

4.9 Fish Surveys Study Plan

This study is designed to provide information relating to special-status and other fish species in areas potentially affected by the Sacramento Municipal Utility District's Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project. The overall approach is to collect information regarding populations and species composition from both literature searches and stream and reservoir surveys.

4.9.1 Pertinent Issue Questions

This fisheries study plan addresses the following Aquatic/Water issues:

1. Does the Project affect special-status species? If so, then where and how?
2. What are the appropriate species to be used as indicator species for management of the Project related to flows?
4. Do Project diversions have an effect on aquatic biota? (e.g. Are fish screens necessary? Low-flow channels & dams?)
8. What is the composition, distribution, and population of aquatic resources in the Project-affected streams and reservoirs (including benthic macroinvertebrates)?
30. What are the effects of the Projects on warm water fisheries in the project reservoirs?

This study plan only addresses fish species. Other aquatic special status species and resources are addressed in the Amphibian and Aquatic Reptiles Study Plan, and benthic macroinvertebrates are addressed in the Aquatic Bioassessment Study Plan. Question 8 regarding diversions is addressed in the Deepwater Intake Entrainment and Shallow Water Intake Entrainment study plans and Question 30 regarding fisheries in the Project reservoirs is addressed in part in the Reservoir Habitat Study Plan, though information developed in this study plan will be useful in all three of these studies.

4.9.2 Background

Based on information from Moyle et al. (1996) and other sources, there are 21 species or subspecies of native fish that may have historically occurred or may currently occur in the Project area (SMUD 2001). Fish populations and species composition in the Sierra Nevada have changed substantially in the last century due to development, non-native species introductions, fish stocking, and other factors. Various species of trout are now the dominant fish species throughout most of the Project area. Quantitative and qualitative fish surveys have been conducted in several stream reaches and reservoirs in the UARP Project Area, as summarized in SMUD (2001) and Tables 1 and 2. These studies provide information on species composition, distribution or abundance.

4.9.3 Study Objectives

The study objectives are to document: 1) current fish species composition; 2) relative fish species abundance; 3) species and age class distribution; and 4) size distribution and growth of fish in the bypass reaches affected by the Project. Additional objectives include: 1) update fish species composition of selected Project reservoirs; and 2) consider potential species to be used as indicator species for water flow management (based on fish species composition); and 3) identify effects of the Projects on warm water fisheries in the reservoirs.

4.9.4 Study Area and Sampling Locations

The stream reaches, and reservoirs included in this study plan are listed in Table 1 (stream reaches) and Table 2 (reservoirs). Summaries of data on fish population densities and species composition are also included in these tables.

TABLE 1.
Known species composition and biomass estimates for study reaches.

Stream Reach	Species*									Trout Biomass (lbs/acre)	References
	RBT	BRN	BRK	CR	SPM	HH	RS	SD	SS		
Rubicon River Dam Reach	•		•							26.9	USDA 1979a
Rubicon Tunnel Outlet Reach										N/A	No species composition or biomass data
Rockbound Dam Reach										N/A	No species composition or biomass data
Buck Island Dam Reach										N/A	No species composition or biomass data
Loon Lake Dam Reach	•	•	•	•						N/A	CDFG Gerle Creek surveys, various dates
Gerle Creek Dam Reach	•	•	•	•						36.4	Turney 1986 [Stillwater UARP Library #100]; CDFG Gerle Creek surveys, various dates
Robbs Peak Dam Reach										N/A	No species composition or biomass data
Ice House Dam Reach	•	•							•	38.7	USDA South Fork Silver Creek survey 1979b
Junction Dam Reach	•	•					•		•	N/A	CDFG Silver Creek surveys, various dates [Stillwater UARP Library #394]; No biomass estimates
Camino Dam Reach	•	•					•		•	N/A	Thomas 1994b [Stillwater UARP Library #231]
South Fork American Reach	•			•	•	•	•	•	•	N/A	TRPA (1998). Survey at Eldorado Powerhouse, downstream of the falls 1 mile below Silver Creek. Sculpin cited were presumed to be riffle sculpin.
Brush Creek Dam Reach	•	•								N/A	CDFG Brush Creek surveys, various dates [Stillwater UARP Library # 302-303]; No biomass data
Slab Creek Dam Reach	•		•			•	•	•	•	9.7	WESCO 1980 [Stillwater UARP Library #249]
Reach Downstream of Chili Bar Dam											No information gathered yet.

