4.8 Fish Passage Study Plan

This study is designed to assess the effects of Project operations on fish migration. The study will focus on upstream migration out of reservoirs, migration within stream reaches, migration barriers at major dams, and migration barriers at tributary confluences for those fishes known to occur in the study area. The study will also consider more general, non-migratory movements of the fish.

4.8.1 Pertinent Issue Questions

This Fish Migration Study Plan addresses the following Aquatic/Water Issue Questions:

32. How are fish migrations and movements affected by the project?

For the purposes of this study plan's execution, it is understood that SMUD will address the UARP reservoirs and stream reaches, and SMUD and PG&E will jointly address Chili Bar Reservoir and the reach below Chili Bar.

4.8.2 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. There are no anadromous fish in the Project area, although there is a land-locked population of kokanee in Union Valley Reservoir. 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. Additional fish population information was collected in 2002. These studies provide information on species composition, distribution or abundance.

4.8.3 Study Objectives

The objective of this study is to assess how project operations affect fish migration.

4.8.4 Study Area

The study area will include all of the Project dams, stream segments within reservoir fluctuation zones, regulated stream reaches below reservoirs, and major tributary confluences in regulated stream reaches. The area also includes the PG&E reservoir at Chili Bar and the reach downstream of Chili Bar Dam.

4.8.5 Information Needed From Other Studies

Information needed from other studies includes: 1) updated information on fish species that occur in each reservoir and stream reach from the Fish Surveys Study; 2) any potential barriers identified at inflows from the Reservoir Fish Study, and 3) any potential barriers identified in stream reaches from the Habitat Mapping Study. Additionally, information from SMUD and PG&E helicopter video and aerial photos will be valuable in the identification and assessment of potential migration barriers.

4.8.6 Study Methods And Schedule

Fish migration and movement within the study area will be broken down into four primary components.

- Upstream migration from reservoirs
- Migration within stream reaches
- Migration barriers at dams
- Migration barriers at tributary confluences

Upstream Migration From Reservoirs
The fish species present in each reservoir will be identified to determine which species are migratory and likely to require access to riverine spawning areas. The general seasonal movements of all fish species present will be assessed in regards to their ability to utilize adjoining habitats in the reservoir inflow areas.

Information from the Reservoir Fish Study along with any available reservoir mapping data will be used to determine if migration barriers are present in the fluctuation zone of inflow areas. Field visits would be required for inflow areas where no mapping data exists.

Migration Within Stream Reaches
The fish species present in each stream reach will be identified to determine which species are migratory and likely to require access to spawning areas not available within adjoining habitats. The general seasonal movements of all fish species present will be assessed in regards to their ability to utilize adjoining habitats within the stream reach.

Information from the Habitat Mapping Study will be used along with available helicopter video of stream channels and aerial photos to determine if potential migration barriers are present in the stream reaches. Barriers will most likely exist at higher gradient cascades and waterfalls. An evaluation of available potential spawning habitat will then be made to determine if barriers are preventing access to spawning areas during periods of low flow. Field visits would be required for areas where mapping data or video does not fully characterize the potential barrier.

Migration Barriers at Dams
The fish species present in each stream reach above and below dams will be identified to determine which species are migratory and likely to require access to spawning areas not available within adjoining habitats. The general movements of all fish species present will be assessed in regards to their ability to utilize adjoining habitats within the stream reaches above and below the dams.

A literature review will be conducted to document the migration and movement tendencies of the resident fish species.

Migration Barriers at Tributary Confluences
The fish species present in each stream reach will be identified to determine which species are migratory and likely to require access to spawning areas in major tributaries within the reach. The general movements of all fish species present will be assessed in regards to their ability to utilize tributary habitats.

Information from the Habitat Mapping Study will be used along with any available helicopter video of stream channels to determine if major tributaries occur within any given stream reach that would be considered potentially suitable and accessible for spawning or seasonal refugia. Tributaries with extreme gradients found in canyon reaches would not be considered suitable. A preliminary investigation to identify suitable tributaries would be made. Field visits would be required for tributaries where mapping data or video does not fully characterize the potential barrier.

4.8.7 Analysis

As described above, data analysis will include identifying and mapping potential fish migration barriers for each reservoir inundation zone, stream reach, dam, and major tributary confluence and quantifying either the amount of habitat potentially affected during normal Project operations and/or describing possible effects on the fish population. Barriers to fish migration and movement will be identified and an assessment of potential effects (e.g., reservoir elevation and/or instream flow levels at which barriers are surmountable by target species and life stages) will be made.

Table 1. Known species composition for study reaches[†]

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

[†] ● Historical data
o 2002 Surveys

*Species:
BRN=Brown trout
SMB = Smallmouth bass
MSK= Mountain sucker
BRK=Brook trout
HCH=Hitch
SPM= Sacramento pikeminnow
CR=California roach
RS=Riffle sculpin
HH=Hardhead
RBT=Rainbow trout
SD=Speckled dace
GSH=Golden shiner
PS = Prickly sculpin
SS=Sacramento sucker

Table 2. Known species composition for Project reservoirs.[†]

	Species*																			
Reservoir	***RBT***	***BRN***	***BRK***	***CR***	***CT***	***CH***	***GS***	***GSH***	***GT***	***HH***	***KS***	***LT***	***MF***	***MN***	***SB***	***SD***	***SS***	***RS***	***TP***	***SMB***	***References***
Rubicon	●	●	●						●												CDFG surveys, various dates
Buck Island	●	●	●																		CDFG surveys, various dates
Loon Lake	● o	● o	●	● o		●	●										● o		●		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	● o	●			●		●	●			● o	● o	●		●		● o			o	SMUD 2001, CDFG surveys, various dates; EA 1980 [Stillwater UARP Library #117]
Ice House	● o	● o	●	o			●				●										SMUD 2001, EA 1980 [Stillwater UARP Library #117], EDAW 1978 [Stillwater UARP Library #118]; CDFG surveys, various dates
Junction	●	● o	●								●						● o				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	●	● o	●	●						● o	●				●	●	● o				SMUD 2001, Thomas 1994c [Stillwater UARP Library #233]; Jordan and Brown 1992; Jones and Stokes 1994; WESCO 1980
Chili Bar		o								o							o				No information gathered yet

† ● Historical data
o 2002 Surveys

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

4.8.8 Study Output

A presentation of study progress will be made to the Aquatics TWG and the Plenary Group in fall 2003. A written report including the issues addressed, objectives, description of study area and sampling locations, methods, results, discussion and conclusions will be prepared after field visits and analyses are complete. 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.

4.8.9 Preliminary Estimated Study Cost

4.8.10 Plenary Group Endorsement

This study plan was approved on August 26, 2003 by the following participants of the Aquatic TWG: USFS, USBLM, Camp Lotus, PG&E, SWRCB, SMUD and CDFG. No participant said they could not "live with" the study plan. The Plenary Group approved the plan on September 9, 2003. The participants a the meeting who said they could "live with" this study plan were USFS, SWRCB, NPS, CDFG, El Dorado County, Taxpayers Association of El Dorado County, Teichert Materials, ARRA/Camp Lotus, El Dorado Irrigation District, SMUD, PCWA, City of Sacramento, FOR, and PG&E. None of the participants at the meeting said they could not "live with" this study plan.

4.8.11 Literature Cited

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AQUATICS TWG NOTE:

1. *It is understood that PG&E and SMUD will consult with the Aquatics TWG to extend this study plan to Chili Bar Reservoir, as appropriate. It is the intent of the Aquatics TWG (including PG&E and SMUD) that this study plan be performed concurrently above and below Chili Bar.*