Project 184
Hardhead Monitoring Plan

EL DORADO IRRIGATION DISTRICT
2890 Mosquito Road
Placerville, CA 95667

June 16, 2007

Version 3.0

This study plan is result of a collaborative effort between El Dorado Irrigation District (EID), Project 184 Ecological Resources Committee (ERC), USDA Forest Service (FS), State Water Resources Control Board (SWRCB), and California Department of Fish and Game. This study plan has been developed to satisfy the Fish Population Monitoring requirements with respect to hardhead (*Mylopharodon conocephalus*) as set forth in the Project 184 Settlement Agreement (EID 2003), U.S. Forest Service 4(e) License Condition No. 37 (USFS 2003), Section 7 of the El Dorado Relicensing Settlement Agreement (Settlement) Monitoring Program, and the California State Water Resources Control Board Section 401 Clean Water Act Water Quality Certification Condition No. 13a (SWRCB 2006).

The scope of this plan has been defined by the Fish Population Monitoring requirements set forth in these documents and has been agreed to by El Dorado Irrigation District (EID).

1.0 Background

The upstream distribution of hardhead in the South Fork American River (SFAR) is thought to be limited to an area downstream of the Silver Creek confluence, approximately 2.5 river kilometers from the Akin Powerhouse, although, 2007 surveys will attempt to identify upstream migration barriers. During the Federal Energy Regulatory Commission (FERC) collaborative relicensing process for EID's FERC license (Project 184), it was determined that additional information was needed to establish hardhead biomass indices in the lower reach of the SFAR that might potentially be affected by Project operations. Therefore, under the provisions of the Project 184 license, EID is required to monitor the hardhead minnow population in the SFAR near the Akin Powerhouse for three years in order to establish some baseline data on the population structure and general condition of the fish within the Project 184 boundaries. Hardhead surveys were conducted in 2004 and 2005. 2007 will comprise the third year of surveys. Following the 3 years of surveying to develop biomass indices, monitoring will continue at 5-year intervals, if the FS, ERC, and SWRCB determine it is necessary.

2.0 Study Plan Objectives

Monitoring fish populations provides a means for assessing fish community composition and abundance. The goal of the monitoring is to evaluate the status of fish populations in selected reaches of the SFAR and includes the following specific objectives.

1. To establish baseline data on the population structure and distribution of hardhead in the South Fork American River near the Akin Powerhouse.

2. To collect length and weight data for hardhead in the South Fork American River.

3. To establish a 5-year monitoring interval that will provide a basis for comparison with baseline data.

3.0 Study Area and Schedule

The study area for this survey is the SFAR adjacent to the Akin Powerhouse and extending upstream of Slab Creek Reservoir for approximately 2.5 kilometers. The surveys will also attempt to identify potential migration barriers that may determine the upstream extent of hardhead distribution in the SFAR. Monitoring will occur during early fall when the South Fork American River has reached base flow conditions.

4.0 Data Collection

Fish populations will be surveyed in the study reach using a combination of quantitative three-pass electrofishing, quantitative two-pass snorkeling, and qualitative one-pass snorkeling techniques. Electrofishing surveys will be conducted at the existing site adjacent to Akin Powerhouse and snorkel surveys will be conducted in the larger pools located upstream. As a precaution, all fish-sampling gear will be sterilized prior to use in order to avoid transporting any pathogens or invasive organisms. Incidental observations of all herpetofauna will also be documented with GPS location.

The attached map (Figure 1) shows the sample reaches and survey sites. Additionally, sites will be photographed and samples will be collected and reported per Section 6.0 of this Plan.

The FS, ERC, and SWRCB have the flexibility to alter the monitoring program methodologies and frequencies of data collection if it is determined that: (a) there is a more appropriate or preferable methodology to use than that described in the monitoring plan or (b) monitoring may be reduced or terminated because the relevant ecological resource objective has been met or no change in resource response is expected.

4.1 Electrofishing Surveys

Stream electrofishing will be conducted within pool, riffle, and run habitats adjacent to Akin Powerhouse using multiple pass depletion methodology (Platts et al., 1983). This method will be used in habitats sufficiently shallow enough to allow for effective sampling. Block seines or natural barriers will be used to isolate the sampling reach. Population estimates will be generated using maximum likelihood estimators and biomass indices will also be calculated. The existing 120-meter site between Akin Powerhouse and Slab Creek Reservoir was chosen because it meets these conditions. Electrofishing surveys will employ standard 3-pass depletion techniques using four backpack electrofishers. Block nets will be placed at the top and bottom of the survey reach to prevent fish from moving in or out of the site. Sampling will proceed from downstream to upstream during each pass. Fish collected during each electrofishing pass will be processed immediately upon completion of the pass. All specimens will be identified to species, weighed to the nearest gram using either an electronic balance or volumetric displacement, and measured to fork length (FL) using a metric fish board. During the 2007 sampling effort, fish scale samples will also be collected from several specimens of different size classes for microscope analysis (see below). For the remainder of the electrofishing survey, processed fish from each pass will be placed in an instream holding area located outside the sampling reach.

