Attachment 1

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Pacific Gas and Electric, Poe Hydroelectric Project	) P-2107-016

BUTTE COUNTY'S RECOMMENDED CONDITIONS FOR NEW LICENSE

Pursuant to Federal Power Act (FPA) section 10(a), 16 U.S.C. § 803(a), Butte County provides these recommendations in response to the Federal Energy Regulatory Commission's (Commission) "Notice Soliciting Comments and Final Recommendations, Terms and Conditions and Prescriptions for Pacific Gas and Electric Company's (PG&E) Poe Project No. 2107" (Feb. 8, 2005). Our comments are organized as follows.

Section I provides the legal basis for our recommended conditions.

Section II states six recommended conditions and provides explanation. On factual issues, we rely on the New License Application (December 2003) (NLA), other documents as cited, and the attached reports prepared by our expert consultants: "Coldwater Fisheries Impacts and Mitigation" (Attachment 1), "Impacts on Economic Value of River Recreation" (Attachment 3), "Power Generation Impacts" (Attachment 6), and "Cost of Decommissioning Big Bend Dam" (Attachment 8). We also attach professional qualifications for our experts Gayland Taylor (Attachment 2), Chuck Watson (Attachment 4), Marvin Feldman (Attachment 5), Jeff Payne (Attachment 7), and Dennis Gathard (Attachment 9).

Section III proposes further procedures to resolve the disputed issues of law and fact in this proceeding.

I.
INTRODUCTION

The NLA proposes new license conditions that would enhance the environmental baseline created by the original license. Most importantly, it proposes to change the minimum flow schedule from 50 cubic feet per second (cfs) to 150 cfs. However, it also would continue that baseline for another 30 years in many other respects in order to protect the power generation value of the Project. Thus, the NLA recommends against any recreational flow schedule and against any mitigation for the Project's continuing impact on passage of coldwater fish. Our recommended conditions are intended to protect and enhance *all* beneficial uses of the Project reaches as required by FPA Section 10(a) and other applicable laws. Specifically, our conditions will mitigate the Project's continuing blockage of fish passage and navigability at Big Bend and Poe Dams; the substitution of shallow reservoirs for roughly 3 miles of free-flowing river; the 90% reduction in frequency of boatable flows in the 8-mile bypass between Poe Diversion Dam and Poe Powerhouse; and the corresponding loss of potential river recreation and associated economic benefits to Butte County.

The Feather River Canyon is a unique and outstanding resource of Butte County. Its scenic beauty, history, and suitability for many forms of recreation, including angling and boating, are "world-class." *See* Butte County, "Comments on Scoping Document 1 (May 3, 2004), Ex. B (Economic Development Opportunity – Feather River, Tourism Related)" (hereafter, SD-1 Comments). Under the baseline, these resources are dedicated to power generation in a manner that substantially impairs other beneficial uses. The new license will achieve a new balance. Under Section 10(a)(1), the new license must assure that the project "...is best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes...." 16 U.S.C. § 803(a)(1); *see also* Udall v. Federal Power Commission, 387 U.S. 428 (1967). The Commission recognizes two comprehensive plans that provide specific direction for this new balance.

First, the new license must be best adapted to the State Water Resources Control Board's (SWRCB) Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (1998) (hereafter, Basin Plan), adopted under Clean Water Act (CWA) section 303, 33 U.S.C. § 1313. While the new license will incorporate the SWRCB's conditions of certification under CWA section 401(a) to assure compliance with water quality standards, the Commission has independent authority under FPA section 10(a)(1) to adopt other conditions to assure that the new license is best adapted to this plan. The Basin Plan designates beneficial uses, which are water quality standards, for the North Fork Feather River (NFFR), including the Project reaches (upper, between Poe Reservoir and Poe Powerhouse; and lower, between that powerhouse and Big Bend Dam). These beneficial uses are: Municipal Water Supply, Power, Water Contact Recreation, Non-Contact Water Recreation, Cold Freshwater Habitat, Spawning, Reproduction, and/or Early Development, and Wildlife Habitat. *See* Basin Plan, *supra*, p. II-2.00. The Clean Water Act does not allow the impairment of non-developmental beneficial uses of this river in favor of hydropower or other developmental uses. It requires that any federal decision subject to these standards shall "...restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a).

Second, the new license must be best adapted to the U.S. Forest Service's Plumas National Forest Land Management Plan (1988) (Forest Plan). While the new license will incorporate the Forest Service's conditions adopted under FPA section 4(e) to assure the adequate protection and utilization of the 144 acres of Plumas National Forest land occupied by the Project (*see* NLA, p. E6-1), the Commission has independent authority under FPA sections 10(a)(1) and 4(e) to adopt other conditions to assure that the new license is best adapted to this plan. The Forest Plan establishes Standards and Guidelines and other management requirements for the NFFR within Project boundaries, including: "Provide for a variety of forest related recreation, "Maintain habitat to support viable populations of all native and desired non-native vertebrate species," "Maintain or improve water quality to protect beneficial uses and meet or exceed State objectives," and "Facilitate permitting of hydroelectric and other new energy development that reasonably protects all resources." *See* Forest Plan, *supra*, pp. 4-1 –4-9. In implementing these standards, the new license must reflect the bedrock purpose of the Organic Administration Act (1897): "No national forest shall be established, except to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States...." 16 U.S.C. § 475. The new license must also reflect the purpose of the Multiple Use-Sustained Yield Act (1960), 16 U.S.C. §§ 528 *et seq.*, which provides for "harmonious and coordinated management" of timber, water, outdoor recreation, fish and wildlife. 16 U.S.C. §§ 539, 531, 528. More specifically, it must assure the "sustained yield" – the "high level" of productivity -- of the affected resources. *Id.*, §§ 529, 531.

