	14.4	13.8	15.2	14.6	13.7	15.5	1,693
6/29/10	12.6	11.8	13.4	14.5	13.0	16.3	14.5	13.1	16.4	14.7	13.2	16.5	15.3	13.6	17.3	14.8	13.7	16.1	15.0	13.7	16.2	1,718
6/30/10	12.5	11.5	13.4	14.3	12.8	16.1	14.3	12.9	16.2	14.5	13.1	16.3	15.1	13.4	16.9	14.4	13.4	15.2	14.5	13.4	15.3	1,587

Table D-4. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, July 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
7/1/10	12.3	11.3	13.3	14.0	12.3	15.9	14.0	12.4	15.9	14.2	12.5	16.0	14.7	12.8	16.6	14.2	13.0	15.2	14.3	13.0	15.3	1,321
7/2/10	12.2	11.3	13.1	14.0	12.2	16.0	14.0	12.3	16.1	14.3	12.4	16.2	14.8	12.7	16.8	14.3	12.8	16.0	14.3	12.7	15.8	1,069
7/3/10	12.0	11.2	12.9	14.1	12.3	15.9	14.1	12.4	16.0	14.4	12.6	16.2	15.0	13.0	16.8	14.5	13.1	16.0	14.5	13.0	15.8	791
7/4/10	11.2	10.4	12.1	14.1	12.1	16.2	14.1	12.2	16.3	14.6	12.7	16.4	15.4	13.7	17.2	15.2	13.8	16.9	14.8	13.3	16.4	426
7/5/10	11.3	10.6	12.2	14.4	12.5	16.7	14.4	12.5	16.8	14.9	13.0	16.8	15.7	13.9	17.6	15.3	14.1	16.8	14.9	13.6	16.5	415
7/6/10	11.4	10.7	12.3	14.5	12.7	16.7	14.5	12.7	16.7	15.0	13.2	16.8	16.0	14.2	17.7	15.4	14.3	16.6	15.1	13.6	16.2	447
7/7/10	11.9	11.4	12.7	14.5	12.8	16.7	14.6	12.9	16.7	14.9	13.1	16.9	15.7	13.8	17.7	15.5	14.0	16.7	15.3	13.7	16.6	527
7/8/10	12.1	11.4	12.7	14.7	13.3	16.6	14.8	13.3	16.7	15.1	13.5	16.9	15.9	14.1	17.7	15.7	14.4	17.1	15.6	14.3	16.8	548
7/9/10	12.1	11.7	12.6	14.8	13.1	17.0	14.9	13.2	17.1	15.2	13.4	17.2	16.0	14.1	18.0	16.0	14.3	17.6	15.8	14.2	17.2	551
7/10/10	12.0	11.6	12.7	14.8	12.9	16.8	14.9	13.0	16.9	15.2	13.3	17.1	16.1	14.1	17.9	16.0	14.5	17.6	15.8	14.4	17.1	423
7/11/10	11.7	11.1	12.4	15.0	13.2	17.2	15.1	13.2	17.2	15.6	13.8	17.3	16.6	14.9	18.3	16.5	15.2	17.7	16.0	14.6	17.2	278
7/12/10	11.5	10.9	12.1	15.4	13.4	17.7	15.5	13.5	17.8	16.0	14.1	17.8	17.1	15.2	18.9	16.8	15.6	18.7	16.2	15.0	17.6	207
7/13/10	11.4	10.7	12.1	15.6	13.8	17.7	15.7	13.8	17.7	16.4	14.4	17.9	17.7	16.0	19.0	17.3	16.3	18.3	16.3	15.2	17.7	236
7/14/10	11.4	11.1	11.9	15.1	13.4	17.3	15.2	13.4	17.4	15.8	14.0	17.5	17.0	15.1	18.5	16.8	15.5	18.1	16.3	15.0	17.4	289
7/15/10	11.5	11.1	12.3	15.2	13.3	17.5	15.3	13.4	17.6	15.8	13.9	17.6	17.0	15.1	18.7	17.0	15.5	18.2	16.5	14.6	17.6	275
7/16/10	11.3	10.8	11.8	15.6	14.0	17.7	15.7	14.1	17.8	16.3	14.6	17.8	17.6	16.0	19.2	17.3	16.4	18.6	16.5	14.1	17.5	217
7/17/10	11.3	10.7	11.8	16.0	13.9	18.3	16.1	14.0	18.4	16.8	14.6	18.5	18.3	16.5	19.9	17.4	16.7	18.5	16.6	14.9	17.8	198
7/18/10	11.2	10.6	11.9	16.0	13.9	18.2	16.1	13.9	18.3	16.8	14.7	18.4	18.4	16.6	19.7	17.2	16.5	18.1	16.6	15.2	17.4	196
7/19/10	11.2	10.5	11.7	15.7	13.6	17.7	15.7	13.6	17.8	16.5	14.4	17.9	17.9	16.2	19.2	17.0	16.1	18.4	16.1	14.9	17.0	191
7/20/10	11.1	10.4	11.7	15.8	13.6	17.8	15.8	13.6	17.8	16.5	14.5	17.9	18.0	16.4	19.2	16.9	16.5	17.8	15.9	14.2	17.2	169
7/21/10	11.0	10.3	11.6	16.5	14.4	18.2	16.5	14.5	18.3	17.3	15.7	18.7	18.7	17.6	20.0	17.5	16.7	19.0	15.8	13.9	18.1	153
7/22/10	11.0	10.2	11.6	16.3	14.1	18.1	16.4	14.2	18.2	17.2	15.6	18.6	18.6	17.5	19.8	17.1	15.8	18.6	16.1	13.9	17.7	154
7/23/10	11.0	10.3	11.7	16.4	14.1	18.3	16.5	14.2	18.4	17.3	15.6	18.7	18.7	17.5	20.0	16.9	15.7	17.9	16.3	15.0	17.6	155
7/24/10	11.2	10.5	11.8	16.6	14.4	18.3	16.7	14.5	18.4	17.5	15.8	18.7	18.9	17.8	20.0	17.4	16.5	18.6	16.4	15.0	17.7	161
7/25/10	11.2	10.5	11.8	16.5	14.5	17.9	16.5	14.6	17.9	17.4	15.9	18.6	19.0	18.0	20.0	18.3	17.2	19.1	16.4	14.5	18.3	155
7/26/10	11.2	10.5	11.8	16.7	14.5	18.5	16.8	14.6	18.5	17.6	16.0	18.9	19.0	18.0	20.1	18.6	18.0	19.5	16.8	14.9	18.4	157
7/27/10	11.1	10.3	11.8	16.8	14.6	18.5	16.8	14.7	18.5	17.7	16.2	19.0	19.1	18.1	20.2	19.0	18.5	20.0	17.0	14.6	19.1	152
7/28/10	11.2	10.4	11.8	16.3	14.1	18.0	16.4	14.2	18.0	17.2	15.5	18.4	18.6	17.5	19.7	18.8	18.2	19.4	17.0	14.9	18.7	157
7/29/10	11.2	10.5	11.8	16.2	14.0	18.0	16.3	14.1	18.1	17.1	15.4	18.5	18.4	17.2	19.6	18.7	18.2	19.2	17.6	16.0	18.9	156
7/30/10	11.2	10.5	11.9	16.2	14.1	17.9	16.3	14.1	18.0	17.1	15.5	18.4	18.4	17.3	19.5	18.7	18.0	19.3	17.7	15.0	18.8	158
7/31/10	11.2	10.5	11.9	16.0	13.9	17.8	16.1	13.9	17.8	16.9	15.1	18.2	18.1	16.9	19.3	18.5	17.7	19.2	17.6	16.2	18.6	159

Table D-5. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, August 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
8/1/10	11.2	10.5	11.9	15.9	13.7	17.6	16.0	13.8	17.7	16.7	15.0	18.0	17.9	16.7	19.1	18.4	17.4	19.1	17.3	15.6	18.6	158
8/2/10	11.3	10.6	11.9	16.1	14.0	17.8	16.2	14.1	17.8	16.9	15.3	18.2	18.1	17.0	19.3	18.4	17.7	19.2	17.3	16.0	18.2	156
8/3/10	11.3	10.5	11.9	15.8	13.6	17.4	15.9	13.7	17.5	16.6	15.0	17.9	17.8	16.6	18.9	18.3	17.5	18.7	17.3	15.6	18.7	155
8/4/10	11.3	10.6	12.0	15.9	13.8	17.6	16.0	13.9	17.7	16.7	15.1	18.0	17.9	16.7	19.1	18.2	17.5	19.0	17.2	15.7	18.5	156
8/5/10	11.4	10.7	12.0	16.0	14.0	17.7	16.1	14.1	17.7	16.8	15.3	18.1	18.0	16.9	19.1	18.3	17.7	19.1	16.9	14.2	18.6	156
8/6/10	11.4	10.7	12.0	16.0	14.0	17.6	16.1	14.1	17.7	16.8	15.3	18.0	18.0	16.9	19.1	18.3	17.6	18.9	17.4	16.0	18.5	157
8/7/10	11.4	10.7	12.0	15.9	13.9	17.4	16.0	14.0	17.5	16.7	15.2	17.8	17.8	16.8	18.9	18.2	17.6	18.8	17.1	15.6	18.1	159
8/8/10	11.5	10.8	12.0	16.0	14.0	17.7	16.1	14.1	17.7	16.8	15.2	18.1	17.9	16.8	19.2	18.3	17.5	19.0	16.6	14.3	18.3	157
8/9/10	11.5	10.7	12.1	16.0	14.0	17.5	16.0	14.1	17.6	16.8	15.2	17.9	18.0	16.9	19.0	18.4	17.8	19.0	17.1	15.4	18.4	155
8/10/10	11.4	10.9	11.9	16.1	14.1	17.7	16.2	14.2	17.8	16.8	15.4	18.2	18.0	17.0	19.2	18.4	17.8	18.9	17.2	15.8	18.7	124
8/11/10	11.0	10.3	11.6	17.4	16.1	19.1	17.5	16.2	19.1	17.9	16.5	19.9	19.0	17.7	20.4	18.9	18.2	19.7	16.6	14.5	21.4	94
8/12/10	11.0	10.3	11.6	17.3	15.9	18.7	17.4	16.0	18.7	18.2	16.7	20.0	19.3	17.8	20.5	18.9	18.3	19.5	17.4	15.0	20.2	91
8/13/10	11.2	10.5	11.7	18.1	16.5	20.2	18.2	16.5	20.2	18.8	17.1	21.0	19.8	18.3	21.2	18.9	18.2	20.0	17.1	15.0	19.3	91
8/14/10	11.3	10.6	11.8	18.8	17.3	20.8	18.9	17.4	20.7	19.6	18.0	21.6	20.6	19.2	21.8	19.3	18.5	21.0	17.4	15.8	18.7	91
8/15/10	11.3	10.7	11.8	19.1	17.5	20.9	19.1	17.6	20.9	19.9	18.3	21.9	20.9	19.5	22.1	19.6	18.7	21.2	17.3	14.6	19.4	91
8/16/10	11.3	10.6	11.8	19.0	17.4	20.8	19.0	17.5	20.8	19.9	18.2	21.9	21.0	19.5	22.2	19.7	18.8	20.5	17.3	15.2	19.7	92
8/17/10	11.3	10.7	11.8	19.1	17.6	21.0	19.1	17.7	20.9	20.1	18.4	22.2	21.1	19.8	22.1	20.0	19.0	21.2	17.6	15.2	20.2	92
8/18/10	11.3	10.7	11.8	18.7	17.3	20.4	18.8	17.4	20.4	19.7	18.1	21.8	20.8	19.5	21.7	20.1	19.2	20.9	17.4	15.6	19.7	93
8/19/10	11.3	10.6	11.8	18.2	16.7	19.9	18.2	16.7	19.8	19.1	17.3	21.2	20.2	18.7	21.1	19.4	19.0	20.1	17.1	14.8	19.4	93
8/20/10	11.3	10.7	11.8	18.1	16.7	20.0	18.2	16.7	19.9	19.0	17.2	21.2	20.0	18.6	21.0	19.1	18.8	19.9	16.8	14.0	19.3	93
8/21/10	11.1	10.7	11.6	17.5	16.3	18.6	17.5	16.4	18.6	18.5	17.4	19.7	19.7	18.7	20.6	19.3	18.8	19.9	17.0	14.1	20.9	93
8/22/10	11.1	10.5	11.7	16.5	14.7	18.2	16.5	14.8	18.2	17.3	15.5	19.4	18.6	17.2	19.5	18.8	18.3	19.2	16.3	14.4	18.9	93
8/23/10	11.3	10.6	11.9	17.2	15.5	19.1	17.2	15.6	19.1	17.9	15.9	20.4	18.8	17.2	20.2	18.3	18.0	18.8	16.7	14.6	18.5	93
8/24/10	11.4	10.7	12.0	18.1	16.6	20.0	18.2	16.6	20.0	18.9	17.0	21.4	19.6	18.0	21.1	18.5	18.1	19.0	17.4	15.2	18.7	94
8/25/10	11.5	10.9	12.1	18.9	17.4	20.7	18.9	17.4	20.7	19.8	18.0	22.2	20.6	19.1	22.0	18.9	18.5	19.6	18.2	16.3	19.2	94
8/26/10	11.7	11.0	12.2	19.5	18.2	21.2	19.5	18.2	21.1	20.4	18.9	22.4	21.3	20.1	22.2	19.2	17.7	20.4	17.9	16.5	20.4	95
8/27/10	11.5	10.9	12.1	18.5	17.3	20.0	18.5	17.3	19.9	19.5	18.1	21.3	20.6	19.4	21.7	19.2	18.1	20.4	17.5	15.6	21.1	95
8/28/10	11.1	10.8	11.6	16.5	15.2	17.7	16.5	15.3	17.8	17.4	16.5	18.9	18.8	17.9	20.6	18.0	17.3	19.1	16.3	15.2	17.7	95
8/29/10	11.1	10.6	11.5	15.0	13.6	16.6	15.1	13.7	16.6	15.9	14.3	17.7	17.2	16.0	18.1	17.0	16.6	17.6	15.6	14.4	17.4	95
8/30/10	11.3	10.7	11.8	15.2	13.8	16.9	15.3	13.8	16.9	15.9	14.2	18.0	16.8	15.4	17.9	16.1	15.3	16.9	15.2	13.1	16.8	96
8/31/10	11.4	10.8	12.0	15.9	14.4	17.6	15.9	14.4	17.6	16.5	14.8	18.7	17.2	15.7	18.5	15.8	15.2	16.5	15.3	14.5	16.9	96

Table D-6. Water Temperature (daily mean temperature rounded to the nearest 0.1°C) and flows for the Spring Gap Stanislaus Project, September 2010.