Following the three-pass depletion survey, all collected fish will be redistributed throughout the survey reach. A sample electrofishing datasheet is provided in Appendix A for reference.

4.2 Snorkel Surveys

Snorkel surveys will be conducted in habitat units that are too deep to be effectively sampled using electrofishing techniques and that contain appropriate habitat for hardhead. (i.e., primarily large, deep pools). A combination of quantitative two-pass and qualitative one-pass snorkeling techniques will be used to survey the large pools in the study area located upstream of Akin Powerhouse. For quantitative two-pass snorkeling, a team of five or six divers will survey each pool moving upstream together in a line. All observed fish will be identified, counted, and categorized into predefined three-inch (76mm) length classes (consistent with previous sampling efforts). Divers will complete the first pass through all pools to be surveyed using the quantitative two-pass technique before returning to the first pool to begin the second pass. Qualitative one-pass snorkeling will largely follow the methods summarized above; with the exception that only one pass will be completed (potentially by fewer divers). Quantitative two-pass and qualitative one-pass snorkel survey methods are detailed further in GANDA (2007). Sample snorkel survey datasheets are provided in Appendix B for reference.

In 2004 the first, second, and third pool upstream of Akin powerhouse were sampled. In 2005, five of the first six pools were sampled. In 2007 surveys will repeat at sites surveyed in 2006 and will continue upstream in additional habitat pools to determine the possible migration barrier. The number and location of pools that will be sampled in the future will be determined by FS, ERC, and SWRCB. Species and size class data for all fish observed will be recorded. Scales will also be collected in 2007 to determine whether hardhead may spawn multiple times per year. Since this work will most likely be conducted in the early fall, when the river is at base flow, EID will use the habitat measurements identified in *2005 Hardhead Surveys in the South Fork American River* (GANDA, 2007), as the basis for calculating biomass as described below.

4.3 Physical habitat

Physical habitat parameters at fish survey sites were measured during the 2005 survey effort. Site length, width, and mean and maximum depth were measured using a metric field tape. Width and depth measurements were collected every 10 meters along the entire length of each habitat unit. Pool depths that were too great to measure were estimated visually. Physical habitat characteristics for quantitative three-pass electrofishing and quantitative two-pass snorkel sites are summarized below in Table 1, and further described in GANDA (2007).

TABLE 1. Summary of physical habitat characteristics for fish population survey sites near Akin Powerhouse, South Fork American River as measured at 72.6 cfs.

SITE	**Total Length** (m)	**Mean Width** (m)	**Mean Depth** (m)	**Surface Area** (m^2)	**Volume** (m^3)
E-fish	120	23.6	0.45	2,832	1,274
Pool 1	230	29.7	2.7	6,831	18,444

Pool 2	70	21	2.2	1,470	3,234
Pool 4	90	20.3	1.3	1,827	2,375

Habitat mapping sequences for additional habitats sampled during 2007 and subsequent years will be shown in a table format denoting habitat lengths, depths, and mean widths.

5.0 Data Analysis

Electrofishing data will be analyzed using the MicroFish 3.0 software package based on the removal-depletion model (Van Deventer and Platts 1989) to generate fish population and biomass estimates. MicroFish estimates biomass by extrapolating the total weight of a sample based on the population estimates and the length-weight relationships of the fish captured. The age structure of the sampled populations will be determined from length-frequency relationships.

For quantitative two-pass snorkeling data, the average count of the two passes will be used as the population estimate for each site. Biomass estimates will be determined by extrapolating the length-weight data from the electrofishing survey. For each species and size class observed, the mean value for the corresponding fish species and size class measured during the electrofishing effort will be used to for biomass estimation.

Biomass calculations will be based on physical habitat measurements recorded under baseflow conditions during fall 2005 fish surveys (see Table 1 above and GANDA 2007). The dimensions of these survey sites are not likely to differ from year to year at baseflow level due to the predominance of highly stable substrate material such as bedrock and large boulders.