Conditions adopted under FPA section 10(a)(1) must mitigate the Project's direct, indirect, and cumulative impacts on the natural resources of the Project reaches, to the extent feasible. Cumulative impacts include: "the impact on the environment which results from the incremental impact of the action *when added to other past, present, and reasonably future actions....*" 40 CFR § 1508.7 (emphasis added). Although the baseline is existing environmental quality, cumulative impacts here will include those impacts which the original license created and this new license may not mitigate, such as any continuing blockage of fish passage or dedication of most in-flow to hydropower generation. *See* American Rivers v. FERC, 201 F.3d 1186, 1198 (9th Cir. 2000). A new license is a "new decision" whether to continue or change each condition of the original license. Confederated Tribes and Bands of the Yakima Indian Nation v. FERC, 746 F.2d 466, 476 (9th Cir. 1984). A new license must improve the environmental baseline by mitigating such cumulative impacts, insofar as the change is justified and within the reasonable control of the project. Under FPA section 10(a)(1), the new license must result in "protection, mitigation, and e*nhancemen*t" of non-developmental uses of the affected waters. (Emphasis added). Under these authorities as well as National Environmental Policy Act (NEPA), 42 U.S.C. §§ 4321 *et seq.*, a new license may require compensation or off-site mitigation proportionate to a significant impact that the license otherwise does not mitigate. *See* Massachusetts Municipal Electric Co. v. Power Authority of the State of New York, 105 FERC ¶ 61,102, 61,602 (Oct. 23, 2003);*see, e.g.,* U.S. Fish and Wildlife Service (FWS), "Mitigation Policy," 46 Fed. Reg. 7644 (1981), which interprets NEPA and other substantive laws for the protection of fish and wildlife to require avoidance of an impact, mitigation as a second preference, and finally compensation (45 Fed. Reg. LEXSEE *32).

II.
RECOMMENDED CONDITIONS

Butte County recommends the following six conditions in the new license to protect, mitigate, and enhance fish and wildlife and recreation resources affected by the project. We state each recommended condition in italicized font. We then provide explanation in normal font.

Condition 1 states a minimum flow schedule between 150 cfs and 300 cfs, depending on the month and Water Year, to enhance the environmental baseline for coldwater fisheries. Condition 2 provides for a Fisheries Enhancement Plan, which will assure effective implementation of non-flow measures to enhance coldwater fisheries, including a fish ladder at Big Bend or decommissioning, along with enhanced access to tributaries in the Project reaches. Condition 3 provides for a Recreation Management Plan, which will establish detailed specifications and performance standards for the recreational facilities. Condition 4 specifies improvements in recreational facilities, beginning at Poe Reservoir and continuing downstream to Poe Powerhouse Beach. Condition 5 states a recreational flow schedule of extended spring spills and one weekend per summer month of boatable flows. Finally, Condition 6 requests a North Fork Feather Enhancement Fund of $20 million (2006) to partially compensate for the otherwise significant unmitigated impacts o the new license on river recreation and fish passage.

We will defer to the SWRCB, Forest Service, or National Marine Fisheries Service (NMFS), with respect to other conditions they will prescribe under CWA section 401(a) and FPA sections 4(e) and 18. We will further defer to the California Department of Fish and Game (DFG) and FWS with respect to other conditions they will recommend under FPA section 10(j), for protection and enhancement of environmental quality. If silent in these comments, we do not object to the NLA's other recommended conditions for recreation or protection of environmental quality.

Our recommended conditions will establish a new balance between power generation and other beneficial uses of the Project reaches. The minimum flow schedule will restore to good condition the habitat for coldwater fisheries, at a loss of 6.5% in the baseline power value. The recreational flow schedule will provide a monthly boating opportunity in the summer, at an incremental loss of less than 1% of the baseline power value. In other words, while the Project will continue to dominate the allocation of available flow, the allocation will be shifted to establish a new balance. The Enhancement Fund of $20 million (2005) over the license term will be used for off-site mitigation of the otherwise unmitigated impacts of the Project on coldwater fisheries and recreation. These continuing impacts include: the blockage of fish passage at Poe Dam, and the loss of more than $*10.1 million per year* in economic benefits to Butte County as a result of diversion of most flow from the bypass reach. In coordination with any similar funds in the licenses for the North Fork Feather Project (P-2105) and Oroville Project (P-2100), the Enhancement Fund will be used by non-licensee agencies to undertake measures both upstream and downstream in the Feather River Canyon to enhance these beneficial uses which the Project will continue to impair on-site.

We now turn to our specific recommendations.

Condition 1. Ecological Flow Schedule and Other Requirements*. The Licensee shall implement the following requirements for the preservation and enhancement of aquatic resources in the Project reach below Poe Dam.*

A. Minimum Flow Schedule. Licensee shall maintain minimum streamflows at gage NF-23 in accordance with the table below. Minimum streamflows shall commence within 60 days of license issuance, unless any facility modification is required.

Month	***Water Year Type***			
	Wet	***Normal***	***Dry***	***Critically Dry***
October	*250*	*250*	*150*	*150*
November	*275*	*275*	*150*	*150*
December	*300*	*300*	*180*	*150*
January	*325*	*300*	*180*	*150*
February (1)	*350*	*325*	*225*	*225*
March	*350*	*350*	*280*	*270*
April	*400*	*375*	*280*	*270*
May	*425*	*325*	*250*	*250*
June (2)	*350*	*300*	*220*	*220*
July (2)	*300*	*275*	*200*	*180*
August (2)	*300*	*250*	*200*	*180*
September (2)	*300*	*250*	*180*	*180*

(1) See pulse flow requirement stated in paragraph (B).
(2) See temperature moderation requirement stated in paragraph (C).

Where facility modification is required to implement the efficient release of minimum flow, the Licensee shall submit to the Commission any necessary application within one year after license issuance, and it shall complete such modification as soon as reasonably practicable but no later than two years after receipt of any required approval. Prior to completion of such *required facility modification, the Licensee shall make a good faith effort to provide the specified minimum streamflows within the capabilities of the existing facilities.*

B. Pulse Flow. Licensee shall release pulse flow [as may be required by Forest Service in their respective conditions].

C. Temperature Moderation. Licensee shall moderate the impact on water temperature [as may be required Forest Service or SWRCB in their respective conditions].

D. Emergency. The requirements of this Condition are subject to temporary modification if required by equipment malfunction, law enforcement authorities, or in response to emergencies. An emergency is an event that is reasonably out of the control of the Licensee and requires Licensee to take immediate action, either unilaterally or under instruction by law enforcement or other regulatory agency staff, to prevent imminent loss of human life or substantial property damage. If the Licensee temporarily modifies the requirements of these conditions, then the Licensee shall make all reasonable efforts to promptly resume performance of such requirements and shall notify California Department of Fish and Game, State Water Resources Control Board, Forest Service, U. S. Fish and Wildlife Service, and NOAA Fisheries.