	Sand Bar Reach												Camp Nine Reach									
	Middle Fork Stanislaus River downstream of Sand Bar Dam Diversion			Middle Fork Stanislaus River, Site 182 (Side Channel)			Middle Fork Stanislaus River, Site 182 (Main Channel)			Middle Fork Stanislaus River upstream of North Fork confluence			Stanislaus River upstream of Collierville Powerhouse			Stanislaus River downstream of Collierville Powerhouse			Stanislaus River downstream of Stanislaus Powerhouse			Middle Fork Stanislaus River - Sand Bar Diversion
	Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Temperature Recorder			Flows (cfs)
Date	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean (°C)	Min	Max	Mean
9/1/10	11.6	10.9	12.1	16.8	15.3	18.6	16.9	15.4	18.6	17.5	15.7	19.8	18.0	16.5	19.4	15.9	15.2	16.8	15.4	14.0	16.8	96
9/2/10	11.7	11.0	12.2	17.6	16.3	19.2	17.7	16.3	19.2	18.4	16.8	20.6	19.0	17.5	20.2	16.3	15.6	17.3	15.9	14.8	16.8	97
9/3/10	11.7	11.0	12.2	17.8	16.4	19.3	17.8	16.5	19.3	18.6	17.0	20.8	19.3	17.9	20.5	16.9	15.7	17.9	16.0	14.7	16.8	97
9/4/10	11.7	11.1	12.2	17.7	16.4	19.2	17.7	16.5	19.2	18.5	17.1	20.6	19.4	18.0	20.3	17.1	16.2	18.8	16.1	15.0	18.4	97
9/5/10	11.7	11.0	12.2	17.3	16.1	18.7	17.3	16.1	18.7	18.2	16.7	20.1	19.0	17.7	19.9	16.9	16.0	17.6	16.3	14.9	17.6	97
9/6/10	11.7	11.0	12.2	17.0	15.7	18.4	17.0	15.7	18.4	17.8	16.2	19.8	18.7	17.3	19.6	16.7	16.0	17.7	16.0	14.5	17.8	97
9/7/10	11.7	11.1	12.2	16.9	15.7	18.4	16.9	15.7	18.4	17.6	16.2	19.5	18.5	17.2	19.2	16.6	15.8	17.7	15.6	13.6	17.2	96
9/8/10	11.3	11.2	12.0	15.2	13.6	16.7	15.3	13.6	16.7	16.0	14.6	17.6	17.2	16.2	18.9	16.2	15.6	16.9	15.0	14.2	16.0	96
9/9/10	11.4	10.9	12.0	13.9	12.4	15.7	14.0	12.5	15.7	14.6	12.9	16.6	15.6	14.3	16.6	15.2	14.5	15.8	14.1	13.1	16.3	104
9/10/10	11.6	11.0	12.1	14.9	13.5	16.5	15.0	13.6	16.5	15.4	13.8	17.6	16.1	14.7	17.3	14.8	14.4	15.3	14.3	13.2	15.9	98
9/11/10	11.8	11.2	12.3	15.9	14.6	17.5	15.9	14.6	17.5	16.4	14.8	18.6	16.9	15.5	18.1	15.0	14.4	15.8	14.6	13.9	15.9	98
9/12/10	11.8	11.2	12.3	16.3	15.0	17.7	16.3	15.1	17.7	16.9	15.4	18.9	17.4	16.1	18.4	15.9	14.9	16.9	15.2	13.6	17.0	98
9/13/10	11.9	11.3	12.3	16.0	15.0	17.0	16.0	15.1	17.0	16.6	15.5	18.0	17.3	16.3	18.1	15.8	14.6	17.1	15.3	14.3	16.9	94
9/14/10	11.9	11.3	12.3	15.7	14.5	17.2	15.7	14.5	17.2	16.3	14.9	18.3	17.0	15.7	18.0	15.5	14.8	16.4	14.8	13.9	16.2	97
9/15/10	11.9	11.3	12.4	16.0	14.8	17.4	16.0	14.8	17.4	16.5	15.2	18.5	17.1	15.7	18.1	15.5	14.5	16.5	14.7	13.4	16.0	97
9/16/10	12.0	11.3	12.9	15.9	14.6	17.3	15.9	14.7	17.3	16.5	15.1	18.5	17.0	15.6	18.1	15.1	14.5	15.9	14.9	13.3	16.1	94
9/17/10	12.1	11.5	12.5	16.1	14.9	17.4	16.1	15.0	17.4	16.7	15.3	18.6	17.2	15.8	18.3	15.2	14.5	16.6	14.6	13.5	15.7	93
9/18/10	12.0	11.4	12.5	16.6	15.4	18.2	16.6	15.5	18.2	17.2	15.7	19.2	17.7	16.4	18.7	15.9	14.9	17.2	15.1	13.5	16.4	92
9/19/10	11.9	11.5	12.3	16.3	15.6	17.2	16.3	15.7	17.2	16.9	16.1	17.9	17.5	16.7	18.5	15.7	15.0	16.4	15.2	14.3	16.7	92
9/20/10	11.9	11.3	12.4	15.7	14.5	17.1	15.7	14.6	17.1	16.3	15.0	18.2	17.0	15.7	17.9	14.9	14.3	15.8	14.7	13.6	15.3	92
9/21/10	12.0	11.5	12.4	15.8	14.6	17.2	15.8	14.7	17.2	16.3	15.0	18.1	16.9	15.7	17.7	15.1	14.4	16.5	14.6	13.7	16.0	92
9/22/10	12.0	11.5	12.4	15.4	14.4	16.5	15.4	14.5	16.5	16.0	14.8	17.5	16.5	15.4	17.4	15.1	14.5	15.9	14.5	13.8	15.6	92
9/23/10	12.0	11.4	12.4	15.0	13.8	16.3	15.0	13.9	16.3	15.5	14.1	17.4	16.0	14.8	17.0	15.0	14.3	15.8	14.4	13.8	15.2	93
9/24/10	12.1	11.5	12.5	15.3	14.1	16.7	15.3	14.1	16.7	15.8	14.3	17.8	16.2	14.8	17.2	14.5	13.7	15.8	14.1	13.5	14.8	91
9/25/10	12.0	11.7	12.4	15.7	14.6	17.2	15.7	14.6	17.2	16.2	14.8	18.3	16.6	15.2	17.7	14.4	13.7	15.4	14.3	13.8	15.7	91
9/26/10	-	-	-	16.0	14.9	17.5	16.0	15.0	17.5	16.6	15.2	18.6	16.9	15.6	18.0	14.6	13.9	15.3	14.4	13.8	15.4	91
9/27/10	-	-	-	16.3	15.2	17.7	16.3	15.2	17.7	16.9	15.5	18.9	17.3	15.9	18.3	14.7	14.0	16.0	14.4	13.5	15.3	91
9/28/10	-	-	-	16.6	15.5	17.9	16.6	15.6	17.9	17.2	15.9	19.2	17.6	16.4	18.7	15.0	14.2	16.5	14.8	14.2	15.7	91
9/29/10	-	-	-	16.8	15.8	18.1	16.8	15.8	18.1	17.5	16.2	19.4	18.0	16.7	18.9	15.2	14.4	16.8	15.0	14.5	15.6	91
9/30/10	-	-	-	16.7	15.8	17.5	16.7	15.9	17.6	17.3	16.3	18.6	18.0	16.9	18.7	15.2	14.4	16.2	15.2	14.5	16.0	92

- Temperature units downstream of Sandbar Dam had been tampered with and removed from the water. As a result, temperature data from 9/26 to 9/30 for this site is unavailable.

APPENDIX E

PROJECT PHOTOS

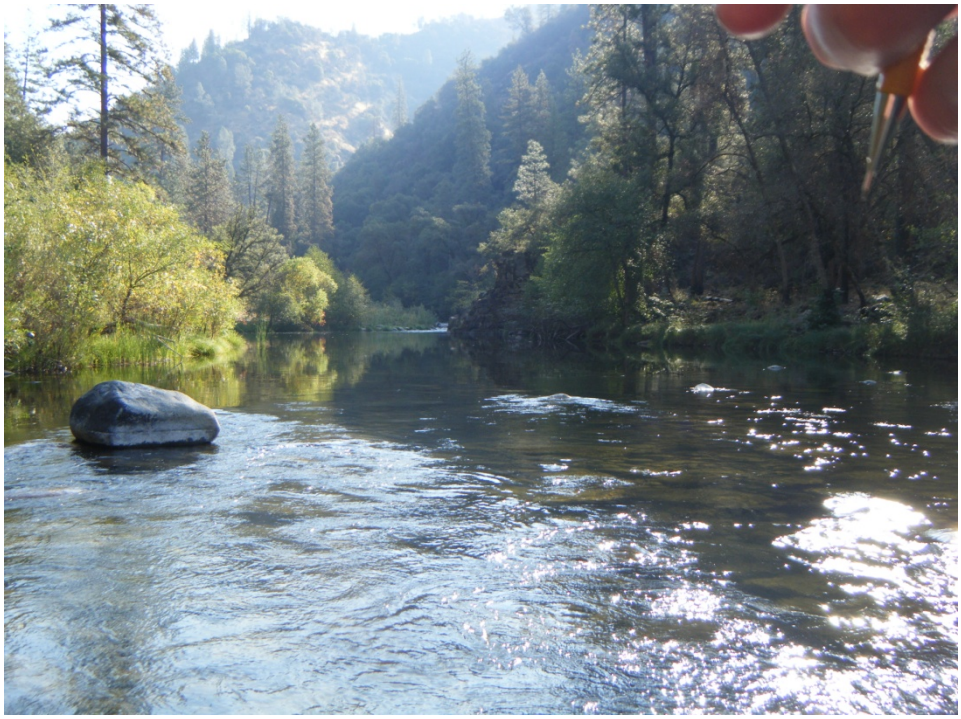


Photo 1. Upper Sandbar Site Pool Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 734111 Easting: 4228483]

Photo 2. Upper Sandbar Site Pool Habitat: Photo from upstream end looking downstream [GPS (UTM) Northing: 734249 Easting: 4228437]

Photo 3. Upper Sandbar Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 734547 Easting: 4228492]

Photo 4 . Upper Sandbar Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 734609 Easting: 4228519]

Photo 5. Lower Sandbar Site Pool Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 732856 Easting: 4226936]

Photo 6. Lower Sandbar Site Pool Habitat: Photo from upstream end looking downstream [GPS (UTM) Northing: 732921 Easting: 4226913]

Photo 7. Lower Sandbar Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 732771 Easting: 4226822]

Photo 8. Lower Sandbar Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 732805 Easting: 4226868]

Photo 9. Camp Nine Site Pool Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 730964 Easting: 4226108]

Photo 10. Camp Nine Site Pool Habitat: Photo from upstream end looking downstream [GPS (UTM) Northing: 731139 Easting: 4226134]

Photo 11. Camp Nine Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 730780 Easting: 4226070]

Photo 12. Camp Nine Site Flat Water Habitat: Photo from downstream end looking upstream [GPS (UTM) Northing: 730854 Easting: 4226082]

Photo 13. Head of second pool upstream of Collierville Powerhouse on mainstem Stanislaus River for hardhead tagging.

Photo 14. Head of second pool upstream of Collierville Powerhouse looking downstream on mainstem Stanislaus River (hardhead tagging).

Photo 15. Adult hardhead with radiotag.

Photo 16. Adult Hardhead with radiotag attachment and floy tag.

Photo 17. Recovery cooler prior to release for tagged adult hardheads.

Photo 18. One of many juvenile smallmouth bass captured during the hardhead tagging effort.

Photo 19. Water temperature monitoring site downstream of the Stanislaus Powerhouse.

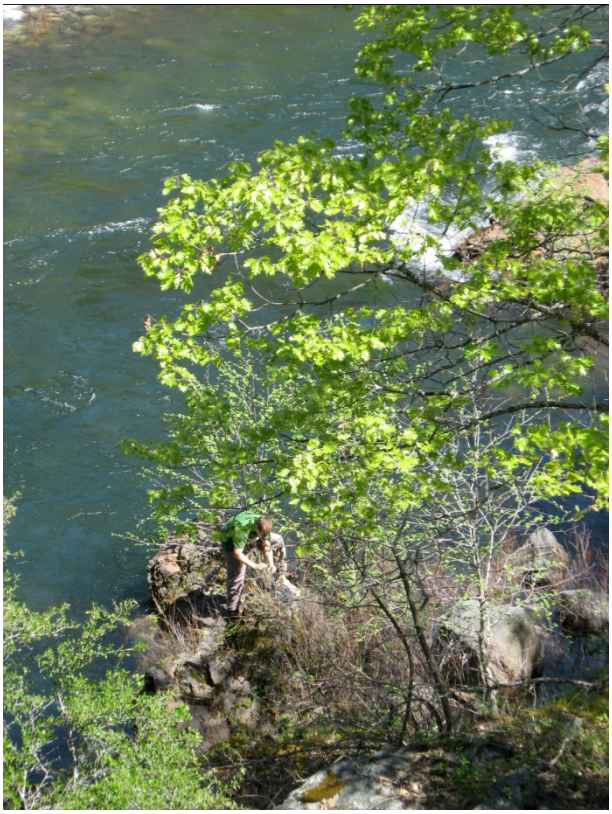


Photo 20. Water temperature monitoring site downstream of the Collierville Powerhouse.

Photo 21. Water temperature monitoring site upstream of the Collierville Powerhouse.

Photo 22. Water temperature monitoring site downstream of the Sandbar Diversion Dam.