5.2 Fish Scale Analysis

Fish scales collected in 2007 will be analyzed under a microscope to determine the age and relative growth rates of the specimens. This information will be used to discern whether hardhead in the study area are spawning multiple times per year. Scale analysis may continue if determined by the FS, ERC, and SWRCB, if necessary.

6.0 Reporting

The data collected under the monitoring protocols identified in this Plan will be electronically compiled and distributed by January 31, to the FS, ERC, and SWRCB. The report will be circulated to the ERC for review and consideration at least two weeks prior to the annual meeting, which will occur by April 1. Based on the results of the annual meeting, EID will submit an annual report to FS, ERC, SWRCB, and FERC by June 30 of each year. The report will summarize the results of any ongoing monitoring or study efforts, any changes to be implemented under the license, and a summary of any unresolved issues and proposed actions to resolve each issue. All ERC members and FS and SWRCB will have 30 days to review and comment on the draft annual report prior to its submittal to FERC. The final annual report will be distributed to FS, ERC, and SWRCB after submission to FERC.

The annual report will include the issues addressed, objectives, study area including sampling locations, methods, and results. The report will also include relevant graphs and tables to describe the results of each process. Discussion appropriate to results and supportive of analyses and conclusions will be provided. All reports will be prepared in a format so that they can easily be reviewed by the ERC and filed with the FERC after approval. E-mail updates and CD of all reporting information will be provided to the ERC.

Incidental observations of all herpetofauna will be included in the report along with a GPS location where each was located.

6.0 Literature Cited

EID –El Dorado Irrigation District. 2003. El Dorado Relicensing Settlement Agreement. El Dorado Project FERC Project 184.

Garcia and Associates (GANDA). 2007. 2005 Hardhead (*Mylopharodon conocephalus*) Surveys in the South Fork American River, El Dorado Hydroelectric Project, FERC No. 184. February 2007.

Platts, W.S., W.F. Megahan, and G.W. Marshall. 1983. Methods of Evaluating Stream, Riparian, and Biotic Conditions. U.S. Forest Service General Technical Report INT 138.

State Water Resources Control Board of California. 2006. Clean Water Act Section 401 Technically-Conditioned Water Quality Certification for Federal Energy Regulatory Commission El Dorado Hydroelectric Project (FERC No. 184).

United States Forest Service. 2003. Forest Service Final Terms and Conditions Provided Under 18 CFR 4.34(b)(1) In Connection With the Application for Relicensing of The El Dorado Hydroelectric Project (FERC No. 184). October 31, 2003.

VanDeventer, J.S. and W.S. Platts. 1989. Microcomputer software system for generating population statistics from electrofishing data: users guide for Microfish 3.0. Gen. Tech. Rept. INT-254. USDA Forest Service, Intermountain Forest and Range Experiment Station, Ogden, UT. 29 p.

INSERT FIGURE 1 – Study area map (SF American, Akin Powerhouse to Silver Creek)

Appendix A:

Sample Electrofishing Datasheet

Date 10 / 18 / 2005 Stream Name: South Fork American River Lat: _____ Long: _____ Quad: _____

Site Info: ONE PASS

Stream Temp: _____ Water Temp: 52 F Time: _____ Pass: ONE Effort: _____

Crew Leader: _____ Crew: _____

	Species	Length	Weight		Species:	Length	Weight		Species	Length	Weight		Species	Length	Weight
1	DACE	91	11	26	SCULP	91	12	51	HARD	67	4	76	HARD	35	
2		42	<1	27		112	19	52		82	6	77		41	
3		40	<1	28		75	6	53		40		78		41	
4		36	<1	29		100	15	54		32		79		43	
5		58	3	30		43	<1	55		21		80		43	
6		38	<1	31		43	<1	56		30		81		41	
7		25	<1	32		79	5	57		32		82		39	
8		38	<1	33		52	<1	58		31		83		30	
9		36	<1	34		43	<1	59		38		84		46	
10		48	<1	35		41	<1	60		29		85		44	
11		34	<1	36				61		36		86		34	
12		30	<1	37				62		29		87		44	
13		35	<1	38				63		45		88		42	
14		25	<1	39				64		45		89		44	
15		31	<1	40				65		38		90		34	
16		37	<1	41				66		38		91		31	
17		37	<1	42				67		33		92		48	
18				43				68		38		93		41	
19				44				69		41		94		44	
20				45				70		37		95		46	
21				46				71		27		96		43	
22				47				72		46		97		36	
23				48				73		45		98		34	
24				49				74		36		99		46	
25				50				75		40		100		39	

