POTENTIAL RESOURCE ISSUE:

- Fish species composition, distribution, and abundance.

PROJECT NEXUS:

- Project operations modify the flow regime and fish habitat in the bypass river reaches.

POTENTIAL LICENSE CONDITION:

- Instream flow releases.

STUDY OBJECTIVES:

- Document fish species composition, distribution, and abundance in the bypass river reaches.
- Characterize fish growth, condition factor, and population age structure in the bypass river reaches.

EXTENT OF STUDY AREA:

The study area includes the bypass river reaches and comparison reaches upstream of Project diversions. Specific study areas are identified in Table AQ 2-1 and Map AQ 2-1. Some portions of the East Fork Kaweah River are difficult to access due to the rugged terrain (see Map AQ 2-1). Field data will only be collected in portions of the river that are accessible.

It should be noted that the majority of lands along the bypass reaches are privately owned and outside the FERC Project boundary. For the purposes of the fish population study described herein, SCE will take the following steps to obtain approval to conduct field studies on private property:

- Provide notification to landowner of Project relicensing and request authorization to enter property to conduct the field studies.
- If authorization is obtained, SCE will complete field studies as described in this technical study plan.
- If authorization is not obtained, SCE will limit field studies to only those lands where land owners have provided access.

STUDY APPROACH:

Study Sites

The general locations of study sites for developing fish standing crop estimates (fish per mile and/or pounds (lbs.) per acre) are shown in Table AQ 2-1 and Map AQ 2-1. River sampling sites (electrofishing and/or snorkeling) will generally be a minimum of 100 meters (m) long. Some of the larger river sites (e.g., Kaweah River) may require sampling sites up to 300 meters to include multiple habitat types. The specific locations of the sampling sites will be determined in the field in coordination with the interested resource agencies. The AQ 1 – Instream Flow Technical Study Plan (TSP) microhabitat mapping will be used to identify representative reach sampling sites with mesohabitat types in similar proportion to the larger geomorphic river segments. Where possible, sampling sites will be chosen that overlap with the instream flow study sites (see the AQ 1 –

Instream Flow TSP) and historic sampling sites. Sampling sites will be chosen far enough upstream or downstream of access locations to minimize the effects of fishing on fish population results, where applicable. Where comparisons likely are to be made between locations upstream and downstream of Project facilities, comparison study sites will be located in sections of river with similar habitat types and similar sampling methods will be used (see below). Table AQ 2-2 shows the specific location, length, and sampling methods (table details to be completed in consultation with interested resource agencies).

River Sampling

The river study sites will be sampled in Year One to identify the spatial distribution and abundance of fish species. Quantitative river sampling will be conducted during the late summer/early fall base flow period using a combination of electrofishing (shallow water) and/or snorkeling (deep water) (Table AQ 2-2). Multi-pass electrofishing (e.g., Reynolds 1996; Van Deventer and Platts 1989; Rexstad and Burnham 1992) will be used to sample and estimate fish populations in shallow stream habitats (<1.5 m) at each representative reach study site. Where possible, the representative reach sampling sites will be partitioned into mesohabitat types for sampling using block nets. Captured fish from each pass will be kept in separate live wells or buckets. Fish will be anesthetized (CO_2), enumerated, identified to species, measured (fork length and weight), and scale samples will be obtained. Fish will be returned to the study site when the sampling is completed. Sampling protocols and field data forms will be consistent with those in Flosi et al. 1998. The lengths and widths of the habitat units sampled will be recorded to calculate fish abundance by length and area (density) of stream sampled. Very small hardhead or pikeminnow that cannot be identified to species will be recorded as hardhead/pikeminow guild. Very small fish of all species that cannot be identified to species (or family) will be recorded as fry.

Snorkeling (e.g., Dolloff et al. 1996) will be used to assess fish populations in deep water habitats (≥ 1.5 m) at each representative reach study site (Table AQ 2-2). Snorkelers will survey in lanes along the river and will identify, count, and estimate the length of each fish observed. Fish data will be recorded by habitat unit type. Snorkeling protocols and field data forms will be consistent with those in Flosi et al. 1998. Juvenile hardhead and pikeminnow (less than approximately 10 inches) will be recorded as a single category, hardhead/pikeminnow guild, where identification is uncertain. Very small fish of all species that cannot be identified will be recorded as fry.