APPENDIX F

CONSULTATION DOCUMENTATION

HARDHEAD MONITORING REPORT

RESPONSE TO COMMENTS

Page #	Section	Paragraph or Bullet	Commented By:	Comments (if a direct edit, indicate with quotation marks)	Response to Comments
				Written Comments Received from Forest Service on April 13, 2011 (Comments made to the March 2011 version of the Hardhead Monitoring Report)	
9 and 25			Forest Service Steve Holdeman	Page 9 of the report indicates radio tagging took place during September 15-17, 2010 whereas on page 25, it is stated that tracking (presumably tagging) occurred on September 15-16, 2010. Clarification of this discrepancy is requested.	**Clarification:** Sampling was conducted on three days (Sept 15-17). No suitably sized hardhead for tagging were captured on the third day, so tagging (not tracking) was conducted on Sept 15 and 16.
			Forest Service Steve Holdeman	Regarding the number of fish tagged during 2010, the Forest Service requested that the maximum number of hardhead (20) be tagged in order to more clearly reflect the movement of a range of individuals (including gender differences) and to account for attrition due to individual fish death or tag loss. Only six (6) fish were collected during one sampling effort. The study plan and PG&E's response to Forest Service (and State Water Board) indicated that up to three sampling periods would be used to collect an adequate sample for the radio tagging. We are requesting clarification as to when and how PG&E plans to collect the remaining hardhead for tracking. This additional collection could occur in early 2011 in order to track an adequate number of fish during 2011, the originally scheduled year for tracking. If the collection of the remaining hardhead will not occur until late 2011, then it is expected that radio tracking of hardhead will continue in 2012.	**Clarification:** Water temperatures cooled rapidly after the initial sampling and we did not feel that we would be able to capture hardhead effectively at these cooler temperatures, given the low success rate in the initial effort. We were in the planning stages to conduct supplemental tagging this spring, however, heavy precipitation and onset of runoff did not allow us to implement this. Additional tagging and tracking are being planned for fall 2011 and 2012. Tracking studies for the individuals tagged last fall have been initiated.
			Forest Service Steve Holdeman	In response to the draft study plan, the Forest Service requested that large schools of "unidentified" cyprinids be sampled by methods including, but not limited to, seining. This information would increase the quality of the information gathered during hardhead surveys because it would inform the extent of recruitment of hardhead in the affected reaches. The 2010 survey report only indicates that "…schools of unidentified cyprinids…" were encountered, but there is no indication that close examination of these schools occurred. The response to the initial Forest Service comment by PG&E was that this comment was adopted with modification and validation of species identification would occur during surveys. It appears as if this agreement was not completed and/or rationale was not provided for not completing this element.	**Clarification:** Snorkeling and algal surveys took more time more time than anticipated at all sites. Because these sites were accessed via helicopter, there was not sufficient time to complete the electrofishing sampling prior to the time the helicopter returned to take the crews out. More time will be allotted to each site in 2011 to allow this sampling to be completed.
40	4.2 Algae Monitoring		Forest Service Steve Holdeman	Pertinent to the Algal Monitoring element of the Hardhead Survey Report, in Section 4, part 2 (4.2) the recommendation is algal monitoring be discontinued because "…algae were observed consistently throughout all three reaches in fall. It does not appear likely, that the amount of algae is a limiting factor for any of the native species distribution in the areas studied." We are requesting some level of discussion explaining the conspicuous absence of hardhead at the Lower Sand Bar site and the lower density of algae in the same reach (<10% canopy cover) compared to the Upper Sand Bar and Camp Nine sites (10-25% cover and >25% cover, respectively). Page 9 of the Hardhead Monitoring Plan states "If relative algal density is determined to be limiting hardhead use in the Lower Sand Bar Dam Reach, additional quantitative algae abundance information may be collected in 2011." We are not requesting the immediate (2011) collection of this additional data; however, the data may be collected if the results of the 2011 (and 2012?) radio tracking indicate a lack of or disproportionately low use in the Lower Sand Bar Reach.	**Clarification:** The reason hardhead were not observed at the lower Sand Bar site is not apparent. While algal density was somewhat lower than at the other two sites, the difference between Lower and Upper Sand Bar sites was not dramatic. The site was somewhat narrower and shallower than the other two sites and velocities were somewhat greater, although velocities in the pool habitat appeared to be suitable. Ongoing monitoring at this site will determine if the 2010 results were anomalous. It is unknown whether fish radio tagged near the confluence will migrate up to the Lower Sand Bar site, so it is unclear how these results would help evaluate the need for additional algae studies. In reviewing the literature on hardhead, we have found reference that hardhead consume algae, however we have not found any information about whether algae are consumed directly or whether it is consumed incidentally, when hardhead are consuming macroinvertebrates on the algae. We have not been able to find any information about the importance of algae in the diet of hardhead or how much algae is needed for them to be successful. In studies being conducted in the San Joaquin River, where hardhead are abundant, algal densities are low. Any additional information that the Forest Service or State Water Board could provide in this regard would be appreciated. Without such information it will likely be impossible to determine if algal growth is limiting to hardhead.

HARDHEAD MONITORING REPORT

RESPONSE TO COMMENTS

Page #	Section	Paragraph or Bullet	Commented By:	Comments (if a direct edit, indicate with quotation marks)	Response to Comments
				Verbal Comments received at the April 15, 2011 Annual Consultation Meeting (Comments made to the March 2011 version of the Hardhead Monitoring Report)	
				Steve Holdeman asked what bait was used to catch the hardhead.	**Clarification:** Worms were used.
				Kathy Strain asked the hardhead sampling crew snorkeled and fished.	**Clarification:** Yes, they did both.
				Steve Holdeman asked if all of his comments were received.	**Clarification:** Yes, they were. Comments from Forest Service are attached.
				Written Comments Received from the State Water Resource Control Board (State Water Board) on May 5, 2011 (Comments made to the March 2011 version of the Hardhead Monitoring Report)	
			State Water Board	State Water Board received and reviewed the report. No comments were filed.	**No Action Needed.**

Summary Table of Consultation for the Spring Gap-Stanislaus Hydroelectric Project (FERC Project No. 2130) Hardhead Monitoring Report

CONTACT	DATE	TOPIC OF CONSULTATION
Correspondence		
To: R. Kanz (State Water Board), B. Martinez (Forest Service), J. Means (CDFG), D. Giglio (USFWS) cc: J. Buckley (Central Sierra Environmental Resource Center) From: R. Jackson (PG&E)	3-21-11	Letter accompanying draft copies of the following 2010 annual reports: Relief Reach Riparian Vegetation Restoration and Streambank Stabilization Report, Hardhead Monitoring Report, Foothill Yellow-legged Frog (*Rana boylii*) Survey Report, Sierra Nevada (Mountain) Yellow-legged Frog (*Rana sierrae*) Survey Report
Emails		
To: R. Jackson (PG&E) From: B. Martinez (Forest Service)	4-13-11	Email accompanying Forest Service comments to the 2010 Environmental Monitoring Reports
To: R. Kanz (State Water Board), J. Means (CDFG), D. Giglio (USFWS) cc: W. Lifton (Cardno ENTRIX), M. Fransz (PG&E), R. Jackson (PG&E), W. Zemke (PG&E), E. Rossi (PG&E) From: R. Jackson (PG&E)	4-27-11	Email requesting that the agencies either provide comments or a "no comment" response to the 2010 Annual Reports
To: R. Jackson (PG&E) From: D. Giglio (USFWS)	4-27-11	Email notifying PG&E that the USFWS does not have comments to the 2010 Annual Reports
To: R. Jackson (PG&E) cc: G. Cismowski, R. Kanz (State Water Board) From: K. Kyler (State Water Board)	5-5-11	Email accompanying State Water Board's comments to the 2010 Environmental Monitoring Reports
Telephone/Meeting Log		
Annual Consultation Meeting	4-15-11	Annual Consultation Meeting notes.

CORRESPONDENCE

Pacific Gas and Electric Company®

Power Generation

245 Market Street
San Francisco, CA 94105

Mailing Address
Mail Code N11C
P. O. Box 770000
San Francisco, CA 94177

March 21, 2011

State Water Resources Control Board
Division of Water Rights
Attn: Mr. Russ Kanz
Environmental Specialist III
1001 I Street, 14th Floor
Sacramento, CA 95812-2000

USDA, Forest Service
Stanislaus National Forest
Supervisors Office
Attn: Ms. Beth Martinez
19777 Greenley Road
Sonora, CA 95370

California Dept. of Fish and Game
Attn: Ms. Julie Means
Environmental Specialist III
1234 East Shaw Avenue
Fresno, CA 93719

U. S. Fish and Wildlife Service
Attn: Ms. Deborah Giglio
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

Re: Spring Gap/Stanislaus River Project, FERC No. 2130 –CA
Annual Report (2010)
- **Foothill Yellow-legged Frog**
- **Sierra Nevada Yellow-legged Frog**
- **Hardhead**
- **Riparian Vegetation Restoration and Streambank Stabilization**

Dear Agencies:

On April 24, 2009, the Federal Energy Regulatory Commission (FERC) issued to Pacific Gas and Electric Company (PG&E) a new license for the Spring Gap-Stanislaus Hydroelectric Project (FERC Project No. 2130). The new license has two appendices consisting of: 1) the State Water Resources Control Board's (SWRCB) Water Quality Certification pursuant to Section 401 of the Clean Water Act (401 Certification), and 2) the USDA Forest Service's (FS) Section 4(e) Conditions.

SWRCB Condition 8 and FS 4(e) Condition 39 require PG&E to develop, in consultation with the FS, SWRCB and California Department of Fish and Game (CDFG), detailed Environmental Monitoring Plans relating to the following: (1) Relief Reach Riparian Vegetation Restoration and Streambank Stabilization, (2) Hardhead Monitoring in Camp Nine Reach and Sand Bar Dam Reach, (3) Trout Population Monitoring in Spring Gap Reach and Sand Bar Dam Reach, (4) Foothill Yellow Legged Frog (FYLF) Monitoring in Sand Bar Reach and Camp Nine Reach, and (5) the required Mountain Yellow Legged Frog Study.

After approval by FERC, PG&E conducted the first year of studies in 2010. The Trout Population Monitoring study did not occur due to scheduling issues with CDFG.

Enclosed are the first year reports for your review and comment. If you have any questions, please give me a call at (415) 973-5747.

Sincerely,

Ross C. Jackson, Senior License Coordinator
Hydro Licensing

Enclosures

cc: Central Sierra Environmental Resource Center
Attn: John Buckley
P.O. Box 396
Twain Harte, CA 95383

EMAILS

From: Beth H Martinez

Sent: Wednesday, April 13, 2011 7:28 AM

To: Jackson, Ross

Subject: Fw: Draft BA - FERC 2130 - Strawberry Dam - Low Level Outlet and Guaging Weir (S-133)

Ross; a couple of things. Working with your agenda for Friday and hope to have it back to you by noon or so.....and will likely send it out to all the FS folks at that time as Friday is quickly drawing near.

A couple of other/related notes: below, please see the comments provided by the Summit biologist on the draft BA for the Strawberry Dam guaging weir. All other specialist reviews fine with what was presented (ie, hydrology, arch., etc.).

Also attaching the comments/feedback I received on the various monitoring reports from our aquatic biologist yesterday. He asked that I share with you all in case you have time to review before Friday. We can discuss then.

Think that's it for now. In and out of the office quite a bit today & tomorrow.....but call or e-mail if we need to connect on anything else before Friday.

Thanks!

Beth

Beth H Martinez
Lands Officer
Stanislaus National Forest
Phone: (209) 532-3671 x 320
Fax: (209) 533-1890

----- Forwarded by Beth H Martinez/R5/USDAFS on 04/13/2011 07:19 AM -----

From: Adam Rich/R5/USDAFS

Sent: 04/07/2011 07:40 AM

To: Beth H Martinez

Subject: Re: Draft BA - FERC 2130 - Strawberry Dam - Low Level Outlet and Guaging Weir (S-133)

thanks Beth - my review comments follow:

-overall one of the better specialist reports i've seen from a consulting firm.

-i recommend addition of conservation measure to conduct a nest survey for Bald Eagle prior to start of project construction activities. If nest is found, follow National Bald Eagle Mgmt

Guidelines (attached) or consult with USFWS/CDFG on recommended actions. There has been an increasing number of Bald Eagle sightings occurring in Spring in recent years.

most of my suggested edits are in regard to species occurrence info, summarized in Table 6-1 but carry through other portions of the document:

comments for Table 6-1:

-*Allium tribracteatum* and *L. stebbinsii*. Potential to occur is low, the action area is granitic and not a volcanic area.

-Yosemite toad: There are records in the Pinecrest Quad at Pinecrest Peak and Three Meadows areas.

-Northern Goshawk. Potential to occur is high.

-Peregrine Falcon. nearest record of breeding territory is Pinecrest Peak, 4N 18E Section 14 N.

-American marten. potential to occur is high.

From: Beth H Martinez

Sent: 04/05/2011 02:02 PM

To: Adam Rich/R5/USDAFS

Subject: Re: Draft BA - FERC 2130 - Strawberry Dam - Low Level Outlet and Guaging Weir (S-133)

Adam - I can't remember if I responded or not....but I put the document in the interoffice mail for you yesterday. Thank you for your help!

Beth

Beth H Martinez
Lands Officer
Stanislaus National Forest
Phone: (209) 532-3671 x 320
Fax: (209) 533-1890

From: Adam Rich/R5/USDAFS

Sent: 04/01/2011 07:29 AM

To: Beth H Martinez

Subject: Re: Draft BA - FERC 2130 - Strawberry Dam - Low Level Outlet and Guaging Weir (S-133)

i have not been but can help review

From: Beth H Martinez

Sent: 03/31/2011 09:41 AM

To: Adam Rich/R5/USDAFS

Subject: Re: Draft BA - FERC 2130 - Strawberry Dam - Low Level Outlet and Guaging Weir (S-133)

Adam: I have a large planning package submitted by PG&E for the above subject line project for FERC license #2130. I was wondering if you have been in the loop as the District biologist on this project. Would you like me to send the draft BA up to you for review? Tracy took a look at the hydrology piece this morning, and Kathy S. was already in the arch loop.....just want to make sure the biology piece was also reviewed. Let me know if I should send this one up to you.

Thanks. Beth

Beth H Martinez

Lands Officer

Stanislaus National Forest

Phone: (209) 532-3671 x 320

Fax: (209) 533-1890

Comments on PG&E's draft 2010 Monitoring Plans for FERC No. 2130

Commenter: Steve Holdeman, Forest Aquatic Biologist

General:

Thank you for the opportunity to review the reports, all are well written and presented. I appreciate the formatting of the reports which allows for easy review and the inclusions of the data and photographs.

I have no comments on the Sierra Nevada (Mountain) Yellow-Legged Frog (*Rana sierrae*) Survey Report, Western Pond Turtle (*Actinemys marmorata*) Survey Technical Memo, or the Relief Reach Riparian Vegetation Restoration and Streambank Stabilization Report.