Appendix B:

Sample Snorkel Survey Datasheet

Date 10 / 19 / 2005 Stream Name: South Fork American River Lat: _____ Long: _____ Quad: _____

Site Info: SITE TWO SNORKEL POOL ONE

Stream Temp: _____ Water Temp: 52° Time: 1025 - 1100 Pass: ONE Effort: _____

Crew Leader: Arakawa Crew: Jackman, Chan, D. Parkinson, T. Parkinson, D. Corcoran, G. Scott

No.	Species	Length	Weight	No.	Species	Length	Weight	No.	Species	Length	Weight	No.	Species	Length	Weight
1	HARD*	0-3	~350	26	BRT	5?	1	51	SUC	15	1	76			
2			10	27				52		18	1	77			
3		0-3	1	28				53				78			
4		0-3	160	29				54				79			
5		0-3	85	30				55				80			
6				31	RBT	6-9	2	56				81			
7				32		9-12	2	57				82			
8				33		14	1	58				83			
9				34				59				84			
10				35				60				85			
11				36				61				86			
12				37				62				87			
13				38				63				88			
14				39				64				89			
15				40				65				90			
16				41				66				91			
17				42				67				92			
18				43				68				93			
19				44				69				94			
20				45				70				95			
21				46				71				96			
22				47				72				97			
23				48				73				98			
24				49				74				99			
25				50				75				100			