RBT=Rainbow trout
 *Species: trout
 BRN=Brown trout
 BRK=Brook trout
 CR=California roach
 HH=Hardhead
 SD=Speckled dace
 RS=Riffle sculpin
 SPM= Sacramento pikeminnow
 SS=Sacramento sucker

4.9.5 Information Needed From Other Studies

Information from the Instream Flow Study (habitat mapping) would be useful to aid in the selection of sampling sites. Data from the hydrology, water temperature, and invertebrate (CSBP) studies will be valuable in assessing habitat conditions.

4.9.6 Study Methods and Schedule

Information review and study site selection

- Augment information in the IIP and current discussions with knowledgeable individuals (e.g., CDFG staff, USFS staff, BLM personnel) to update known occurrences of fish species in the area of the UARP and Chili Bar Projects.
- Based on information from aerial photos, aerial videography, project area reconnaissance, any available habitat mapping conducted for the instream flow study, and historical information, identify accessible and representative areas of bypass reaches to use as study sites.

TABLE 2.
Known species composition for Project reservoirs

Reservoir	Species*																		References	
	RBT	BRN	BRK	CR	CT	CH	GS	GSH	GT	HH	KS	LT	MF	MN	SB	SD	SS	RS		TP
Rubicon	•	•	•						•											CDFG surveys, various dates
Buck Island	•	•	•																	CDFG surveys, various dates
Loon Lake	•	•	•	•		•	•										•		•	SMUD 2001; EDAW 1978 [Stillwater UARP Library #118]
Gerle Creek	•	•	•																	Turney 1986 [Stillwater UARP Library #100]
Robbs Peak	•	•																		CDFG surveys, various dates; EA 1982, SMUD 2001
Union Valley	•	•		•			•	•			•	•	•		•					SMUD 2001, CDFG surveys, various dates; EA 1980 [Stillwater UARP Library #117]
Ice House	•	•	•				•				•									SMUD 2001, EA 1980 [Stillwater UARP Library #117], EDAW 1978 [Stillwater UARP Library #118]; CDFG surveys, various dates
Junction	•	•	•								•								•	Thomas 1994b [Stillwater UARP Library #231]
Camino	•	•	•	•										•					•	SMUD 2001, ENF Stream Survey, not dated
Brush Creek	•	•																		ENF Stream Survey 1974 [Stillwater UARP Library #250]
Slab Creek	•	•	•	•							•	•			•	•	•			SMUD 2001, Thomas 1994c [Stillwater UARP Library #233]; Jordan and Brown 1992; Jones and Stokes 1994; WESCO 1980
Chili Bar																				No information gathered yet

*Species: RBT=Rainbow trout KS=Kokanee salmon
 BRN=Brown trout LT=Lake trout
 BRK=Brook trout MF=Mosquito fish
 CH=Chubs MN=Minnows
 CR=California roach SB=Smallmouth bass
 CT=Cutthroat trout SD=Speckled dace
 GS=Green sunfish SS=Sacramento sucker
 GSH=Golden shiner RS=Riffle sculpin
 GT=Golden trout TP=Tule perch
 HH=Hardhead

Field surveys

- The preferred method of sampling stream reaches is quantitative electrofishing. A three-pass depletion method (Platts et al. 1983) using Smith-Root electrofishers will be used wherever practical (i.e., suitable depth, width, and flow conditions). Study sites will be approximately 300 feet long, depending on site conditions, and will likely be partitioned into segments of similar habitat type. Each site will be blocked off with nets to prevent movement of fish in or out of the sampling areas. The bottoms of the block nets will be sealed off with rocks, and the tops will be propped above the water surface with dowels or PVC pipe. One or two netters will accompany each field technician with a backpack electrofisher. Based on the level of effort used in previous surveys, it is anticipated that two backpack electrofishers (6-person field crew) will be sufficient for coverage of

the sampling areas. The sampling crew will, to the degree possible, maintain a line perpendicular to the stream channel as they move upstream in order to maximize capture probabilities. Netters will position their nets downstream of the anode ring in turbulent areas such as riffles, in order to maximize capture of young-of-the-year (YOY) fish that cannot be easily observed from the surface.

Table 3 summarizes expected field-sampling techniques and number of sampling sites for the stream reaches.