I do have several comments on the Hardhead Monitoring Report and the Foothill Yellow-Legged Frog (*Rana boylii*) Survey Report.

Hardhead Monitoring Report:

Page 9 of the report indicates radio tagging took place during September 15-17, 2010 whereas on page 25, it is stated that tracking (presumably tagging) occurred on September 15-16, 2010. Clarification of this discrepancy is requested.

Regarding the number of fish tagged during 2010, the Forest Service requested that the maximum number of hardhead (20) be tagged in order to more clearly reflect the movement of a range of individuals (including gender differences) and to account for attrition due to individual fish death or tag loss. Only six (6) fish were collected during one sampling effort. The study plan and PG&E's response to Forest Service (and State Water Board) indicated that up to three sampling periods would be used to collect an adequate sample for the radio tagging. We are requesting clarification as to when and how PG&E plans to collect the remaining hardhead for tracking. This additional collection could occur in early 2011 in order to track an adequate number of fish during 2011, the originally scheduled year for tracking. If the collection of the remaining hardhead will not occur until late 2011, then it is expected that radio tracking of hardhead will continue in 2012.

In response to the draft study plan, the Forest Service requested that large schools of "unidentified" cyprinids be sampled by methods including, but not limited to, seining. This information would increase the quality of the information gathered during hardhead surveys because it would inform the extent of recruitment of hardhead in the affected reaches. The 2010 survey report only indicates that "…schools of unidentified cyprinids…" were encountered, but there is no indication that close examination of these schools occurred. The response to the initial Forest Service comment by PG&E was that this comment was adopted with modification and validation of species identification would occur during surveys. It appears as if this agreement was not completed and/or rationale was not provided for not completing this element.

Pertinent to the Algal Monitoring element of the Hardhead Survey Report, in Section 4, part 2 (4.2) the recommendation is algal monitoring be discontinued because "…algae were observed consistently throughout all three reaches in fall. It does not appear likely, that the amount of algae is a limiting factor for any of the native species distribution in the areas studied." We are requesting some level of discussion explaining the conspicuous absence of hardhead at the Lower Sand Bar site and the lower density of algae in the same reach (<10% canopy cover) compared to the Upper Sand Bar and Camp Nine sites (10-25% cover and >25% cover, respectively). Page 9 of the Hardhead Monitoring Plan states "If relative algal density is determined to be limiting hardhead use in the Lower Sand Bar Dam Reach, additional quantitative algae abundance information may be collected in 2011." We are not requesting the immediate (2011) collection of this additional data; however, the data may be collected if the results of the 2011 (and 2012?) radio tracking indicate a lack of or disproportionately low use in the Lower Sand Bar Reach.

Foothill Yellow-Legged Frog (*Rana boylii*) Survey Report.

It is requested that PG&E develop a time table for the development of the temperature trigger. Temperature data was collected at the indicated locations and foothill yellow-legged frogs were surveyed in 2010. Though premature for the development of the final temperature trigger, sufficient information appears to have been gathered to determine the approximate water temperature at the time of breeding and compare this estimate to the initial water temperature trigger that was to be developed using "[p]roject-specific and existing, relevant and reasonably available FYLF data from other river systems on the west slope of the Sierra Nevada…" (page 12, FYLF Monitoring Plan).

From: Jackson, Ross

To: rkanz@waterboards.ca.gov ; jmeans@dfg.ca.gov; deborah_giglio@fws.gov

Cc: Wayne Lifton; Fransz, Matthew D; Jackson, Ross; Zemke, William; Rossi, Elisabeth

Sent: Wed Apr 27 14:40:44 2011

Subject: Spring Gap Stanislaus Project FERC No. 2130 - Environmental Studies Annual Report Review

Russ/Julie/Deborah:

On March 21, 2010, PG&E provided your agency copies of the 2010 Annual environmental reports for the Foothill Yellow-legged Frog, Sierra Nevada Yellow-legged Frog, Hardhead and the Riparian Vegetation Restoration and Streambank Stabilization Studies. In that letter we requested any comments or concerns from your agency.

As spelled out in the Study Plans, PG&E must file with FERC by May 15th of each year, the results of the prior years study results and addressing any comments or concerns of the agencies. PG&E plans on filing the Annual Environmental Reports by May 12th. In order to incorporate any comments/concerns of your agency, PG&E must receive them by Friday May 6th. If your agency does not plan on providing comments, please provide me with a "no comment" response. Emails are acceptable. If comments are received after the May 6th deadline, a separate FERC filing will be necessary.

Regards

Ross Jackson
Senior License Coordinator
Pacific Gas & Electric Co.
245 Market St.
San Francisco, CA 94105-1702
(415) 973-5747

From: Deborah_Giglio@fws.gov

Sent: Wednesday, April 27, 2011 1:19 PM

To: Jackson, Ross

Subject: Re: Spring Gap Stanislaus Project FERC No. 2130 - Environmental Studies Annual Report Review

Hi to my knowledge we won't be commenting. Thank you.

Deborah A. Giglio-Willoughby
Supervisory Fish and Wildlife Biologist
Conservation, Restoration and Contaminants Program
U.S. Fish and Wildlife Service
2800 Cottage Way, Suite W-2605
Sacramento, CA 95825
phone (916) 414-6591
fax (916) 414-6712
e-mail deborah_giglio@fws.gov

From: Kari Kyler [mailto:KKyler@waterboards.ca.gov]

Sent: Thursday, May 05, 2011 3:47 PM

To: Jackson, Ross

cc: Gail Cismowski; Russ Kanz

Subject: Spring Gap-Stanislaus (FERC 2130) Env. Monitoring Reports Comment Letter

Ross-

Attached below are the State Water Boards comments to the 2010 Environmental Monitoring Reports. This letter will go out in the mail tomorrow and should be received by your office early next week. Thank you for the opportunity to comment and if you have any questions please do not hesitate to call Russ or me.

Thank you,

Kari Kyler
Environmental Scientist
Bay-Delta Unit
State Water Resources Control Board
P.O. Box 2000 Sacramento, CA 95812
(916) 445-5987

Linda S. Adams
Acting Secretary for
Environmental Protection

State Water Resources Control Board

Division of Water Rights

1001 I Street • Sacramento, California 95814• (916) 341-5300
Mailing Address: P.O. Box 2000 • Sacramento, California • 95812-2000
FAX (916) 341-5400 • http://www.waterboards.ca.gov

Edmund G. Brown Jr.
Governor

MAY 05 2011

Ross Jackson
Pacific Gas and Electric Company
P.O. Box 770000, Mail Code N11C
San Francisco, CA 94177

Dear Mr. Jackson:

ENVIRONMENTAL MONITORING PLANS, 2010 ENVIRONMENTAL MONITORING REPORTS - REQUEST FOR REVIEW AND COMMENT, SPRING GAP-STANISLAUS HYDROELECTRIC PROJECT, FERC #2130

The Federal Energy Regulatory Commission (Commission) issued a new license for the Spring Gap-Stanislaus Hydroelectric Project FERC No. 2130 (Project) on April 24, 2009. As a condition of the Water Quality Certification (Certification) for the Project, the State Water Resources Control Board (State Water Board) included requirements to submit detailed Environmental Monitoring Plans for Foothill Yellow-Legged Frog, Sierra Nevada (Mountain) Yellow-Legged Frog, Hardhead, Trout Population, and Relief Reach Riparian Vegetation Restoration and Streambank Stabilization (Environmental Monitoring Plans), for approval by the Deputy Director for Water Rights.

The Deputy Director for Water Rights approved the Environmental Monitoring Plans on May 24, 2010 and the Commission approved them, with modifications, on October 15, 2010. On March 22, 2011, the State Water Board received the following 2010 Environmental Monitoring Reports as required by the Environmental Monitoring Plans: Foothill Yellow-Legged Frog, Sierra Nevada (Mountain) Yellow-Legged Frog, Hardhead, and Relief Reach Riparian Vegetation Restoration and Streambank Stabilization (2010 Environmental Monitoring Reports). State Water Board staff has reviewed the 2010 Environmental Monitoring Reports and has provided the following comments:

Foothill Yellow-Legged Frog (FYLF) Environmental Monitoring Report

The Certification requires Pacific Gas and Electric Company (PG&E) to determine if the specified streamflow regime affects FYLF in the Camp Nine and Sand Bar reaches. The Certification also requires the collection of data to develop a Water Temperature Trigger for the supplemental flows in the Sand Bar Dam Reach. As reported in the FYLF Environmental Monitoring Report, streamflow conditions were not suitable for collecting the water temperature information needed to develop a revised Water Temperature Trigger. Therefore, no analysis on development of a revised Water Temperature Trigger was performed. Because Water Temperature Trigger data could not be collected in 2010 due to unusually high and sustained outflow conditions and associated cool water temperatures, PG&E determined that Water Temperature Trigger data should be collected during 2011, when a more natural hydrograph may occur. Due to the difficulty in performing the required Water Temperature Trigger data collection and analyses, the State Water Board staff requests a meeting with PG&E to discuss alternatives for collecting the required temperature data. If deemed necessary, modifications to the Environmental Monitoring Plan may be made. Any and all modifications shall be developed in consultation with the United States Department of Agriculture (Forest Service), California Department of Fish and Game (DFG), and State Water Board, and approved by these agencies and provided to the Commission before implementation.

Mountain Yellow-Legged Frog (MYLF) Environmental Monitoring Report

The Certification requires PG&E to determine if the specified streamflow regime or land management practices have an affect on MYLF in the Relief Reach. As reported in the MYLF Environmental Monitoring Report, due to required maintenance work on Relief Dam during the summer and fall of 2010, PG&E did not implement the new flow schedule for Relief Reach. Therefore, new streamflow effects on MYLF and their habitat could not be assessed in 2010 for streamflow. However, the MYLF Environmental Monitoring Report did not address land management practices in the Relief Reach. Neither streamflow nor land management effects were discussed in the 2010 Environmental Monitoring Report and must be discussed, when possible, in subsequent monitoring reports per the requirements of the Certification.

Trout Population Environmental Monitoring Report (Not Submitted)

On September 24, 2010, DFG requested the Tri-Dam Project modify instream flows below Beardsley Reservoir to provide safe working conditions in the Spring-Gap Reach. Because Tri-Dam could not provide the requested flows, the surveys were postponed due to safety concerns. On January 14, 2011, PG&E informed the Commission that the Trout Population Monitoring Surveys planned for 2010 were postponed to a later date. DFG and PG&E plan to coordinate efforts in 2011 to conduct trout monitoring.

The Trout Population Environmental Monitoring Report is anticipated to be received for review next year, after the Trout Population Environmental Monitoring Plan is executed in 2011. As a reminder, if modification to the Trout Population Environmental Monitoring Plan is anticipated during the implementation stage, any and all modifications shall be developed in consultation with the Forest Service, DFG, and State Water Board, and approved by these agencies and provided to Commission before implementation.

If you have any questions or would like to discuss any related issues, please contact me, at kkyler@waterboards.ca.gov or at (916) 445-5987.

Sincerely,

ORIGINAL SIGNED BY:

Kari Kyler
Environmental Scientist

cc:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Julie Means
California Department of Fish and Game
1234 East Shaw Avenue
Fresno, CA 93719

Kathy Burnett
USDA Forest Service
Stanislaus National Forest
Summit Ranger District
1 Pinecrest Lake Road
Pinecrest, CA 95364

Debbie Giglio
U.S. Fish and Wildlife Service
2800 Cottage Way, Room W-2605
Sacramento, CA 95825

California Environmental Protection Agency

Recycled Paper

TELEPHONE/MEETING LOG

SPRING GAP-STANISLAUS PROJECT

(FERC PROJECT NO. 2130)

Annual PG&E/Forest Service Condition 5 Consultation,
Condition 37 Special Status Species,
Report Out on 2010 Environmental Studies and Road Management Meeting

Friday, April 15, 2011

Time: 9:00 a.m. – 1:00 p.m. / Coordinator: Ross Jackson – PG&E

Sonora Fire Station
(210 South Shepard Street, Sonora, CA 95370)

Note Taker: Iris Eschen, Cardno ENTRIX

Participants	**Organization**
Beth Martinez	U.S. Department of Agriculture Forest Service (Forest Service)
Julie Martin	Forest Service
Karen Caldwell	Forest Service
Kathy Strain	Forest Service
Marty Gmelin	Forest Service
Mike Bradshaw	Forest Service
Phyllis Ashmead	Forest Service
Steve Holdeman	Forest Service
Tom Durston	Forest Service
Mike DeCarlo	Parsons
Justin Smith	Pacific Gas and Electric Company (PG&E)
Matt Fransz	PG&E
Ross Jackson	PG&E
Shannon Dinis	PG&E
Alicia C. Pool	ECORP Consulting
Katie Ross-Smith	Cardno ENTRIX
Larry Wise	Cardno ENTRIX
Mitchell Katzel	Cardno ENTRIX
Wayne Lifton	Cardno ENTRIX
Iris Eschen	Cardno ENTRIX

Introductions

Ross Jackson kicked-off the meeting by introducing himself and explaining the State Water Resource Control Board's (State Water Board) role. He also provided his contact information (included in the agenda hand-out). Annual consultation to meet with the Forest Service to discuss resources, updates and to address any special-status species. The agenda was reviewed.

Safety Moment

Beth Martinez (Forest Service) provided safety and logistics information for the meeting location.

WATER-YEAR TYPE REPORT

Ross Jackson identified water year types for this year. Reports are put out on the 10th of each month from February to April. For water year (WY) type as of May, DWR will come with their report at this time (see attached handout—hardcopy). By April 15 we will need to file a drawdown curve.

Beth Martinez noted that this was the fifth wettest year on record. Alicia Pool asked if the stream flow gage located below Sand Bar Diversion Dam (PG&E gage S12) is rated for flows above 200 cfs. Ross replied that at this point it is not but that it will be replaced at a future date for measuring recreational flows.

2010 ENVIRONMENTAL STUDIES REPORT

Wayne Lifton presented the team providing the results of the environmental monitoring plans.

Riparian Overview

Katie Ross-Smith reviewed objectives and results.