0-3 HARD are cyprinids - could be pikeminnow or hardhead

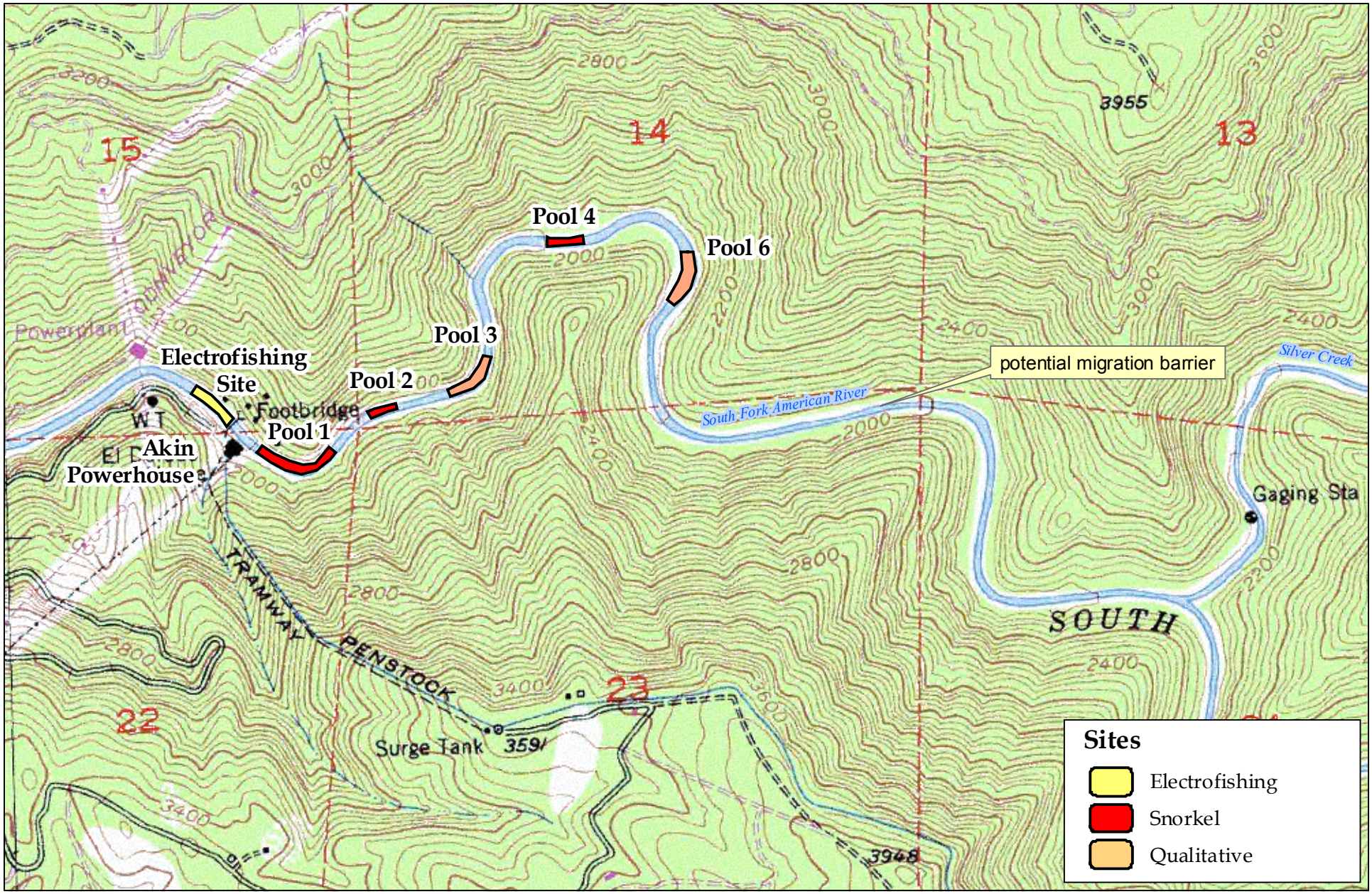

FIGURE 1. Study area for hardhead population monitoring, South Fork American River, California

Source: USGS 7.5-minute topographic map (Pollock Pines)

123 FERC ¶ 62,201
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

EL DORADO IRRIGATION DISTRICT PROJECT NO. 184 – 127

ORDER MODIFYING AND APPROVING HARDHEAD MONITORING PLAN UNDER ARTICLE 401

(Issued June 6, 2008)

The El Dorado Irrigation District (licensee) filed on August 9, 2007, a plan to monitor *Mylopharodon conocephalus* (hardhead) at the El Dorado Project pursuant to Article 401 of the license [1]. The licensee filed supplemental information on April 30, 2008. The project is located on the South Fork American River (SFAR) and its tributaries in El Dorado, Alpine, and Amador Counties, California, and occupies Federal lands administered by the U.S. Forest Service (USFS).

LICENSE REQUIREMENTS AND BACKGROUND

Article 401 requires the licensee to file for Commission approval, the plans or reports required by various conditions found in the California State Water Resources Control Board (State Board) water quality certification and the USFS final Section 4 (e) conditions. State Board Condition 13 and USFS Condition 37 require the licensee to conduct ecological resources monitoring.

The final study plans for these monitoring efforts shall be approved by the USFS, the Ecological Resources Committee (ERC; required by USFS Condition 38), and the State Board. The USFS, ERC, and State Board have the flexibility to alter the monitoring program methodologies and frequencies of data collection if it is determined that: (a) there is a more appropriate or preferable methodology to use than that described in the monitoring plan or (b) monitoring may be reduced or terminated because the relevant ecological resource objective has been met or no change in resource response is expected.

The licensee shall file with FERC by June 30 of each year an annual report fully describing the monitoring efforts of the previous calendar year. The USFS, ERC, and State Board shall have at least 30 days to review the report prior to filing with FERC.

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1 117 FERC ¶ 62, 044 (2006)

The licensee shall provide copies of the annual report to the USFS, ERC, and State Board.

The following guidelines shall be used in implementing the monitoring program: (a) monitoring and studies shall be relevant to the project, (b) monitoring and studies shall be conducted such that they provide useful information for management decisions or establishing compliance with license conditions, and (c) monitoring and studies shall be as cost-effective as possible. Funding for performing the monitoring, as well as specified contingency funding, shall be provided by the licensee.

For purposes of the ecological resources adaptive management program, each year is defined on a calendar year basis (i.e., January through December). This monitoring program covers monitoring to be conducted during all years until a new license is issued.

State Board Condition 13 (a) and USFS Condition 37 (1) require the licensee to collect data on hardhead sufficient to derive biomass indices for determining habitat quality. The data are to be collected at a site located upstream of the Akin Powerhouse and downstream of the confluence with Silver Creek in the section where hardhead were identified. This site may require a combination of snorkeling and electrofishing. If the hardhead data are collected during the relicensing of the Upper American River Project (FERC No. 2101), the data can be used to satisfy this requirement after review and approval by the USFS, the ERC, and the State Board.

The licensee will monitor hardhead for 3 years to determine the biomass indices; thereafter, monitoring would continue at 5-year intervals if the USFS, ERC, and State Board determine it is necessary.

LICENSEE'S PLAN

The SFAR hardhead study area proposed by the licensee extends from the project powerhouse upstream approximately 2.5 miles. The licensee will attempt to identify migration barriers that can limit hardhead distribution. Monitoring will occur in the fall during low-flow conditions. Physical parameters at the sampling sites were previously recorded; width and depth measurements were made every 10 meters.