Explanation for Condition 1

NLA recommends that the new license include a flow schedule of 150 cfs released on a continuous, year-round basis. NLA, p. Project Resource Summary (PRS)-12. *Paragraph A* requires a flow schedule that will better enhance the baseline condition, which results from the release of 50 cubic feet per second (cfs) under the original license. "[T]he existing project has altered the historic ecosystem (hydrology and water temperature) and this altered ecosystem now favors non-native warmwater fish." Letter from Larry Eng, DFG, to Randy Livingstone, PG&E (July 18, 2001), p. 7; *see also* letter from Sharon Stohrer, SWRCB, to Tom Jereb, PG&E (July 17, 2002), pp. 3-4. The unimpaired inflow in the Project reaches, which sustained substantial anadromous and coldwater fisheries before Project construction (*see* NMFS, "Comments, Modified Terms and Conditions, and Modified Prescriptions for the Upper North Fork Feather River Project, No. 2105" (March 11, 2005) (hereafter, P-2105 Fishway Prescription), pp. 1-2) usually exceeded 1,000 cfs. *See* NLA Appendix B-1 ("Flow Duration Curves"). According to PG&E's "Instream Flow Study" (NLA Appendix E3-14), habitat (expressed as weighted useable area) for rainbow trout increases rapidly from 100 to 250 cfs, and more gradually thereafter. *See id.,* p. 32.

The recommended flow schedule will substantially enhance the existing habitat for coldwater fisheries. *See* Attachment 1, pp. 1-2. It will reduce the baseline power value of the project by less than 6.5%. *See* Attachment 6, p. 6. We understand the resource agencies support and will offer this schedule under their various authorities.

Condition 2. ***<u>Fisheries Enhancement Plan</u>***. *Within one year of license issuance, the Licensee shall develop, submit for the Commission's approval, and thereafter implement a Fisheries Management Plan for the purpose of enhancing the coldwater and other fisheries in the Poe Project reaches. The plan shall include the following elements.*

A. <u>Tributary Access</u>. The Licensee shall inventory all barriers to passage of riverine trout within the project boundaries, including tributary streams. The plan shall include location and detailed description of each such barrier, description of ownership and the feasibility of obtaining permission to remove, and an analysis of the cost-effectiveness of such removal. Pursuant to a mutually agreeable arrangement with CalTrans and Union Pacific Railroad, and within three years of license issuance, the Licensee shall construct fish passage facilities on Flea Valley Creek and Mill Creek. Any facility for fish passage shall be designed not to retain spawning gravel.

B. <u>Big Bend Passage</u>. Within three years of license issuance, Licensee shall replace the existing fish passage facility at Big Bend Dam to provide effective passage of trout and salmon. The design shall include velocity and other features designed to exclude other reservoir fish. The Licensee shall include in the Fisheries Enhancement Plan a further study of the feasibility and cost-effectiveness of removal of Big Bend Dam.

C. <u>Spawning Gravel</u>. The Licensee shall replace spawning gravels in locations and amounts specified in the Fisheries Enhancement Plan as appropriate to enhance trout spawning.

D. <u>Coordination with Other Projects in Watershed</u>. The Licensee shall coordinate the implementation of the protection, mitigation, and enhancement measures in this license and the licenses for North Fork Feather Project (P-2105), Rock Creek-Cresta Project (P-1962), and California Department of Water Resources' Oroville Project (P-2100).

E. <u>Ecological Management Committee</u>. Within two months of license issuance, Licensee shall establish and thereafter administer an Ecological Management Team (EMT) that includes U.S. Forest Service, U.S. Fish and Wildlife Service, National Marine Fisheries, California Department of Fish and Game, and Butte County. The Licensee shall consult with the team to develop and implement the Fisheries Enhancement Plan and coordinate with other collaborative efforts for upstream and downstream projects on the North Fork Feather River. The Licensee shall, by consensus with the team, adopt written protocols for schedule and conduct of meetings and dispute resolution. Through this team and as otherwise required by applicable law, the Licensee shall consult with these agencies regarding measures within their respective jurisdictions.

<u>Explanation for Condition 2</u>

The NLA does not provide for submittal of a Fisheries Enhancement Plan. Consistent with the Commission's standard practice, such a plan is appropriate to establish the specific designs and performance standards of non-flow measures to enhance coldwater fisheries and other aquatic resources.

Paragraph A requires PG&E to inventory man-made barriers to tributary access within the Project boundaries, and to evaluate the feasibility of removal in cooperation with any third party. It further requires PG&E, in cooperation with CalTrans and Union Pacific, to remedy the barriers to Flea Valley Creek and Mill Creek (*see* NLA, p. PRS-17, E3.1-224), which are the "most suitable spawning habitat in the Poe Reach." NLA, p. PRS-17. Such access may be accomplished by ladder or removal of the barriers. *See* Attachment 1, p. 2.

Paragraph B will mitigate the continuing impacts of Big Bend Dam on fish passage. The dam blocks all upstream passage in most conditions. *See* NLA, p. E3.1-226. While "[t]he dam at one time had a fish ladder designed for Chinook salmon passage, major portions of which no longer exist." NLA, p. PRS-17. NMFS anticipates that its fishway prescriptions in the ongoing relicensing proceedings on the North Fork Feather "...will allow anadromous fish to utilize upstream habitats which are presently blocked by the Oroville, Big Bend, and Poe Dams." NMFS, P-2105 Fishway Prescription, *supra,* p. 2. We will support any reasonable prescription of a fish ladder at Big Bend Dam, if screened to exclude non-game fish resident in Oroville Reservoir. If NMFS instead reserves its Section 18 authority for this Project, the Commission may require such upstream passage under FPA section 10(a) or 10(j) to enhance riverine coldwater fisheries. The new license may omit such requirement (in the face of the Project's significant impact on fish passage) only if substantial evidence shows that the measure will not effectively enhance the coldwater fisheries in the Project reaches.

Paragraph B also requires PG&E to reconsider the feasibility and cost-effectiveness of removing Big Bend Dam. The NLA's Big Bend Dam Report" (Appendix E3-16) does not contain or disclose the engineering and economic data necessary to evaluate (or duplicate) its finding (*see id.*, p. 6) that such removal would cost $10 million (2008). Attachment 8, p. 1. As a result, Butte County engaged a structural engineer, Dennis Gathard, to provide an appraisal-level study of the measure. *See id.* On the basis of an itemized cost analysis, Mr. Gathard estimates that removal of the dam structure would cost $6.4 million (2008). *See id.*, pp. 7-8. This tracks PG&E's estimate of $6.2 million (2008) for such removal alone. *See id.* Sediment removal is the primary difference between PG&E's overall estimate of $10 million and Mr. Gathard's estimate, which is $3.8 million or 39% less. *See id.*, p. 4.[1] Mr. Gathard did not locate any explanation for PG&E's estimate that 100,000 cubic yards of sediment would need to be removed in addition to the dam structure. *See id.* He estimates that only

[1] We have not evaluated PG&E's estimate that a new weir to replace the backpressure function provided by Big Bend Reservoir would cost $1 million for construction and $2 million for lost generation during construction. *See* Appendix E3-16, p. 5.