Along the river segments, between or above the quantitative study sites (QSS), qualitative presence/absence sampling will be used to identify the distribution of fish species. Snorkeling or qualitative electrofishing will be used, as needed, to spot check between the study sites to identify the approximate late summer/early fall distribution of hardhead and or trout.

Special Purpose Qualitative Sampling

Qualitative sampling using electrofishing and/or seining gear will also be used to collect seasonal information on emergence of fry (i.e., to identify timing of spawning and early fry rearing). This sampling will be used to identify the timing and abundance of fry in the vicinity of Project diversions. Three samplings will be equally spaced through the early May to early July time period.

Data Reporting

- Summarize fish standing crop estimates for each species at each study site in terms of density (e.g., fish/ft² and fish/mile) and biomass (lbs/acre and lbs/mile).

- Identify appropriate fish standing crop comparison datasets in collaboration with the interested resource agencies.
- Develop a distribution map for each species in the Project study area using the quantitative abundance estimates and qualitative sampling data.
- Develop a fish life stage periodicity chart (or life history chronology chart by month) for each species for each study reach based on available literature, consultation with qualified fisheries biologists, and the fish population sampling data.
- Develop length frequency histograms of sampled fish and examine distribution modality, in conjunction with scale data, to determine the age structure of fish populations.
- Summarize fish growth and age data using length frequency and scale analysis.
- Calculate fish condition factors using measured weight and length data.
- Provide an electronic database (Excel spreadsheet) of all fish sampling data (date, location, fish species, fish size, sampling pass, etc.) to BLM, resource agencies, and interested stakeholders.

SCHEDULE:

Date	Activity
April–May 2018	Select fish population sampling sites in collaboration with interested resource agencies
May–June 2018	Conduct qualitative fish sampling (young-of-the-year [YOY] emergence)
Late August–November 2018	Conduct quantitative fish sampling (electrofishing/ snorkeling) and fish tissue collection for water quality study, as needed
December 2018–February 2019	Analyze data and prepare draft report
February 2019	Distribute draft report to the stakeholders
March–May 2019	Stakeholders review and provide comments on draft report (90 days)
June–July 2019	Resolve comments and prepare final report
August 2019	Distribute final report in Draft License Application

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TABLES

Table AQ 2-1. Fish Population River Sampling Reaches.