Captured fish will be kept in live wells or buckets. Fish will be processed by identifying them to species, weighing them to the nearest gram, and measuring them for total length before returning them to the stream. These measurements will allow for calculation of condition factors, and development of age and growth information based on length/frequency distributions.

The following habitat parameters will be assessed at each site:

- width (at 6-10 points) and length of sample area
- substrate composition (visual estimate in 5-10% increments)
- maximum depth
- average depth
- water clarity and temperature
- dissolved oxygen and conductivity
- habitat type
- cover (type and approximate amount in %)
- approximate discharge

Photos and GPS locations (top and bottom of location) will be taken of each site, and site locations delineated on topographic maps.

- Where electrofishing is not possible due to depth or flow constraints at candidate study sites (in representative and accessible locations), snorkeling surveys will be conducted. Snorkeling will utilize replicate counts to increase the accuracy of the estimate (Thurow 1994 and Dolloff et al. 1996).

Snorkel survey sample sites will be stratified into swimming lanes, using rope as lane markers where necessary. Lanes will be sized to ensure areas of visual overlap between divers, based on water clarity. It is assumed that four divers will be sufficient to adequately survey the sample areas. Fish will be identified and counted. Divers will carry writing slates with length measurements on them, to better estimate lengths of observed fish. The slates will also be used to record data. Replicate dives will be made by the same team in order to assess efficiency.

- Fish sampling in the reservoirs will be conducted using variable mesh gill nets and beach seines. Up to six 100-ft gill nets will be deployed overnight for 1-2 nights in each major project reservoir if existing data indicate species other than trout may be supported. Gill netting is expected in Loon Lake, Union Valley, Ice House, Junction, Camino, Chili Bar, and Slab Creek, during the summer or early fall of 2002. In Slab Creek Reservoir and Chili Bar Reservoir, gill nets will be checked regularly and removed in the evening in order to minimize the potential for mortality of special-status species (i.e., hardhead), since Slab Creek Reservoir has previously been reported to support this species. Beach seines will be used, where practical, in near shore areas with shallow depths, gradual slopes, and small substrates. Up to four sites per reservoir would be seined. Water quality parameters to be measured at each reservoir sampling site include dissolved oxygen, water clarity, and water temperature.
- Multiple years (anticipate 3 years) of sampling will be conducted. An extensive fish survey program (electrofishing, snorkel surveys, and reservoir sampling) will be conducted in the late summer and early fall of 2002 in the reaches identified in Table 3, as suitable for sampling. Following the 2002 sampling, the magnitude (number and type of sites), timing, and frequency of sampling in the following years will be developed in consultation with the Aquatic TWG.

4.9.7 Analysis

A description of current fish species population presence, relative abundance, and distribution in the project reaches and reservoirs will be produced. Electrofishing data analyses will utilize the Zippen method (Platts et al. 1983) or maximum likelihood method for population estimation. Computed statistics will include biomass (lbs/acre) and confidence limits, condition factors, as well as fish densities and catchable fish per mile. Growth rates will be estimated from the length-frequency distributions through identification of different age classes.

TABLE 3.
Proposed stream reach sampling methods and number of sites.