4,500 cubic yards would need to be removed, and contamination of this sediment is unlikely. *See id.*

Paragraph C requires supplementation of spawning gravel in the Poe Reach. Such gravel is a limiting factor for coldwater fisheries. "Spawning habitat in the NFFR and tributaries above Poe Dam is limited due to the limited amounts of gravel in the main river and poor tributary access." NLA, pp. PRS-17, E3.1-228. Further, "[o]ne of the major contributors in preventing the natural downriver movement of sediment was determined to be the Rock Creek-Cresta Project immediately upriver from the Poe Project. ... Poe Dam was also identified as contributing to the problem by preventing the movement of sediment out of Poe Reservoir into the Poe Reach." NLA, p. E3.1-230.

Paragraph D requires coordination of mitigation measures for this and PG&E's other projects on the North Fork Feather River. "To consider one stream reach without the others would present a perspective far too narrow to provide accurate assessment of potential sources for impact or to offer opportunity for modifications that could truly control the level of impact. As fishery habitat, water quality and recreational benefits are evaluated for any project within the North Fork, system, the drainage and all hydropower operations on it should be reviewed as a whole." *See* letter from Sharon Stohrer, SWRCB, to Tom Jereb, PG&E (May 7, 1999). *Paragraph D* is consistent with NMFS' stated intention to coordinate its fish prescriptions for the Oroville Project (P-2100), the Upper North Fork Feather Project (P-2105), and the Poe Project. *See* NMFS, P-2105 Fishway Prescription, *supra*, p. 2.

Paragraph E requires PG&E to establish and administer an Ecological Management Committee (EMC) as a forum for coordination between PG&E, agencies, and other stakeholders in the implementation of non-flow measures. Many of these measures include substantial discretion in design or implementation, such as the amount or locations for gravel replenishment. The EMC will collaborate with PG&E in the preparation of the Fisheries Enhancement Plan and, following Commission approval, its implementation. This paragraph is not intended to delegate any of the Commission's authority or PG&E's obligations to other stakeholders. Instead, it will function to resolve disputes in plan development or implementation within the range of discretion permitted by the license. The 2001 license for the Rock Creek-Cresta Project and the pending Settlement Agreement for the North Fork Feather Project, require such collaboration.

Condition 3. Recreation Management Plan*. Within one year of license issuance, the Licensee shall develop, submit for the Commission's approval, and thereafter implement a Recreational Management Plan to enhance recreational use of the project reaches. The Licensee shall develop the plan in consultation with the Recreational Management Team established by paragraph (B); and it shall include all comments of team members and the Licensee's responses. The plan shall include the following elements.*

A. Drawings and specifications for facility construction, and standards for facility maintenance. Licensee shall:

1. Design all facilities to resist vandalism and otherwise protect public health and safety.

2. Include in the plan: (a) estimates of the expected level of use of each site, (b) performance standards for the conditions of facilities appropriate to protect public health and safety, and (c) triggers for improvements in facilities if use exceeds expectation or as appropriate for public health and safety.

3. Inspect and maintain facilities on a weekly schedule or more frequently as determined by such inspection.

B. Recreation Management Committee. Within two months of license issuance, the Licensee shall establish and thereafter administer a Recreation Management Committee that includes State Water Resources Control Board, California Department of Fish and Game, California Department of Boating and Waterways, and Butte County. The Licensee shall consult with the committee to develop and implement the Recreation Management Plan and coordinate with counterpart collaborative efforts for upstream and downstream projects on the North Fork Feather River. The Licensee shall, by consensus with the committee, adopt written protocols for schedule and conduct of meetings and dispute resolution. Through this committee and as otherwise required by applicable law, the Licensee shall consult with Butte County, Forest Service, and DFG, and DBW, regarding measures within their respective jurisdictions.

Explanation for Condition 3

The NLA does not provide for submittal of a Recreation Management Plan. Consistent with the Commission's standard practice, such a plan is appropriate to state the design specifications and performance standards for facilities, including the exact locations and dimensions of trails, the frequency of service for such toilets and trash receptacles, and the level of use which may justify additional capacity.

Paragraph A requires a Recreation Management Plan, which will state the design specifications and performance standards for all recreational facilities. Recreation in the project reaches will increase significantly over the term of the new license. *See* NLA, p. E5-139; *see also* Attachment 3. Certain existing facilities do not have adequate carrying capacity for future demand. Further, they are maintained in a manner that limits use and may result in user conflicts. *See* Attachment 3. Increased usage will require affirmative and systematic maintenance over the term of the new license. As a result, Paragraph A requires maintenance at least weekly for trash collection and sanitation.

Paragraph B requires PG&E to establish and administer a Recreational Management Committee (RMC) as a forum for coordination between PG&E, agencies, and other stakeholders in the design and implementation of recreational measures. Other RMC members will collaborate with PG&E in the preparation of the Recreation Management Plan and, following Commission approval, its implementation. This paragraph is not intended to delegate any of the Commission's authority or PG&E's obligations to other stakeholders. Instead, it will function to resolve disputes in plan development or implementation within the range of discretion permitted by the license. The 2001 license for the Rock Creek-Cresta Project and the pending Settlement Agreement for the North Fork Feather Project, require such collaboration.

Condition 4. ***<u>Recreational Facilities</u>.*** *Licensee shall include in the Recreation Management Plan appropriate provisions for the implementation of the following measures to enhance recreational use of the project reaches.*

A. *<u>Poe Reservoir</u>. Licensee shall:*

1. Construct and maintain recreational facilities on the high-flat or other appropriate areas in the vicinity of the Cresta Powerhouse. Licensee shall: (a) move PG&E gate to a location on the powerhouse access road below the turn-out to the high-flat area; (b) install and maintain new gate on gravel access road loop at edge of the high-flat area; (c) construct and maintain a vehicular barrier, such as post, rail, or boulder which is visually appropriate, along edge of the high-flat area between the two gates; (d) install and maintain three picnic tables at the west end of the high-flat area, located to separate users and take advantage of shade; (e) install and maintain portable or vault toilets and trash receptacles in appropriate locations commensurate with use and pursuant to Forest Service use standards; and maintain these facilities weekly during the season of use or more frequently commensurate with use; and (f) with CalTrans' approval, install and maintain appropriate signage on Highway 70 to indicate recreational facilities and maintain safe traffic control.