Katie Ross-Smith provided an overview of the activities completed in 2010 for the three study components of the Relief Reach Riparian Vegetation Restoration and Streambank Stabilization Plan (Geomorphic Conditions Assessment and Streambank Stability, Riparian Vegetation, and Grazing Exclusion and Planting focused study components). The locations of four study reaches and cross-sections within the study reaches were selected with agency concurrence.

For the Geomorphic Conditions Assessment and Streambank Stability Focused Study Component, aerial photography from 1990-2009 for Upper and Lower Kennedy Meadows were reviewed. The channel within Upper Kennedy Meadows has been relatively stable since the mid-1990's despite very high flows. Bar surface area has increased in both Upper and Lower Kennedy Meadows reaches between 1993 and 2009. The proportion of stream banks rated as stable using the SCI method was similar between the early 2000's and 2009 in the Upper Kennedy Meadows Reach, but has decreased by about 38 percent in the Lower Kennedy Meadows reach.

Study component recommendations include recommendations for the study components that will be completed within each reach and a revised schedule for completing each focused study

component. The schedule for completing the studies has been moved back one year as a result of the timing of the approval of the plan by FERC and the State Water Board. The surveys for the Riparian Vegetation Focused Study Component will be completed in 2011. The Grazing Exclusion and Planting Focused Study Component will be conducted in 2011 through 2013. The recommendations for restoration alternatives and/or long-term monitoring, if needed, will be done after this study is completed. The grazing exclusion study will be set up before July 1. Monitoring will continue August - October.

Beth Martinez asked if grazing is exclusive to the county meadow private parcel. Ross responded yes.

Beth commented that Tracy has also looked at this report and that they are fine with it.

Hardhead

Larry Wise reviewed objectives and results.

Radio Tagging: continue to place tags in the Fall of 2011. Get out earlier in the Fall of 2011 in an attempt to get more tags placed and continue tracking in 2012. Snorkel Surveys: allocate more time to each site this year verify species and relative abundance of mixed cyprinid schools. Algal Monitoring: there is not a great difference between upper and lower sand bar.

1. **Recommendations.** Plan to get flotation gear out there to sample mid-channel areas for hardhead tagging study.
2. **Conduct snorkel surveys earlier in season.** Allot more time for each site.

Steve Holdeman asked what was used to catch the hardhead. Larry replied that worms were used. Kathy Strain asked if they snorkeled and fished. Larry replied that they did both.

Steve Holdeman asked if all of his comments were received and Larry replied that yes they were.

Summary of 2010 Aquatic Reptile and Amphibian Studies

Alicia Pool introduced herself and noted that she has been involved with this project since relicensing started in 2000. Today, she will focus on 2010 monitoring objectives and study areas, survey methods and results, and recommendations.

Western Pond Turtle (WPT)

Alicia Pool reviewed objectives and results.

1. **Objectives.** Conduct one season of visual surveys for WPT to determine presence / absence of this species. If WPT are found, develop mitigation plan.

2. **Study Area and Methods.** In 2010, visual surveys for WPT were conducted at Sand Bar Diversion Dam impoundment and Stanislaus Forebay. Surveys were conducted for basking and / or floating turtles using binoculars and spotting scopes. Surveys were conducted from shore and a kayak was also used at Sand Bar Diversion Dam impoundment for areas not accessible on foot.
3. **Results and Conclusions.** No WPT were detected during July and August 2010 surveys. Although physical habitat features for WPT present at both sites, cold water temperatures throughout the summer likely precludes occupation of these sites by turtles (i.e. resident populations).
4. **Recommendations.** Ms. Pool recommended that incidental observations of WPT recorded during other aquatic surveys (e.g. amphibian, fish) be reported to the CDFG and Forest Service.

Sierra Nevada Yellow Legged Frog (SNYLF)

Alicia Pool reviewed objectives and results.

Ms. Pool noted that since the amphibian Monitoring Plan was developed for the project, the mountain yellow-legged frog (MYLF) (*Rana muscosa*) was split into two Distinct Population Segments (DPS). The Spring Gap-Stanislaus Project area falls within the range of the Sierra Nevada yellow-legged frog (SNYLF) (*R. sierrae*) DPS and is currently a Candidate for Federal and State listing. The southern DPS – MYLF – is federally listed as endangered.

1. **Study Area and Methods.** In 2010, two sites were surveyed for SNYLF: Subsite 90a, where SNYLF were documented during 2001 relicensing surveys; and, a 1,000-meter long section of the MFSR in the Relief Reach at Kennedy Meadows. Subsite 90a is a perennial water feature (oxbow channel isolated from the MFSR). Two visual encounter surveys (VES) for frogs and tadpoles were conducted at each site in 2010: one survey in early August and one survey in late September.
2. **Results and Conclusions.** No SNYLF were observed at Subsite 90a or along the 1,000-meter sub-reach of the MFSR surveyed in 2010. Two native amphibian species, chorus frog and southern long-toed salamander, were documented at Subsite 90a. During the early August survey, several chorus frog tadpoles and hundreds of long-toed salamander larvae measuring approximately 10 mm in total length were observed. During the September survey, several chorus frog young-of-year and about a dozen salamander larvae, measuring 40 to 50 mm in total length, were observed. It appeared that the majority of salamander larvae observed in August had metamorphosed and moved into the surrounding uplands by September.

   Habitat conditions at Subsite 90a appear suitable for SNYLF. Although potential habitat for SNYLF is present along the MFSR at Kennedy Meadows, the presence of predatory fish (trout) and a high level of recreation, predominantly fishing, in this sub-reach reduces the overall quality of potential habitat for SNYLF.
3. **Recommendations.** As specified in Study Plan, continue to perform SNYLF VES at Subsite 90a and the 1,000-meter sub-reach of the MFSR at Kennedy Meadows. Perform

an evaluation of possible effects of the fall streamflow regime on potential SNYLF overwintering habitat.

Although Ms. Pool also recommended an evaluation of the possible effects of manure spreading in Kennedy Meadows on potential SNYLF habitat along the MFSR and at Subsite 90a, Ross Jackson stated that the practice of spreading manure across the river was discontinued between six and eight years ago. Ross indicated that historically the pack station would cross the river and broadcast manure throughout the meadow on the south-western side of the MFSR (between the MFSR and Subsite 90a). This no longer occurs and the current practice stipulates that there will be no crossing the MFSR to broadcast manure. Although manure is still broadcast at Kennedy Meadows on the eastern side of the MFSR, the pack station operators must observe a 50-foot buffer from the river.

Ross also indicated that the broadcasting of manure typically occurs in late September or mid-October, after the manure has somewhat neutralized.

Ms. Pool was asked where the dividing line for the southern mountain yellow-legged and Sierra Nevada yellow-legged frog species is located. Alicia replied that the dividing line for the two DPS is around the Kings River basin, south of the Spring Gap-Stanislaus project area. She also stated that the southern mountain yellow-legged frog DPS is federally listed as endangered.

Foothill Yellow Legged Frog (FYLF)

Alicia Pool reviewed objectives and results.

1. **Study Area and Methods.** The 2010 visual encounter surveys (VES) were conducted at MFSR sites with known FYLF breeding: Sites 181 and 182 in the Sand Bar Dam (SBD) Reach; and, Site 187 in the Camp Nine Reach. Sites 181 and 182 include designated subsite areas that were identified during relicensing studies based on breaks in habitat and features preferred by FYLF (e.g. cobble / boulder river bars, side channels, boulder islands). The mainstem surveys included 500-meter long extensions upstream and downstream of established site boundaries. These subsite extensions were surveyed separately from established sites so that a pre- and post- license FYLF survey results could compared. In addition to mainstem surveys, two tributary drainages near Sites 181 and 182 in the SBD Reach were also surveyed.

   Water temperature monitoring was also conducted at three locations to assist in refining the Initial Water Temperature Trigger for Supplemental Flows in the SBD Reach. Continuous water temperature recorders were installed immediately below Sand Bar Diversion Dam, in the mainstem and side channel at FYLF Site 182 (mid-Sand Bar Dam Reach), and just upstream of the confluence of the Middle and North Forks Stanislaus River. Water temperature data will be used to establish a relationship between river temperature and initiation of FYLF breeding so Supplemental Flows in years that Beardsley Reservoir is not forecast to spill are timed prior to temperatures at which FYLF breeding is initiated.

In 2010, three VES were conducted at mainstem river sites and site extensions although high flows during the breeding survey prevented safe access to some site extension areas. These areas were surveyed during the second and third survey efforts. Two VES were conducted in summer for egg masses and tadpoles in an attempt to bracket the breeding period, and one VES in late fall for young-of-year (YOY) frogs. Egg mass surveys were conducted by pedestrian and snorkeling surveyors in tandem. Subsequent surveys conducted by pedestrian surveyors. Tributary drainages were surveyed once in late fall. Habitat assessments were completed for all FYLF sites surveyed.

2. **Results.** Breeding VES were conducted July 19 and 20 with 3 egg masses (1 apparently unfertilized), 141 tadpoles, and 1 adult observed for all sites and subsites combined. The tadpole VES was conducted between August 16 and 24, with a combined site / subsite total of 191 tadpoles, 7 juveniles (2009 cohort), and 8 adults observed. The YOY VES was performed from October 11 through 14 with a combined total of 57 YOY (2 dead), 6 tadpoles, 7 juveniles, and 18 adults observed.

3. **Major Findings**

    a. Only 3 FYLF egg masses observed in 2010, but we would expect more given the amount of area surveyed. It is likely that there was an earlier breeding effort in 2010 with subsequent high flows that may have scoured egg masses or displaced small tadpoles.

    b. The developmental stage of FYLF eggs and tadpoles observed on July 19 and 20 indicates that FYLF breeding in 2010 likely occurred during the first week of July.

    c. During YOY VES, a total of 57 YOY and 6 tadpoles observed along approximately 6,375 linear meters (~4 miles) of river surveyed. Low FYLF recruitment in 2010 with late-season (mid-October) tadpoles present. Individuals that metamorphose late and at low body mass have lower chance of survival over winter.

    d. Sustained high flows in the SBD Reach resulted in cool water temperatures into summer (through August 10th), which prolonged tadpole development and delayed metamorphosis into late fall. All tadpoles observed during the October VES were at Site 182: the most upstream FYLF monitoring site in the SBD Reach. Ms. Pool indicated that cool water temperatures can delay onset of breeding, and slow embryo and tadpole development, and lower water temperatures at this upper site may be why there were still tadpoles at that location.

    e. Tributary 183 (across from Site 181) had limited search length due to a steep impassable bedrock wall and the section that was surveyed (150 m [492 ft] from confluence with MFSR) was dry. One adult female FYLF observed at first pool in the unnamed ephemeral tributary upstream of Subsite 182d. Pool located approximately 963 m (0.6 mi) from mainstem. No additional frogs were observed in pools further up unnamed drainage.

Ms. Pool mentioned that 10 adult FYLF were observed along the mainstem MFSR (500 m U/S of Site 182 extension) during the October VES.

Steve Holdeman indicated that on Rose Creek, a nearby FYLF population, more adults have been observed along the mainstem in the fall than during summer months. Alicia replied that it is possible that adult FYLF may move to the mainstem in fall to forage on aquatic macroinvertebrates that hatch in the fall. During the October VES, they noticed a large caddis hatch.

4. **Recommendations:** As stated in the Study Plan, continue performing FYLF VES at the three mainstem monitoring sites, including subsites and 500-meter extensions. Continue tributary surveys.

To revise / refine the Initial Temperature Trigger recommendation, Ms. Pool recommended collection of FYLF breeding and tadpole data and corresponding water temperature data in a year (2 years recommended) with no spill at Beardsley Reservoir. Ideally we would have data from the year. Want to nail the temperature for the reach.

Steve Holdeman and Alicia Pool had an open discussion of the intricacies of identifying FYLF breeding periods by using developmental stages of eggs and tadpoles and water temperature data. Alicia replied that surveys conducted in the Project area in 2003 documented FYLF egg masses in May. There was a subsequent spill at Beardsley Reservoir through the month of June and follow-up surveys in July found that egg masses located in May were gone, but new egg masses were found. There are early and late breeders; it is a hard place to get to.

Alicia also indicated that the vegetation along the river margins and on the cobble bars and islands is impenetrable. In 2001 these areas were accessible whereas today they are impenetrable. Ms. Pool stated that because 2010 is a *Wet* water year, some of the vegetation (willow, alder, sedges, and blackberry) may be washed out during high flows. Although FYLF prefer open rocky areas with limited vegetation, it appears that the frogs in this population are still utilizing historical breeding locations despite the encroaching vegetation

Spill Channel Plan

Mitch Katzel reviewed objectives and results.

Monitor stability of Spring Gap and Stanislaus spill channels. Monitor turbidity Middle Fork Stanislaus River. We do not have data for the upstream turbidity monitor at Spring Gap during the initial installation period in late October 2010 to mid-December, as we discovered that the monitor had not been functioning during that period. It was reset for future monitoring in mid-December servicing. Multiple spills in Spring Gap channel for October-December were from half hour in length to a few hours, and flows were about 20 to 30 cfs.

Ross Jackson asked if on about December 9 where turbidity peaks for Spring Gap downstream monitor, did the spill peak? It seems turbidity was going up naturally up to that date, and then turbidity goes down during and following that spill. Mitchell replied that the general increase in turbidity over time since October could be a response to numerous rainfall events. And, there is a drop in the river flow itself during the October to beginning of December time-frame, but the turbidity has a continuous smooth rise. This could also be due to bio-fouling of the turbidity sensor.

Ross wanted to know how turbidity could be due to the spill after the peak turbidity on the graph? Mitchell replied that it does not look like there was any turbidity response specifically to spill events.

Steve Holdeman asked if the large rain fall could be causing small channels to release water and turbidity to the Middle Fork. There is some literature on how those responses are documented how the sediment gets into the river. Mitchell replied that there are two backup monitors for Stanislaus spill channel, on is located 12 miles up the canyon at Sand Bar diversion which is a backup for the monitor upstream of the Stanislaus confluence and one monitor is downstream near the Collierville Powerhouse, which is the backup for the monitor just downstream of the spill channel. Helicopter is the only access to the Stanislaus spill channel turbidity monitors. There were equipment malfunction issues with the backup monitor downstream near Collierville powerhouse. Got it up and running as of the December servicing and it should be functioning now.