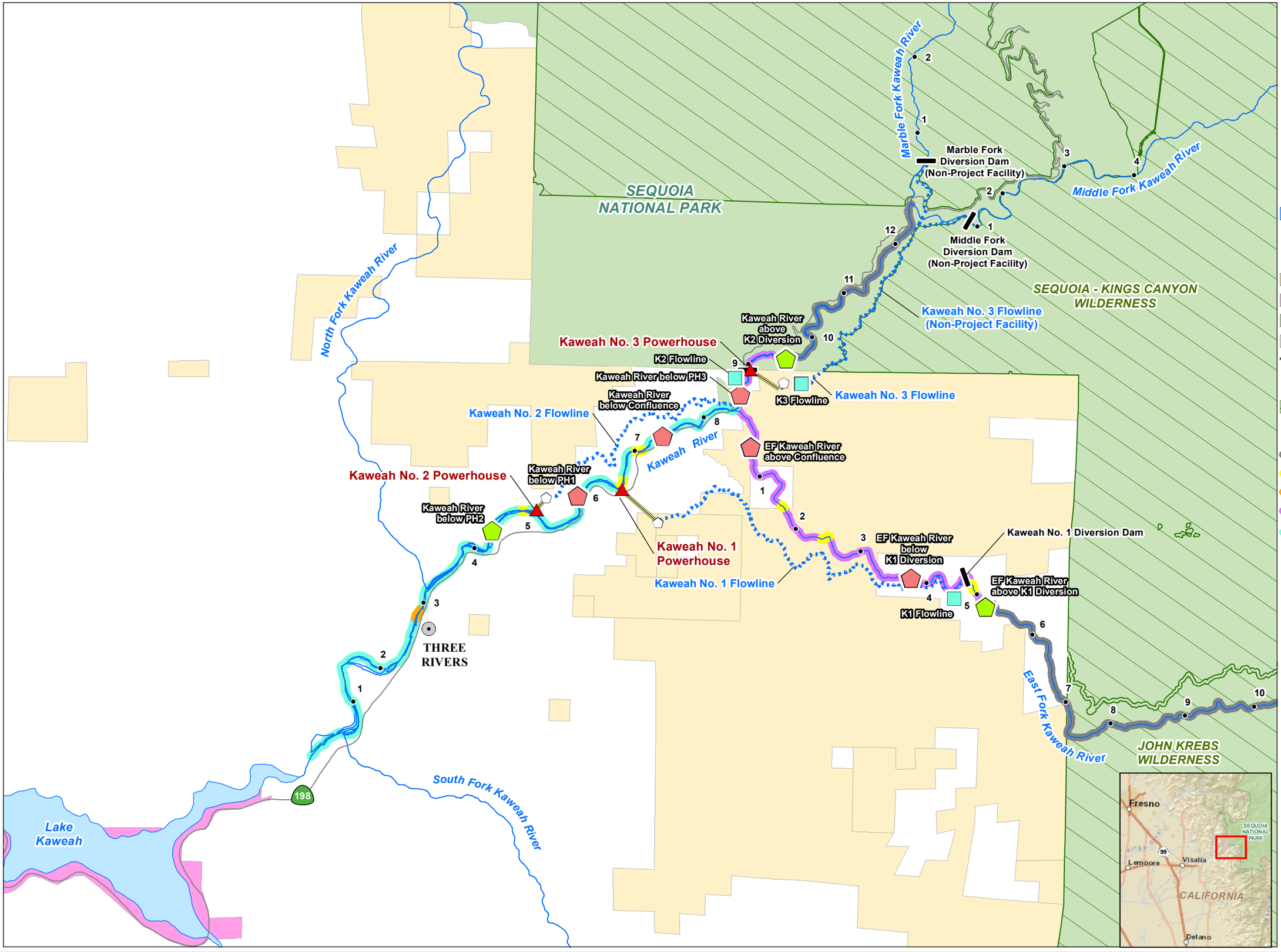
Study Reach	Site ID	Bypass Reaches	Reaches Upstream of Project Facilities or Comparison Reaches	Number of Fish Population Sampling Sites
Kaweah River				
Kaweah River Upstream of Kaweah No. 3 Powerhouse	K9.5		●	1
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	K8.7	●		1
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	K7.3	●		1
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	K6.9	●		1
Kaweah River Downstream of Kaweah No. 2 Powerhouse	K4.3		●	1
East Fork Kaweah River				
East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion	EFK5.2		●	1
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	EFK3.8	●		1
East Fork Kaweah River Upstream of Confluence with Kaweah River	EFK0.7	●		1

Table AQ 2-2. Fish Population River Sampling Locations[1].

Study River and Site ID	Sampling Location		Site Length (m)	Sampling Dates	Sampling Method	Comments
	River Miles	GPS at Downstream Starting Location				
Kaweah River						
K9.5	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
K8.7	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
K7.3	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
K6.9	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
K4.3	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
East Fork Kaweah River						
EFK5.2	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
EFK3.8	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	
EFK0.7	TBD	TBD	100	Fall 2016	Electrofishing/Snorkeling	

[1]All information is tentative. Information to be determined in the field and completed in coordination with interested resource agencies.

MAP



Facilities

- Powerhouse
- Diversion
- Forebay
- Flowline
- Penstock

Other Features

- City/Town
- Highway/Road
- Watercourse
- Water Body
- River Mile

Land Jurisdiction*

- Bureau of Land Management
- U.S. Army Corps of Engineers
- National Park Service
- Private

*SOURCE: BLM 2012

Land Management

- National Wilderness Area

Channel Characterization

- NA
- bedrock
- bedrock/cascade
- bedrock/step-pool/cascade
- pool-riffle/plane-bed

Sampling Locations

- Entrainment Monitoring (flowlines)
- Fish, BMI, FYLF, Riparian
- Fish, BMI, FYLF, Riparian, Instream Flow

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Map AQ 2-1
Kaweah Project
Aquatic and Riparian Sampling Locations

Date: 12/8/2015

0 0.25 0.5 1 Miles

Projection: UTM Zone 11
Datum: NAD 83