2. Permit access to Poe Reservoir for hand-carried boats and angling. (a) Licensee shall keep the access gate open during daylight hours in the summer season. (b) It shall improve existing trail from the west end of the high-flat area downstream to the eddy beach, adequate to accommodate pedestrian passage, including hand-carrying of boats such as inner tubes, kayaks, and canoes. It shall undertake brushing and trail modification for ease and safety of pedestrian use. (c) In cooperation with California Department of Fish and Game (DFG), Licensee shall undertake appropriate measures to establish and maintain a viable recreational fishery. [Specify measure or funding obligations.] (d) With CalTrans' approval, it shall install and maintain appropriate signs on Highway 70 to indicate recreational facilities and maintain safe traffic control.

B. Sandy Beach. Licensee shall undertake measures to enhance recreational use of Sandy Beach. (1) It shall install and maintain wooden tread-edge steps on the two informal trails between the parking and beach areas. (2) In the main use season [specify], it shall install and maintain two portable toilets and trash receptacles at appropriate locations. (3) With CalTrans' approval, it shall install and maintain appropriate signs on Highway 70 to indicate recreation facilities and maintain safe traffic control. Such signs shall include: on eastbound Highway 70, "No Left Turn"; on outbound access road, "No Right Turn"; and across Highway 70 from outbound access road, "Left Turn Only - Turn Around Available 1/4 mi. East." In addition, Licensee shall extend a traffic barrier along north side of Highway 70 into access road alignment to prevent right turns onto westbound Highway 70.

C. Bardees Bar. Licensee shall undertake measures to enhance recreational use of Bardees Bar. (1) It shall clean-up the existing site, including removal of informal pit-toilet, fire rings, abandoned buildings, and construction debris. (2) It shall install and maintain three picnic tables, including fire rings. These facilities shall be designed to separate users and take advantage of shade. (3) It shall install and maintain one vault toilet and trash receptacles at appropriate locations. (4) It shall remove or repair the abandoned bridge. (5) In cooperation with Butte County, it shall improve site access. For that purpose, it shall: (a) install and maintain parking zones and barriers at appropriate locations to prevent damage to ecologically sensitive areas and provide for reasonable pedestrian access to the main channel and site; (b) construct and maintain a stable, low-maintenance crossing at Bardees Creek that will be useable by 2-wheel drive vehicles; (c) remove construction and other debris at the existing failed crossings; (d) improve the existing abandoned construction road to an all-weather casual hiking trail designed to prevent motorized uses and avoid user conflicts with other user-groups, which includes signage as to destination and mileage, between Bardees Bar and an improved scenic point downstream of the Highway 70 bridge; and (e) undertake appropriate measures to respond to reported accidents or problems with road maintenance that may otherwise interfere with use by 2-wheel drive vehicles, including removal of slumps, downed trees, and washouts. Licensee shall identify recurrent problems in road maintenance associated with recreational use and undertake appropriate improvements.

D. Poe Reach Trail. Within 4 years of license issuance, Licensee shall undertake measures to enhance recreational use of Poe Reach. (1) It shall construct and maintain a trail between Bardees Bar and Poe Beach. The trail shall be aligned adjacent to the flood-trim line of the west-side channel. The trailhead at the Poe Beach end shall end at the next road turn-out north of the Poe Beach turn-out. (2) Licensee shall develop four spur trails at various locations to provide pedestrian access to the river channel.

E. Poe Beach. Licensee shall construct and maintain a trail along east-side channel, through the boulder field on the channel margin, to connect to the rope scramble at the east-side bridge abutment for emergency egress. It shall install and maintain a sign at Poe Beach stating that casual floaters should exit the river above the bridge.

F. Poe Powerhouse. Licensee shall undertake measures to enhance recreational use in the vicinity of Poe Powerhouse. (1) It shall clean-up the existing site, including removal of informal pit-toilets, fire rings, waste concrete, abandoned mid-channel pilings, and other concentrated and dispersed debris. (2) It shall install and maintain one vault toilets and trash receptacle at appropriate locations. (3) It shall improve access by: (a) smoothing and gravel-surfacing access road to the lower beach; (b) establishing a parking zone on the firmer surface area of the lower beach with maximum capacity consistent with turn-around; (c) undertaking minor grading in the high parking area and an existing turn-out (between railroad right of way and powerhouse), to expand parking capacity; (d) maintaining a passing turn-out at the existing turnout along west side of powerhouse fence; (e) constructing and maintaining a trail along the east-side in the vicinity of Poe Beach to provide for suitable and safe access for angling and other water contact recreation; and (f) installing informational signs regarding picking up trash, forest manners, availability of parking, and other access and use conditions.

G. Navigation Hazards. Undertake measures to improve navigability of Project reaches. Licensee shall inventory debris and other man-made modifications within the project boundaries that are risks to public health and safety. In cooperation with CalTrans and Union Pacific and with funds from the North Fork Enhancement Fund, Licensee shall provide for the removal of the identified debris. It shall remove newly introduced debris within project boundaries over the term of the license.

H. Law Enforcement and Safety.

1. In cooperation with Butte County, Forest Service, and DFG, and California Department of Boating and Waterways (DBW), Licensee shall establish and undertake a cooperative program for management of recreational use, law enforcement, and emergency communication, at Project sites. The program shall be subject to modification on basis of performance standards included in the plan.

2. By March 1 of each year of the new Project license, Licensee shall provide $120,000 per year (2006) to fund one FTE of a trained peace officer. The position shall be housed in Butte County, California Department of Fish and Game, California Department of Parks and Recreation, or U.S. Forest Service, under a Memorandum of Understanding between them; and it may consist of a new employee or an appropriate combination of existing employees. This position shall provide law enforcement services, including patrol, criminal investigations, and search and rescue.

3. In cooperation with Butte County Sheriff's Office, investigate, purchase and install radio repeaters at an appropriate location to assist law enforcement and public safety personnel operating within the North Fork Feather River Canyon.