There is a turbidity spike about October 25th that seems to be coincident with both a spill event on the Stanislaus spill channel and five inches of precipitation that occurred just prior to the turbidity going up. There may have been some algae growth occurring in November and December on the turbidity sensor that is just upstream of the Stanislaus Spill channel that could be adversely affecting the turbidity readings, causing the steady rise in turbidity measurements during this period, and also having a much higher turbidity reading than the monitor just downstream of the spill channel. The discrepancy between the upstream and downstream monitors could be possibly due to bio-fouling of the upstream sensor, but it is unclear - the turbidity sensors all have wipers that automatically clean the unit every time it wakes up to take a turbidity reading, about every ½ hour through the winter so bio-fouling is supposed to be minimized with this equipment.

For the Spring Gap spill channel, we will be re-surveying channel stability in late July or August this year when there is a PG&E maintenance outage which is the only time it is safe and permissible to enter the channel. The Stanislaus spill channels were determined to be all bedrock and extremely stable although difficult to access. It was agreed with the Forest Service and State Water Board this past fall that we would revise the study plan to remove the monitoring for those spill channels since they are highly stable. Beth Martinez asked Mitchell to take a look at changes that were captured for the final.

Annual PGE/FS Condition 5 Consultation, Condition 37 Special Status Species, Report Out on 2010 Environmental Studies and Road Management Meeting

4/15/2011
9:00 AM
210 South Shepard Street (Sonora Fire Station)
Sonora, CA 95370

Meeting called by: Pacific Gas and Electric	Type of meeting: Annual FS/PG&E Meeting

Agenda

Introduction	Ross/Beth
Conditon 5 Resource Protection	Group
Conditon 37 Special Status Species	Group
2010 Environmental Studies Report	Wayne
Water-year Type Report	Ross
Road Management Discussion	Justin
Round Table Discussion	Group

Additional Information

Ground Disturbing Activities process; Erosion Control Plan vs. SWPPP for Construction Activities; Time Extensions; Invasive Weed Plan;

SPRING GAP-STANISLAUS WATER-YEAR TYPE – 2011

Water-Year Type	DWR Forecast Annual Unimpaired Inflow to New Melones Reservoir (acre-feet)
Critically Dry	Less than or equal to 350,000
Dry	Greater than 350,000 and less than or equal to 676,000
Normal	Greater than 676,000 and less than 1,585,000
Normal-Dry	Greater than 676,000 and less than 1,050,000
Normal-Wet	Greater than or equal to 1,050,000 and less than 1,585,000
Wet	Greater than or equal to 1,585,000

The data below is based on California Department of Water Resources (CDWR's) April 1, 2011 FORECAST OF UNIMPAIRED RUNOFF, annual inflow into New Melones Reservoir of 2035 TAF (2,035,000 acre feet). The CDWR's Bulletin 120 entitled "Water Conditions in California" was published on 4/8/2011.

MIDDLE FORK STANISLAUS RIVER

- S- 52 – Middle Fork Stanislaus River at Kennedy Meadows
- S-12 – Middle Fork Stanislaus River below Sand Bar Diversion Dam

The Water-year Type has been upgraded from **NORMAL** to **WET** for compliance points on the middle fork at gauges S-52 and S-12.

Minimum and Maximum Streamflows for the Relief Reach (cfs)

Month	*Water-Year Type*					
	Normal		*Dry and Critically Dry*		*Wet*	
	Min	*Max*	*Min*	*Max*	*Min*	*Max*
October 1-31	30	50	20	40	40	125
November 1-30	30	60	20	50	40	125
December 1-31	30	60	20	50	40	125
January 1–February 9	30	60	20	50	40	125
February 10-March 9	30	60	20	50	40	125
March 10-April 9	30	60	25	50	40	125
April 10-May 9	60	NA	45	NA	70	NA
May 10-May 31	100	NA	80	NA	150	NA
June 1-30	150	NA	100	NA	250	NA
July 1-31	90	NA	40	NA	200	NA
August 1-31	40	200	20	40	100	300
September 1-30	30	120	20	40	60	200

Minimum daily flow schedule for the Sand Bar Dam Reach (cfs)

Month	Water-Year Type		
	Normal	Dry and Critically Dry	Wet
October 1-31	80	50	80
November 1-30	70	50	70
December 1-31	70	50	70
January 1 - February 9	70	50	70
February 10 - March 9	70	50	70
March 10 - April 9	80	50	80
April 10 - May 9	80	50	80
May 10 – May 31	80	50	80
June 1 – 30	80	50	80
July 1- 31	80	60	100
August 1 – 31	80	60	100
September 1 – 30	80	50	100

SOUTH FORK STANISLAUS RIVER

- S-61 – South Fork Stanislaus River downstream of Herring Creek
- S-83 – South Fork Stanislaus River downstream of the Philadelphia Div. Dam

The Water-year Type has been upgraded from **NORMAL-WET** to **WET** for compliance points on the south fork at gauges S-61 and S-83.

Minimum streamflow schedule for the Pinecrest Reach (cfs)

Month	Water-Year Type			
	Dry	Normal-Dry	Normal-Wet	Wet
October 1-31	10	10	15	15
November 1-30	10	10	15	15
December 1-31	10	10	10	15
January 1 – February 9	10	10	10	15
February 10 – March 9	10	10	10	15
March 10 - April 9	10	10	10	15
April 10 - May 9	10	10	15	15
May 10 – May 31	10	10	15	15
June 1 – 30	10	10	15	15
July 1- 31	10	10	15	15
August 1 – 31	10	10	15	15
September 1 – 30	10	10	15	15

Minimum streamflow schedule for the Philadelphia Reach (cfs)

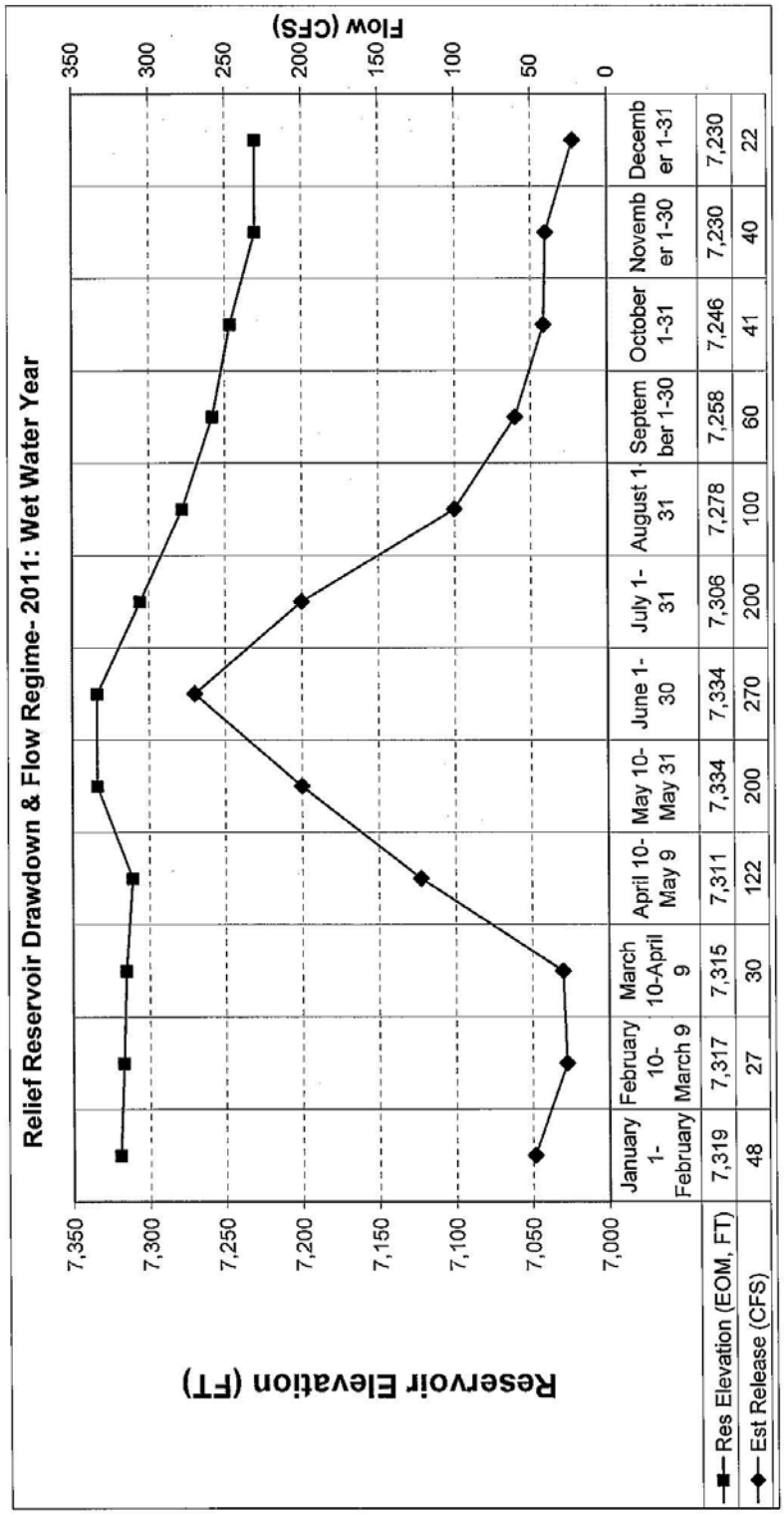
Month	*Water-Year Type*			
	Dry	*Normal-Dry*	*Normal-Wet*	*Wet*
October 1-31	10	10	15	15
November 1-30	10	10	15	15
December 1-31	10	10	10	15
January 1 – February 9	10	10	10	15
January 1 – February 9	10	10	10	15
March 10 - April 9	10	10	10	15
April 10 - May 9	10	10	15	15
May 10 – May 31	10	10	15	15
June 1 – 30	10	10	15	15
July 1- 31	10	10	15	15
August 1 – 31	10	10	15	15
September 1 – 30	10	10	15	15

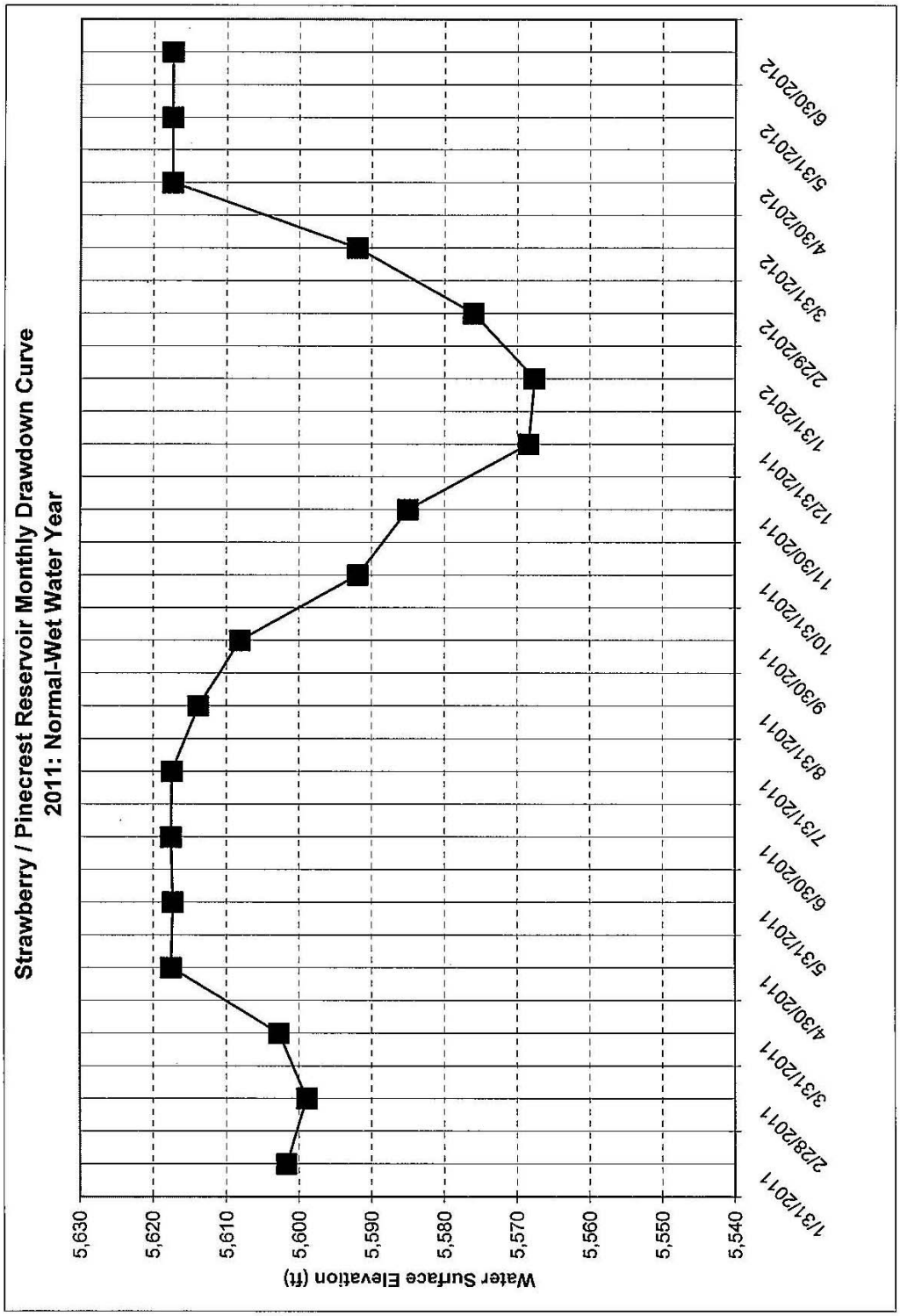
SOUTH FORK STANISLAUS RIVER (Phoenix Project FERC No. 1061)

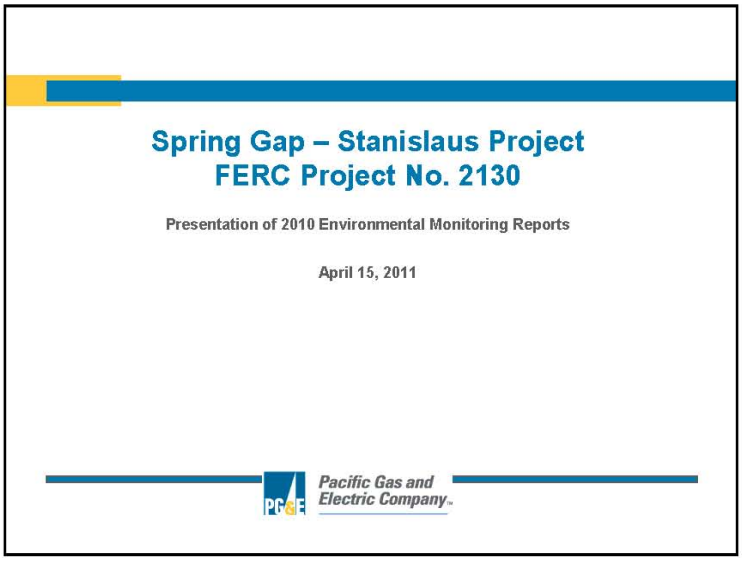
- S-51 – South Fork Stanislaus River below Lyons Dam

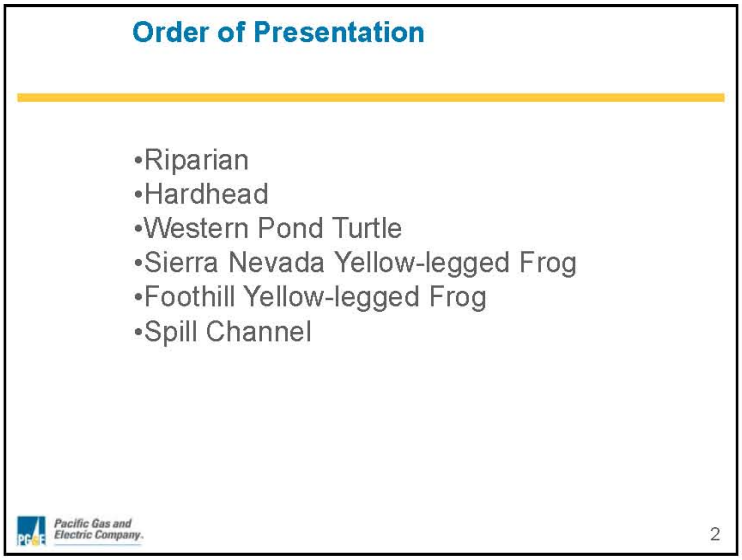
The Water-Year Type continues to be **NOT DRY** for compliance points on the south fork at gauge S-51.