A combination of electroshocking and snorkeling techniques will be used. Fish captured by electroshocking will be identified, weighed and measured, and held outside the sampling area. Scale samples may be taken to compliment samples taken during previous sampling efforts. Captured fish will be redistributed throughout the area once sampling is completed. Qualitative one- and two-pass snorkeling techniques will be used

in pools too deep to be sampled effectively by electrofishing. A line of divers moving upstream will identify, count, and estimate the length of fish observed.

The electrofishing data will be analyzed using commercially available software. Fish population and biomass will be estimated. Age structure will be determined from length-frequency relationships. The snorkeling data will provide an estimate of the fish population. The length-weight data from the electrofishing effort will be used to estimate fish biomass at the snorkeling sites. Age and relative growth rates will be determined from scale analysis. These data will be used to assess spawning rates.

The licensee proposes to distribute the data to the USFS, ERC, and State Board electronically by January 31. A report on the sampling will be distributed to the ERC at least 2 weeks prior to the annual meeting (typically held by April 1). An annual report will be provided to the USFS, the ERC, the State Board, and the Commission by June 30. The USFS, ERC, and State Board will have 30 days to review and comment on the draft report before it is submitted to the Commission. The final annual report will be distributed to the USFS, the ERC, and the State Board after its submission to the Commission.

AGENCY COMMENTS

The USFS letter to the licensee dated July 6, 2007, approved the Hardhead Monitoring Plan. The State Board letter dated August 3, 2007, also approved the plan. The licensee filed on April 30, 2008, copies of monitoring plan approval forms from the members of the ERC.

DISCUSSION AND COMMENTS

The techniques and methodologies described in the Hardhead Monitoring Plan are appropriate to acquire the data required by the license. The proposed reporting schedule, however, is confusing. The licensee proposes to submit an annual report to the USFS, the ERC, the State Board, and the Commission by June 30, and allow the agencies and the ERC 30 days to provide comments and recommendations before a final annual report is filed with the Commission. WQC Condition 13 and USFS Condition 37 require the licensee to file the report with the Commission by June 30. The Commission does not consider a draft annual report to meet this requirement.

The reporting requirement is further complicated because the licensee, with agency and ERC concurrence, began hardhead monitoring to develop the biomass indices in

2004. The licensee completed the second year of monitoring in 2005, and the third year was completed in 2007. The Commission has not received reports on these efforts.

The licensee should file a Summary Report of the first 3 years of hardhead monitoring. The report should include the comments and recommendations of the resources agencies and the ERC, including their determination of the need for subsequent monitoring every 5 years.

If the USFS, ERC, and State Board decide additional hardhead monitoring is necessary, the licensee should provide them with a draft annual report. The licensee should allow them at least 30 days for comments and recommendations. The licensee should file the final annual report with the Commission by June 30 of the year following data collection.

The licensee's plan, as modified herein, will provide the data necessary for assessing the hardhead population in the bypassed reach of the SFAR. The modified plan should be approved.

The Director Orders:

(A) The Hardhead Monitoring Plan filed August 9, 2007, by the El Dorado Irrigation District pursuant to Article 401, and supplemented April 30, 2008, is approved, subject to the modifications in Paragraphs B and C.

(B) The licensee shall file with the Commission by June 30, 2008, a summary report on the first 3 years of hardhead monitoring. The report shall include the comments and recommendations of the U. S. Forest Service, the California State Water Resources Control Board, and the Ecological Resources Committee.

If the licensee does not adopt a recommendation, the filing shall include the licensee’s reasons based on project-specific information. The Commission reserves the right to modify the Hardhead Monitoring Plan to protect aquatic resources in the South Fork American River and its tributaries.

(C) The licensee shall distribute copies of the draft annual report for any subsequent hardhead monitoring to the U. S. Forest Service, the California State Water Resources Control Board, and the Ecological Resources Committee. The licensee shall allow the agencies and the committee at least 30 days to provide comments and recommendations. The licensee shall file the final annual report with the Commission by June 30 of the year following the required monitoring.

The report filed with the Commission shall include the comments and recommendations made by the U. S. Forest Service, the California State Water Resources Control Board, and the Ecological Resources Committee. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

(C) This order constitutes final agency action. Request for rehearing by the Commission may be filed within 30 days from the date of the issuance of this order, pursuant to 18 CFR ' 385.713.

George H. Taylor
Chief, Biological Resources Branch
Division of Hydropower Administration
and Compliance