Explanation for Condition 4

Condition 4 generally requires enhancement of all recreational facilities in the project reaches. In addition to the specific justifications below, these measures will enhance tourism, which is critical to the economic development of Butte County. *See* Butte County, General Plan, Recreation Element (1971), p. 2. The County is a tourist destination because of its renowned beauty, hunting and fishing opportunities, and rich history. *See id.* The climate and its waters are suitable for many forms of recreation. *See id.* The Recreation Element of this General Plan includes, as goals: providing recreational activities "which will satisfy the needs and desires of all age groups ...;" reserving sites with "outstanding recreational value" for "parks and recreational use to avoid their development with less suitable and beneficial land-uses; and encouraging "the development of private and commercial recreation facilities ... in order that they may help meet existing and future leisure time needs." *Id.*, p. 7.

Demand for river recreation in this county will grow substantially over the term of the new license. Through 2035, population will grow at a rapid rate: in California, by 61 percent; and in Butte County, by 92 percent. *See* NLA, p. E5-139. Demand for river recreation will increase even more quickly. PG&E estimated that user-days in the Project reaches will increase by 94 percent, from 5,808 user-days in 2001 to 11,241 in 2035. *See id.*

We now turn to the explanation for the specific measures, proceeding from the top of the Project reaches downstream to Big Bend.

NLA does not recommend any recreational facilities at Poe Reservoir, where formal facilities do not exist today. See NLA, pp. E5-145, -341. Today, the site is gated, and PG&E opens the gate only when Rock Creek-Cresta Project makes recreational flow releases. More frequent access is appropriate. This site is one of few locations within the Project reaches where access from Highway 70 is relatively easy. It is suited for picnicking and general recreation. As a result, Paragraph A requires picnic tables, toilets, and trash receptacles for this site.

Paragraph A requires certain measures to improve vehicle access, including opening of the gate to recreational use during the summer season. Parking, which is restricted today to the shoulder of Highway 70, results in an unnecessarily long walk to the informal parking area and the reservoir. Further, it is unreasonable to expect boaters to carry boats from the highway to the reservoir.

PG&E has expressed concerns that more frequent usage will increase risk of vandalism to Cresta Powerhouse. Those concerns, which are legitimate, may be effectively addressed by maintaining the existing gate at the highway, limiting access to the parking area to daylight hours, and upgrading security measures along the powerhouse perimeter. The existing lighting there is often broken, and the fencing is easily circumvented. The new license should require continuation of the existing screening that effectively separates the exposed sub-station and intertie from the informal parking area.

Paragraph B will enhance recreational use of Sandy Beach. According to PG&E's Recreation User Count Survey, the highest recreational usage in the Project reaches occurs at Sandy Beach. PG&E estimates that peak daily use is 56 user-days (NLA, p. E5-46); annual usage is 3,073 user-days (*id.*, p. E5-131); and such use will increase 1.94% per year to 4,100 in 2015 and 6,020 in 2035. *See id.* We note that the NLA's estimates for this and other recreational sites may substantially underestimate growth in usage in response to improved flows. *See generally* Attachment 3.

Additional measures are necessary to meet existing and future recreational demand in a manner that prevents adverse impacts on environmental quality, including dispersed trash, human wastes, and trampling or other degradation of a band of riparian vegetation and possibly special status plant species. *See* NLA, p. E5-167. The NLA recommends a single portable toilet and a trash receptacle. NLA, p. E5-341. Given future usage, we recommend two toilets and multiple trash receptacles.

The NLA recommends a hardened trail from the parking area to Sandy Beach. NLA, p. E5-341. We concur. Such an improvement of the existing informal trails will avoid impacts to special status plant species and riparian vegetation. Users are less likely to stray if access trails are clearly designated and maintained. Since the channel where hardened trails or stairways will be located will be occasionally exposed to flood flows and high water velocities, the design of such facilities will be low-profile and resistant to scour loss. The gate to the site will be maintained for the limited purposes of site closure for reasons of public safety during flooding and other special circumstances. Further, new signage for east- and westbound Highway 70 traffic, as well as egress traffic from the site, is prudent for public safety.

Paragraph C will enhance recreational use of Bardees Bar. PG&E estimates that annual use is 384 user-days today and will increase to 465 user-days in 2015 and 601 user-days in 2035. *See* NLA, E5-131. Future use may exceed the site's existing capacity. *See* NLA, p. E5-234.

Bardees Bar is not adequately maintained today. Trash and informal fire-rings are scattered in many locations; several informal pit-toilets are frequently used; and slab foundations of at least one abandoned construction building obstruct access.

Pursuant to *Paragraph C.2*, we recommend one vault toilet and multiple trash receptacles. This recommendation is consistent with the NLA, except that the NLA provides for a single trash receptacle (*see* NLA, p. E5-347).

Paragraph C.1 requires that PG&E remove various forms of debris that create risks to public safety at Bardees Bar. These include: construction debris on the east-side channel, scattered metal, bulldozed cobble and boulder materials, and the engineered concrete slope designed to protect the spoil pile from erosion. The concrete slope will function as an informal trail if modified by a narrow tread located above the slope toe. The NLA does not recommend this measure. *See* NLA, p. E5-347.

Paragraph C.5 requires an upgrade of an existing abandoned construction road that progresses from Bardees Bar upstream toward the Highway 70 Bridge and gradually climbs above the channel. This hiking trail will terminate at a scenic overlook of the canyon, the bridge, and the railroad. This portion of the Feather River is at an elevation below the snowline and is incised into a very steep, narrow, and rugged canyon. It has high scenic qualities and is close to Oroville and Chico. If developed in conjunction with the Poe Reach Trail (*see* Condition 4.D), it will provide scenic, all-weather hiking opportunities. Current use of a similar trail system in the South Yuba Canyon is 15-40 user-days per day in the summer season, and 5-10 user-days per day in the winter season. If the new license requires a flow schedule suitable for recreation, Butte County estimates that use of the Poe Reach Trail will average 35 –70 user-days per day during the summer season, and 5-10 user-days per day during the winter season. The NLA does not recommend this measure. *See* NLA, p. E5-347.

Paragraph C.4 requires the removal *or* repair of the abandoned bridge at Bardees Bar. If the bridge is removed as recommended in the NLA (p. E5-347), PG&E should also remove the bridge piers and surface metal reinforcements as appropriate for public safety. If the bridge is not removed, we recommend improvement to form the basis of an extensive river corridor trail system that would roughly double the mileage of the proposed Poe Reach Trail alone (Condition 4.D) and enhance access to the entire east-side channel for general recreational uses.[2] A new trail section just downstream of this bridge would provide access to that entire side of the channel from Bardees Bar to Poe Powerhouse. If so, the informal trail system along that side of the channel may be developed for casual hiking or mountain biking. This scenario also preserves the future opportunity to tie the proposed Poe Project Trail to Lake Oroville, if Department of Water Resources develops a trail along the eastern lakeshore, following the abandoned railroad alignment between the new railroad bridge at Poe Powerhouse and French Creek. Under *Paragraph C.4*, PG&E, in collaboration with other members of the Recreation Management Committee, will evaluate the comparative merits of removal or repair, and that PG&E include a final recommendation in the Recreation Management Plan.