<i>Stream Reach</i>	<i>Sampling Method</i>	<i>Number of Sites</i>	<i>Comments</i>
Rubicon River Dam Reach (Rubicon River downstream of Rubicon Reservoir)	Electrofishing	2	Fish population studies are proposed in this reach, with an emphasis on assessing whether there is adequate spawning and late summer flow to sustain a significant stream fishery.
Rubicon Tunnel Outlet Reach (Rubicon Tunnel Outlet to Rockbound Lake)	No sampling proposed in this stream reach.	0	This reach is short, with intermittent flow into and through lakes at the upstream end of Rockbound Lake. Since flow control in this area is limited, and fish populations are dependent on the adjacent lakes, no fish population studies are proposed in this reach.
Rockbound Dam Reach (Little Rubicon River between Rockbound Lake and Buck Island Reservoir)	No sampling proposed in this stream reach.	0	This reach is very short, and flow is potentially intermittent depending on the level of Rockbound Lake. Since flow control in this area is limited, and fish populations are dependent on the adjacent lakes, no fish population studies are proposed in this reach.
Buck Island Dam Reach (Little Rubicon River downstream of Buck Island Reservoir)	Electrofishing	1	Fish population studies are proposed in this reach. Fish species information for this area is not available.
Loon Lake Dam Reach (Gerle Creek downstream of Loon Lake)	Electrofishing	2	Fish population studies are proposed in this reach. Of particular interest is a comparison of habitat conditions and population upstream and downstream of Gerle Creek Dam.
Gerle Creek Dam Reach (Gerle Creek downstream of Gerle Reservoir)	Electrofishing	1	Fish population studies are proposed in this reach. Of particular interest is a comparison of habitat conditions and population upstream and downstream of Gerle Creek Dam.
Robbs Peak Dam Reach (South Fork Rubicon River downstream of Robbs Peak Reservoir)	Electrofishing	1	Fish population studies are proposed in this reach. Sampling is proposed downstream of the Gerle Creek confluence.
Ice House Dam Reach (South Fork Silver Creek downstream of Ice House Reservoir)	Electrofishing	2	Fish population studies are proposed in this reach. Due to the length of the bypass reach and the variable conditions due to the fire, upper and lower sample sites are proposed.
Junction Dam Reach (Silver Creek downstream of Junction Reservoir)	Snorkel Survey	2	Fish population studies are proposed in this reach. Snorkel surveys may be necessary, rather than electrofishing.
Camino Dam Reach (Silver Creek downstream of Camino Reservoir)	Snorkel Survey	2	Fish population studies are proposed in this reach. Snorkel surveys may be necessary, rather than electrofishing.
South Fork American Reach (South Fork American downstream of Silver Creek)	Snorkel Survey	1	Fish population studies are proposed in this reach. Snorkel surveys may be necessary, rather than electrofishing.
Brush Creek Dam Reach (Brush Creek downstream of Brush Creek Reservoir)	Electrofishing	1	Fish population studies are proposed in this reach. (To date, no current stream surveys information is available.)

<i>Stream Reach</i>	<i>Sampling Method</i>	<i>Number of Sites</i>	<i>Comments</i>
Slab Creek Dam Reach (S.F. American River downstream of Slab Creek Reservoir)	Snorkel Survey	2	Fish population studies are proposed in this reach. Snorkel surveys may be necessary, rather than electrofishing.
Reach downstream of Chili Bar Dam (South Fork American River downstream of Chili Bar Dam)	Snorkel Survey	4-6	Fish population studies are proposed in this reach. Snorkel surveys are expected, rather than electrofishing. Due to the length of the reach, up to six sites are proposed for sampling.

Minimum population estimates and biomass will be developed from the snorkeling surveys based on the number and lengths of fish observed, the area surveyed, and a length/weight regression developed as part of the electrofishing analysis.

Evaluation of the data will provide answers to the issue questions listed at the beginning of this study plan. Specifically, the composition, distribution, and relative abundance of fish species throughout the project area will be known, providing an indication of: 1) any areas of poor productivity that could be related to project operations, 2) information on dominant or sensitive species in the project area that may be candidates for “indicator species,” 3) presence and distribution of sensitive species, and 4) reservoir species that may be affected by project operations.

4.9.8 Study Output

A written report including the issues addressed, objectives, description of study area and sampling locations, methods, results, discussion and conclusions will be prepared after the field studies and analyses are complete. Fish population results will include biomass estimates, along with confidence limits, and comparison to other available data from west slope Sierra streams.

The report will be prepared in a format that can easily be incorporated into the Licensee’s draft environmental assessment that will be submitted to FERC with the Licensee’s application for a new license. A presentation of the study results will be made to the Aquatics TWG in late 2002 or early 2003. Original data and electronic worksheet files will be provided to the Licensee’s on CD.

4.9.9 Preliminary Estimated Study Cost

A preliminary estimated study cost will be prepared after the Plenary Group approves the plan.

4.9.10 Plenary Group and TWG Endorsement

The Aquatic TWG approved this plan, as amended, on August 28, 2002. The participants at the meeting who said they could “live with” this study plan were USFS, CDFG, NMFS, SWRCB, PG&E and SMUD. None of the participants at the meeting said they could not “live with” this study plan. The Plenary Group approved this study plan on September 4, 2002. The Participants who said they could “live with” the plan included CSPA, PCWA, NPS, City of Sacramento, Friends of El Dorado County, Taxpayers Association of El Dorado County, PG&E, CDFG, EDCWA, Citizens for Water, and Camp Lotus.

4.9.11 Literature Cited

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