The water-year type classification for the remainder of the year will be determined from the CDWR's Bulletin 120 to be published first week of May 2011.









Relief Reach Riparian Vegetation Restoration and Streambank Stabilization Plan

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3

2010 Objectives

- **Geomorphic Conditions Assessment and Streambank Stability Focused Study Component**
  - Assess geomorphic conditions and influences and historical modifications that have affected channel form in the upper and lower Kennedy Meadows reaches.
- **Riparian Vegetation Focused Study Component**
  - Evaluate current composition and age class distribution of riparian vegetation and historical cottonwood patterns in the Relief Reach.
- **Grazing Exclusion and Planting Focused Study Component**
  - Evaluate whether grazing by cattle or other large mammals affect cottonwood and willow survival in Kennedy Meadows.

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2010 Study Component Activities Completed

- Initial Field Reconnaissance Survey
- Selection of Study Reach and Cross-section Locations with Agency Concurrence
- Assessment of Geomorphic Condition of Channel in Kennedy Meadows Sub-reaches

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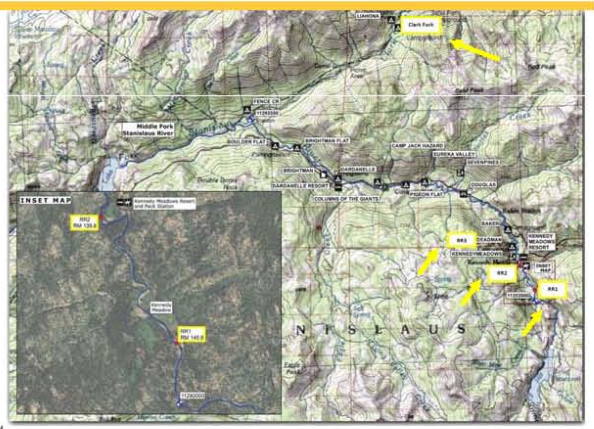
Study Reach Locations



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Results – Geomorphic Condition Assessment

- Upper Kennedy Meadows :
  - Channel has been relatively stable since the mid-1990s (A)
  - Development in surface area of bars between 1993 and 2009 (B)
  - Stream bank stability has changed little since the early 2000's (C)
- Lower Kennedy Meadows:
  - Development in surface area of bars between 1993 and 2009 (B)
  - Proportion of stream banks rated as stable declined since the early 2000's (C)

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Recommendations – Study Component Activities

Study Component			Task
Geomorphic Condition Assessment	Riparian Vegetation	Grazing Exclusion and Planting	
Upper Kennedy Meadows (RR1) Study Reach			
•	•	•	• Conduct Forest Service SCI Survey and survey cross-sections and compare with relicensing studies, if feasible (Completed) • Conduct vegetation surveys (line-intercept and greenline) and compare with relicensing studies. • Date sub-set of cottonwood trees and compare with hydrology • Conduct grazing exclusion experiment
Lower Kennedy Meadows (RR2) Study Reach			
•			• Conduct Forest Service SCI Survey and compare with relicensing studies, if feasible (Completed)
Deadman Campground (RR3) Study Reach			
	•		• Conduct vegetation surveys (line-intercept and greenline) and compare with relicensing studies • Date sub-set of cottonwood trees and compare with hydrology
Clark Fork near Sand Flat Campground Study Reach (comparison study reach)			
	•		• Conduct vegetation surveys (line-intercept and greenline) and compare with other study reaches • Date sub-set of cottonwood trees and compare with hydrology

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Recommendations – Revised Schedule

Action	Year and Timing	Status
Geomorphic Conditions Assessment and Streambank Stability Focused Study Component		
Aerial Photograph Review, Field Reconnaissance Survey, and Agency Site Visit	2010: Early ~~Summer~~ Fall	Completed
Field Surveys	2010: ~~Summer~~ /Early Fall	
Develop Report	2010 – 11: Winter	
Develop Restoration Alternatives and/or Long-term Monitoring, if needed	~~2013~~ 2014: Winter	
Riparian Vegetation Focused Study Component		
Aerial Photograph Review, Field Reconnaissance Survey, and Agency Site Visit	2010: Early ~~Summer~~ Fall	Completed
Field Surveys	~~2010~~ 2011: Summer /Early Fall	
Develop Report	~~2010-11~~ 2011 – 12: Winter	
Develop Restoration Alternatives and/or Long-term Monitoring, if needed	~~2013~~ 2014: Winter	
Grazing Exclusion and Planting Focused Study Component		
Field Reconnaissance Survey and Agency Site Visit	2010: Early ~~Summer~~ Fall	Completed
Set up Exclosures and Gather and Plant Cuttings	~~2010~~ 2011: Early Summer Prior to Staging of Cattle (~Jul 1)	
Monitoring	~~2010 – 12~~[1] 2011 – 13: Eight Times: • Late Summer ~~2010~~ 2011, ~~2011~~ 2012, and ~~2012~~ 2013; • Fall ~~2010~~ 2011, ~~2011~~ 2012, and ~~2012~~ 2013 after cattle leave in October; and • Spring ~~2011~~ 2012 and ~~2012~~ 2013	
Develop Report and Restoration Alternatives and/or Long-term Monitoring, if needed	~~2013~~ 2014: Winter	

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2011 Field Activities and Schedule

Task	Timing	Flow/Access Dependent
Riparian Vegetation Focused Study Component		
Clark Fork (Comparison reach) Stage-Discharge Measurements	Spring Snowmelt (May-June)	●
Vegetation Surveys	August	
Grazing Exclusion and Planting Focused Study Component		
Study Set Up and Planting	Before July 1st	●
Monitoring	August, early October	

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Spring Gap-Stanislaus Project
FERC Project No. 2130

2010 HARDHEAD STUDY RESULTS

April 15, 2011

Pacific Gas and Electric Company

OBJECTIVE

- Determine if the new flow regime affects hardhead habitat in the Camp Nine Reach and the lower portions of the Sand Bar Dam Reach

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ELEMENTS

- Temperature Monitoring – determine effects of new flows on temperatures and thermal suitability for hardhead
- Tagging and Radio Tracking – to determine movement patterns of hardhead in the Camp 9 and lower Sand Bar reaches
- Snorkel Surveys – evaluate hardhead distribution and relative abundance under new flow regime
- Algal Surveys – evaluate relative food availability and determine if algae is a limiting factor for hardhead

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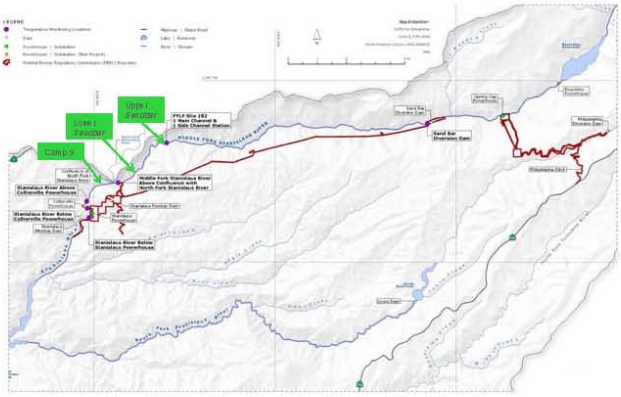
PROJECT AREA



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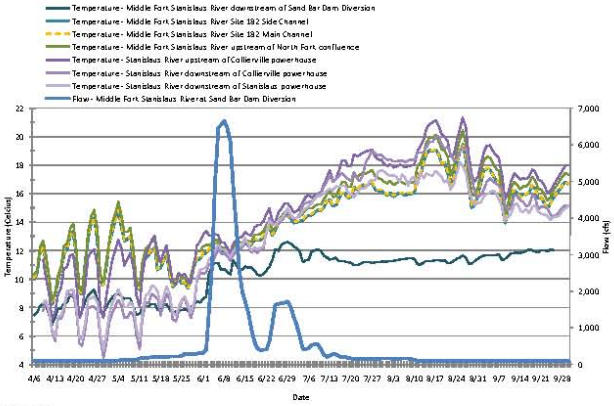
TEMPERATURE MONITORING



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RADIO TAGGING

- Radio tagging occurred Sept 15-17, 2010 between powerhouse and NF and MF confluence
- Many hardhead observed
- 6 hardhead radio tagged
- Large numbers of smallmouth bass, rainbow trout and brown trout interfered with sampling

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SNORKEL SURVEYS

- Sampled October 21 and 22, 2010
- 3 sites, 2 in Sand Bar Reach, 1 in Camp 9 Reach
- Over 2,100 fish observed in 5 species
- 62% unidentified cyprinids (hardhead and pikeminnow)
- 316 hardhead identified, 70% 6-9 inches long, 21% 9-12 inches long
- Hardhead the most abundant species clearly identified at Upper Sand Bar and Camp 9 sites. Not observed at Lower Sand Bar site

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ALGAL MONITORING

- Conducted with Snorkel Surveys
- Algal coverage 10 to 25% at Upper Sand Bar and Camp 9 reach, < 10% at Lower Sand Bar

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RECOMMENDATIONS

- Radio Tagging
  - Sample earlier, when temperatures are warmer
  - Increase sampling effort

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Spring Gap-Stanislaus Project
FERC Project No. 2130

Summary of 2010 Survey Results for Western Pond Turtle (*Actinemys marmorata*)

April 15, 2011

Pacific Gas and Electric Company

Objectives & Study Area

- Conduct one season of visual surveys for western pond turtle (WPT) to determine presence/absence of this native wildlife species potentially affected by the Project
- If western pond turtle found, develop a mitigation plan with recommended mitigation measures
- Surveys for western pond turtle were conducted at two sites previously identified with potential habitat
  1. Sand Bar Diversion Dam impoundment (Site 153)
  2. Stanislaus Forebay (Site 166)

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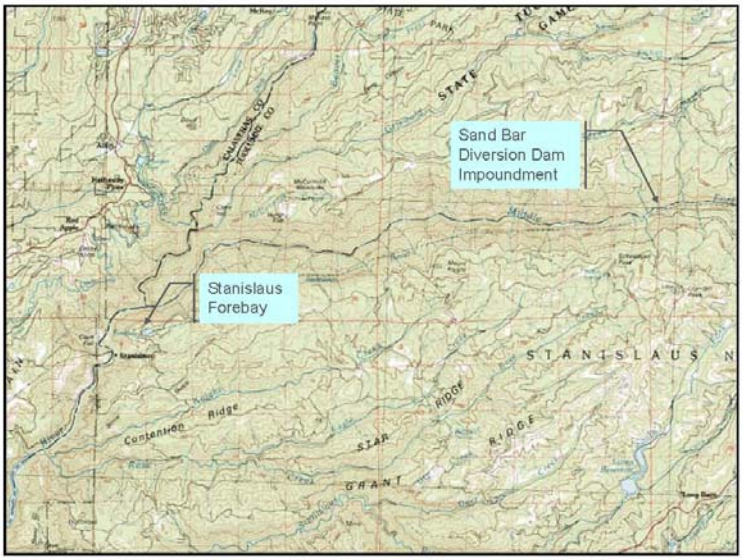

Survey Approach - Methods

- Western pond turtle surveys conducted according to protocols developed by Holland (1991)
- Surveys conducted at times of day optimal for observing basking/thermoregulation
- Using binoculars and spotting scopes, surveyors scanned potential basking or haul-out sites as well as checking the water surface for signs of swimming or floating turtles
- At Sand Bar Diversion Dam impoundment, a kayak was also used to survey areas along the shoreline not accessible on foot

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Survey Results

Date	Time of Day	Air Temp	Water Temp	Turtles Observed
Sand Bar Diversion Dam Impoundment (Site 153)				
7/21/10	morning	26.8 to 31.1°C	10.5°C	No
8/20/10	morning	20.0° to 26.0°C	10.0° - 10.5°C	No
Stanislaus Forebay (Site 166)				
7/19/10	morning	24° to 29.5°C	12°C	No
	afternoon	32.2° to 35°C	13°C	No
8/18/10	morning	22° to 27.5°C	11.5°C	No
	afternoon	28.5° to 31.5°C	11.5°C	No

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Conclusions & Recommendations