[2] In the 7.4 miles of bypass reach below Sandy Beach, the east-side channel is accessible for general recreation only at the Poe Powerhouse, Poe Beach and Bardees Bar by wading or swimming from the west-side. Increased minimum flows will largely foreclose such river crossings.

Butte County also recommends improvements to the access road and signage, in order to increase capacity. *See* NLA, E5-169. This recommendation is generally consistent with the NLA. *See id.*, p. E5-347).

Bardees Bar road, which the County maintains, is generally in good condition, except at the crossing of an unnamed stream immediately upstream of Bardees Bar. Repeated culvert crossings have failed due to high flows. Pursuant to *Paragraph C.5(b)*, a stable crossing will provide all-weather access to Bardees Bar. The NLA does not recommend this measure. *See* NLA, p. E5-347.

Paragraph D will enhance hiking uses between Bardees Bar and Poe Beach. It requires construction and maintenance of the Poe Reach Trail, to provide low-elevation access by casual hikers to the bypass reach. This trail, routed along the west-side of the channel, will provide an 8.8-mile (roundtrip) hike between these locations, or a 12.8-mile (roundtrip) hike to a scenic overlook via the new trail proposed upstream from Bardees Bar (*see* Condition C.5(d)). In addition, the trail will include spurs that provide access for hiking, water-contact, angling, and casual-floating in the bypass reach. The trail will be located at an elevation just above the apparent flood trimline. Where routed within the flood trimline by topography and bedrock, the trail will be constructed of appropriate materials to resist scour. The NLA does not recommend this measure.

Paragraph E will enhance recreational use of Poe Beach. PG&E estimates that annual use is 735 user-days today and will increase to 981 in 2015 and 1,440 in 2035. *See* NLA, p. E5-131. PG&E reports that existing use may exceed ecological, physical and facility capacities. *See id.*, pp. E5-171, E5-238. Generally consistent with the NLA (*see* NLA, p. E5-351), we recommend construction and maintenance of a trail along the east-side channel to connect to the rope scramble at the east-side bridge abutment.

Paragraph F will enhance recreational use of Poe Powerhouse Beach. PG&E estimates that use is 1,175 user-days today and will increase to 1,568 in 2015 and 2,302 in 2035. *See* NLA, p. E5-131. Such use may approach the ecological and carrying capacity of the site. *See* NLA, E5-175. Additional measures at Poe Powerhouse will be required to meet the increased recreational use.

Pursuant to *Paragraph F.1*, we recommend site clean-up, including removal of human wastes (due to absence of toilets), dispersed trash, and metal debris and concrete waste in mid-channel bars. The NLA does not recommend this measure. *See* NLA, p. E5-355.

Paragraph F.2 requires a vault toilet and multiple trash receptacles for adequate sanitation. This recommendation is consistent with the NLA (p. E5-355), except that the NLA provides for a single trash receptacle.

Poe Powerhouse Beach has inadequate access, including parking capacity. *See* NLA, pp. E5-174, E5-243. *Paragraph F.2(c)* provides for expansion of an existing turn-out, just above the general entry to the powerhouse area, to provide parking space for 5-8 additional vehicles. The NLA does not recommend this measure. *See* NLA, p. E5-355.

Paragraph F.3(a) provides for improvement of the access road to the lower beach. This is consistent with the NLA. *See* NLA, p. E5-355. *Paragraph F.3(b)* further provides for a secure turnaround on the lower beach, to prevent *ad hoc* configurations. The NLA does not recommend this measure. *See* NLA, p. E5-355.

Paragraph F.(3)(e) provides for a trail on the east-side channel between Poe Powerhouse Beach and Poe Beach, in order to permit safe access to this reach under the new minimum flow schedule.[3] The NLA does not recommend this measure. *See* NLA, p. E5-355.

Paragraph G requires PG&E to inventory and remove man-made debris in the Project reaches, in order to prevent risks of injury associated with boating and other forms of recreation. Debris includes metal and other materials from bridge structures, cars, railroad rails, and construction. The NLA does not recommend this measure. *See* NLA, pp. E5-341 *et seq.*

Paragraph H will protect public safety as recreational use increases in the Project reaches. Such increased use may result in vandalism to recreational facilities and parked vehicles, poaching, and other risks to public safety. *See, e.g.*, NLA, pp. E5-248. In *Paragraph H.1*, Butte County recommends systematic coordination between PG&E and law enforcement agencies. *Paragraph H.2* provides that PG&E pay $120,000 per year to fund a peace officer dedicated to river recreation. *See* Attachment 1, p. A1-4. Even though such law enforcement associated with river recreation is generally not the responsibility of a licensee, this measure partially mitigates the significant economic losses which the new license will cause to Butte County, as discussed below. *Paragraph H.3* provides for upgrade of the emergency communication system in the river corridor, for the same reason. The NLA does not recommend either measure.

Condition 5. ***<u>Recreational Flow Schedule</u>***. *Licensee shall implement the following flow schedule and operational requirements to enhance recreational use of the reach below Poe Dam.*

A. <u>Spring Spills</u>. In each Wet and Normal water year, Licensee shall extend the last expected spill event of the spring runoff season at the Poe Diversion a minimum of 8 days, resulting in flows at the Pulga gage between 800 and 1,500 cfs. During these extended-spill

[3] The channel bed is generally composed of large cobble to small boulder-sized material. This substrate interferes with secure footing when an angler or other user is in water with significant velocity. Higher minimum flows will prevent safe access to the east-side channel upstream of the Poe Powerhouse access bridge.

periods the flow at the Pulga gage may be allowed to vary day-to-day within the specified range above, but shall remain in a narrow range during each day between 0900 and 1700 hours.

B. Summer Flow Schedule. In all water years, Licensee shall release recreational flows from Poe Dam one weekend each month from June to October.

1. On release days when Lake Oroville is above an elevation of 800 feet MSL, the flow release shall be not less than 800 and not more than 1300 cfs. In any given year, 50% of these days shall be between 1000 and 1200 cfs. Under this condition, the Licensee shall provide the flow release from 0900-1800 hours at the Pulga gage.