- No WPT were observed during 2010 surveys
- Although physical habitat features for WPT are present, cold water temperatures throughout the summer likely precludes occupation of these sites by turtles (i.e., resident population)
- Forest Service 4(e) Condition No. 43 required one season of surveys be conducted to determine presence/absence of WPT
- No turtles were observed during 2010 surveys despite favorable survey conditions and availability of potential habitat. No further surveys for WPT are recommended.
- Report incidental observations of WPT recorded during amphibian and/or fisheries studies to the DFG and FS

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Spring Gap-Stanislaus Project
FERC Project No. 2130

Summary of 2010 Survey Results for
Sierra Nevada Yellow-Legged Frog (*Rana sierrae*)

Monitoring Year 1
April 15, 2011

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Objectives, Study Area and Surveys

- Determine if the specified streamflow regime or the Licensee's land management practices have an affect on SNYLF (= MYLF) in the Relief Reach
- The SNYLF Study Area includes an historic breeding location along the southern and western edge of Kennedy Meadows (Subsite 90a) and a 1,000-meter sub-reach of the MFSR in the Relief Reach
- Two SNYLF surveys conducted in 2010 - August 6th and September 21st
- Both survey efforts at Subsite 90a included visual surveys for frogs and dip netting for tadpoles
- Habitat assessments were completed for sites surveyed

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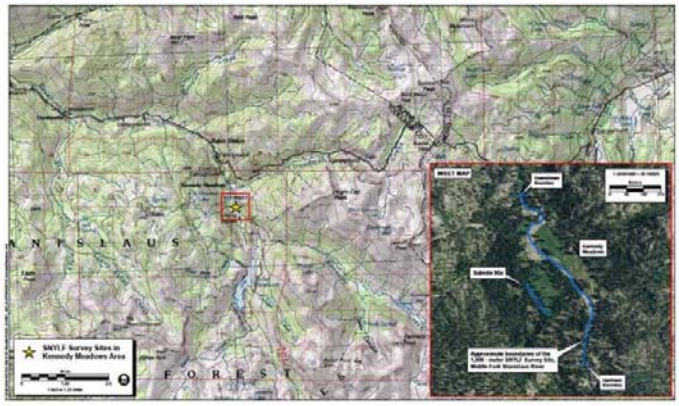
SNYLF Study Area



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Subsite 90a Survey Findings

- No SNYLF were observed at Subsite 90a.
- Habitat conditions at Subsite 90a appear suitable for SNYLF and several amphibians were incidentally observed during surveys.

- southern long-toed salamander (*Ambystoma macrodactylum sigillatum*) larvae, August 6, 2010

- The land use practice of manure spreading in the meadow area adjacent to Subsite 90a did not occur in 2010. However, the presence of dried cattle dung indicates that the meadow was used for staging livestock.

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MFSR at Kennedy Meadows Survey Findings

- No SNYLF were observed along the MFSR at Kennedy Meadows.
- The presence of trout in the MFSR, which were abundant in the surveyed reach, and a high level of recreation, predominantly fishing, was also noted during both survey efforts.
- Although habitat conditions along the MFSR in the Kennedy Meadows area appears suitable for SNYLF, the presence of predatory fish and a high level of recreation in the reach reduces the overall quality of potential habitat for SNYLF.

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Recommendations

- As specified in the Study Plan, continue to perform SNYLF VES in Kennedy Meadows area – at Subsite 90a & 1,000-meter reach of MFSR.
- Perform an evaluation of possible effects of the fall streamflow regime on potential SNYLF overwintering habitat.
- Perform an evaluation the possible effects of manure spreading in Kennedy Meadows on potential SNYLF habitat along the MFSR and at Subsite 90a.

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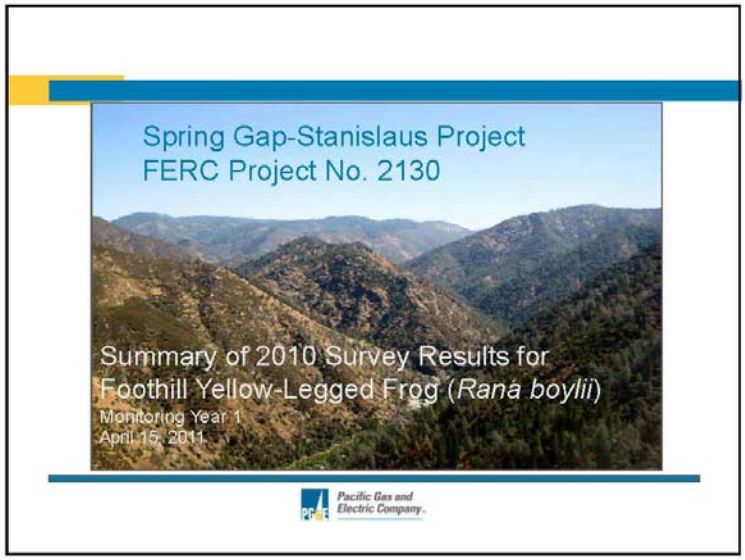

Objectives & Study Area

- Determine if the specified streamflow regime affects foothill yellow-legged frog (FYLF) in the Camp Nine and Sand Bar Dam reaches, MFSR
- Collect information to revise the Initial Water Temperature Trigger for minimum Supplemental Flows specified for the Sand Bar Dam Reach
- Surveys at river sites with known FYLF breeding: Sites 181 and 182, Sand Bar Dam Reach; and Site 187, Camp Nine Reach. Surveys at two tributaries.
- Water temperature monitoring at three sites (Sand Bar Diversion Dam, mid-Sand Bar Dam Reach – at FYLF Site 182, and above the confluence of the Middle and North Forks Stanislaus River)

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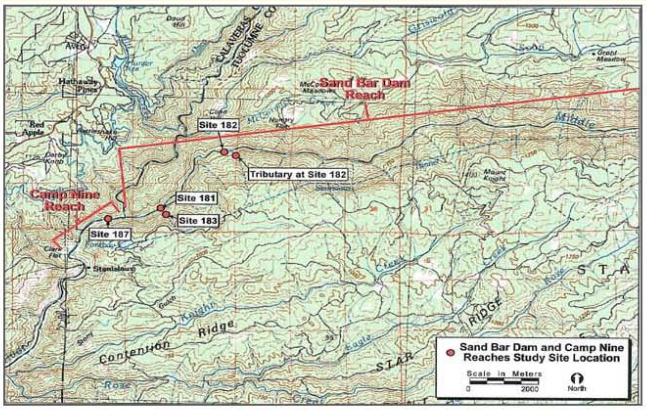
FYLF Study Area – Locations of Established FYLF Monitoring Sites



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FYLF Surveys

- In 2010, three visual encounter surveys (VES) were conducted at mainstem river sites and site extensions*: two VES during the spring/early summer for egg masses and tadpoles in an attempt to bracket the breeding period; and one late summer/early fall for young-of-year (YOY) frogs.
- Egg mass surveys were conducted by pedestrian and snorkeling surveyors in tandem. Subsequent VES conducted by pedestrian surveyors.
- Tributary drainages were surveyed once in late summer/early fall.
- Habitat assessments were completed for all sites surveyed.

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2010 FYLF Surveys & Results

Type of VES	Survey Dates	Flow (cfs)[1]	Water Temp.[2]	Comments
Egg Mass	July 19 – 20	~200	~16°C	Due to high flows & unsafe conditions, all or portions of some sites could not be surveyed.
Tadpole	August 16 – 24	~92	~18°C	Surveyed areas previously unable to access.
Young-of-Year	October 11 – 14	~96	~15°C	Preliminary YOY VES on September 20 at Site 187.

[1] – Preliminary data subject to revision. [2] – Mean daily main channel temperature as measured at Site 182.

Type of VES	VES Results – All Sites / Subsites Combined
Egg Mass	3 egg masses (1 unfertilized), 141 tadpoles, 1 adult
Tadpole	191 tadpoles, 7 juveniles, 8 adults
Young-of-Year	57 YOY (2 dead), 6 tadpoles, 7 juveniles, 18 adults

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Major Findings

- A total of 3 egg masses (1 unfertilized) observed in 2010
- The developmental stage of FYLF eggs and tadpoles observed on July 19 and 20 indicates that breeding likely occurred during the first week of July
- Based on the few number of egg masses observed, there was likely an earlier breeding effort with subsequent high flows that may have scoured egg masses or displaced small tadpoles
- During YOY VES (October 11-14), a total of 57 YOY and 6 tadpoles observed along approximately 6,375 linear meters (~4 miles) of river surveyed
- Sustained high flows in SBD Reach resulted in cool water temperatures into summer (August 10th), which prolonged tadpole development and delayed metamorphosis to late fall
- Tributary 183 (across from Site 181) – limited search length due to steep bedrock wall – section dry. Unnamed ephemeral tributary upstream of Subsite 182d, one large adult female observed at first pool, 963 m (0.6 mi) from mainstem.

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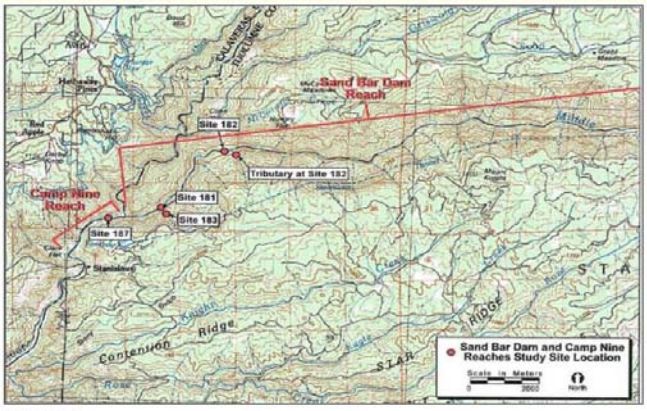
FYLF Monitoring Sites – Water Temperature & Egg and Tadpole Development



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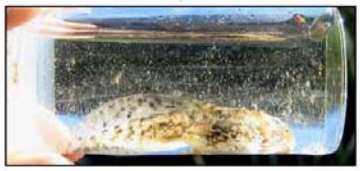
Tadpole Development (Subsite 182b) & 2010 FYLF Cohort

- 16 August 2010, Gosner 30

- 13 October 2010, Gosner 41



- 12 October 2010, 15 mm SVL FYLF YOY, 500 m D/S of Site 181

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Recommendations

- As stated in the Study Plan, continue performing FYLF VES at the three mainstem monitoring sites, including subsites and 500-meter extensions, and at tributary sites.
- To revise / refine the Initial Temperature Trigger recommendation, collection of FYLF breeding and tadpole data in a year (2 years recommended) with no spill at Beardsley Reservoir, and corresponding continuous water temperature data is required.

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Spring Gap-Stanislaus Hydroelectric Project
FERC Project No. 2130
License Implementation

SPILL CHANNEL MANAGEMENT PLAN
April 15, 2011

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OBJECTIVES

- Monitor stability of Spring Gap and Stanislaus spill channels
- Monitor turbidity Middle Fork Stanislaus

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STUDY ELEMENTS

- Conduct reconnaissance survey of Spring Gap and Stanislaus spill channels
  - characterize channel stability and identify candidate stability monitoring sites
- Select stability monitoring sites in consultation with the resource agencies
- Perform baseline monitoring studies: cross-sections, erosion pin installation and photo-documentation
- Install turbidity monitoring equipment in the MFSR
  - data downloads and servicing

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MONITORING SITES: SPRING GAP SPILL CHANNEL TURBIDITY

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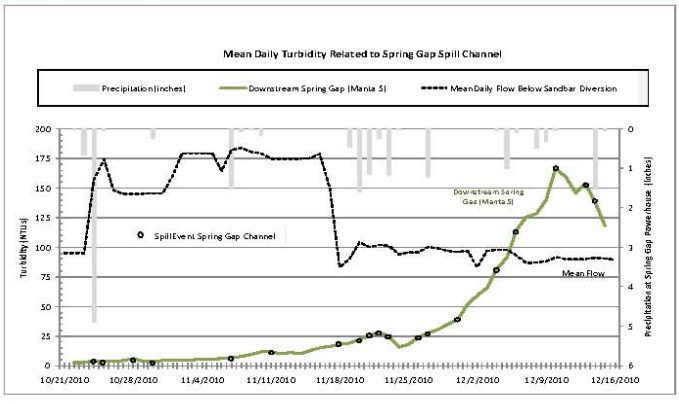
TURBIDITY MONITORING for SPRING GAP SPILL CHANNEL



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MONITORING SITES: STANISLAUS SPILL CHANNEL TURBIDITY

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MONITORING SITES: STANISLAUS SPILL CHANNEL TURBIDITY

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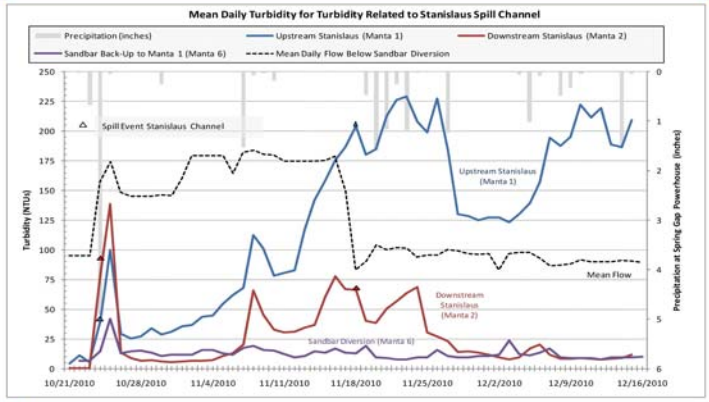
TURBIDITY MONITORING for STANISLAUS SPILL CHANNEL



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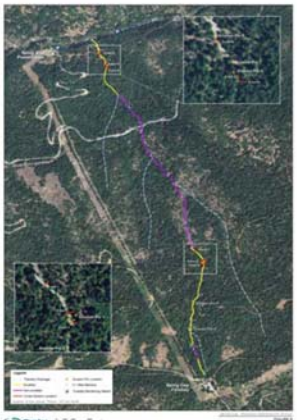
MONITORING SITES: SPRING GAP SPILL CHANNEL STABILITY



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CONCLUSIONS: SPRING GAP SPILL CHANNEL STABILITY

- Six Cross-Sections Surveyed
- Seven Erosion Pin Sites
  - 28 pins installed

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CONCLUSIONS: STANISLAUS SPILL CHANNEL STABILITY

- Stable Channel
  - Consultation with SWB and USDA-FS
  - No stability monitoring, revise Plan

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