2. On release days when Lake Oroville is at and below an elevation of 800 feet MSL, the recreational flow release shall be not less than 1500 and not more than 2500 cfs. In any given year, 50% of these days shall be above 1750 cfs. Under this condition, the flow release shall be provided from 1000-1800 hours at Bardees Bar.

C. Ramping Rate. Each recreational flow schedule shall be subject to ramping rates [as prescribed by water quality certification and the Forest Service's FPA section 4(e) conditions]

Explanation for Condition 5

The New License Application does not propose any recreational flow schedule in the bypass reach. *See* NLA, p. PRS-22. While suitable flows between 800 to 2,000 cfs (*see* NLA, p. E5-279) would occur during spring and other spills, the Project would reduce by more than 90% the frequency of boatable days in this reach, as shown in the attached table, which is derived from Attachment 4, Section 6.2.

Table 1.
Comparison of Boatable Days without and With Poe Project Regulation

Month	***Poe Non-Regulation***			***Baseline***		
	Year Type			***Year Type***		
	Wet	***Normal***	***Dry/CD***	***Wet***	***Normal***	***Dry/CD***
Oct	19	14	17	1	-	-
Nov	13	17	24	1	1	-
Dec	8	16	19	1	1	-
Jan	1	6	17	2	2	-
Feb	-	-	-	-	-	-

Mar	-	-	-	5	5	-
Apr	-	-	-	3	3	-
May	-	-	-	2	1	-
Jun	3	6	18	1	1	-
Jul	16	19	6	-	-	-
Aug	25	13	1	-	-	-
Sep	22	16	4	-	-	-
Totals	107	107	106	16	14	-

Paragraph A provides for extension of spills during spring runoff. *Paragraph B* provides for one weekend of boatable flows from June to October. The minimum release in the summer schedule varies as a function of the level of Lake Oroville. When the lake is below 800 feet MSL, a long reach of the North Fork Feather below Big Bend Dam is exposed. As a result, *Paragraph B* requires a higher release to accommodate rafting, which may continue beyond the Project boundary to Dark Canyon. The flow schedule reduces power value by less than 1%. *See* Attachment 6, Table 5.

This condition is intended to meet unmet demand for recreational boating in the Project vicinity. "Whitewater boating has repeatedly been shown to be in demand in the region and supporting it on the Poe project expands opportunities for boating in the NFFR complex." Letter from Harry Williamson, National Park Service, to Tom Jereb, PG&E (July 2001), p. 3. The NLA acknowledges that there is unmet demand for whitewater boating in the Project area. *See* NLA, p. E5-137. No comparable whitewater is proximate to Chico, Paradise, and Oroville. *See id.*, p. E5-321. In the PG&E Whitewater Study, most boaters stated that they would return to the bypass reach if adequate flow is provided. *See id.* They stated specifically that the upper reach is above average and may be among the best whitewater resources in the region. *See id.*, p. E5-317. Further, Condition 5 will result in extension of the whitewater opportunities in the upstream Rock Creek-Cresta Project, where use already exceeds the pre-licensing predictions. *See* PG&E, "Draft Recreation Monitoring Report (P-1962)" (Feb. 25, 2005).

We acknowledge that a recreational flow schedule may adversely affect foothill yellow-legged frogs (FYLF) and other species that benefit from the Project's flow regulation. PG&E continues to study such impacts in the implementation of the new license for the Rock Creek-Cresta Project. *See, e.g.*, NLA, p. PRS-22. The development of the scientific record will assist in the refinement of any recreational flow schedule to mitigate any adverse impacts. However, it is legally wrong, as discussed in Section I, to permit a new license to largely eliminate the beneficial use of boating as protected by water quality standards and other applicable law, due to potential impacts on another beneficial use.

Condition 6. ***North Fork Feather Enhancement Fund.*** *Licensee shall establish and fund a trust fund, "North Fork Feather Enhancement Fund," to address the project's otherwise unmitigated adverse impacts on the beneficial uses of the North Fork Feather. It shall provide: $5 million (2006) within 6 months of license issuance and $500,000 per year (2006, subject to CPI adjustment), in each subsequent year during the term of the new license. It shall adopt a trust instrument consistent with this Article.*

A. Governance. The trust instrument shall provide that the U.S. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, California Department of Fish and Game, California Department of Boating and Waterways, and Butte County, shall govern the Enhancement Fund and report annually to the Licensee and the Commission about expenditures. The trust instrument shall further provide that: (1) the Licensee may consult with these agencies but will not approve or otherwise be responsible for any funded measure; (2) the agencies shall report annually to the Licensee and the Commission regarding any expenditures; and (3) any unused funds at the end of the new license shall revert to Licensee.

B. Fisheries Account. One-half of the initial and each annual contributions required by Condition 6 shall be paid over to a Fisheries Account, for the enhancement of anadromous and other coldwater fisheries in the Feather River Basin or elsewhere in Butte County. The trust instrument shall provide that the account may be used to fund the removal or remediation of fish barriers that prevent access to historic habitat at locations including Butte Creek, including Little Butte Creek, Honcutt Creek, and lower Feather River below Oroville Dam.

C. Recreation Account. One-half of the initial and each annual contributions required by Condition 6 shall be paid over to a Recreation Account, for the enhancement of river recreation in the Feather River Basin or elsewhere in Butte County. The trust instrument shall provide that, subject to the governance above and any further regulatory approvals, and in coordination with related provisions in the new licenses for other projects in the Feather River Basin, the Recreation Account may be used to fund the following measures, among others:

1. An urban whitewater park below Lake Oroville.

2. Feather River Corridor, which will include: (a) linkages from Lake Almanor to the Poe reaches, such as coordinated trails or shuttle service and (B) a boating trail from Oroville Dam to confluence with Sacramento River, consisting of appropriately spaced access and camping facilities

3. Trail access and boating tow services at the Bald Rock run of the Middle Fork Feather River near Oroville Reservoir.

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4. Improvements to Berry Road adjacent to Lake Oroville for boating access.

5. Tow services below Big Bend Dam to Dark Canyon on Lake Oroville.

6. Feather River Visitor Center on Highway 70.

Explanation for Condition 6

The NLA does not recommend any off-site measure for the Project's unmitigated impacts on the beneficial uses of the NFFR. Poe Dam will continue to be an impassable barrier to upstream fish passage. Even under the proposed minimum flow schedule, the Project will continue to divert most in-flow from the bypass reach, preventing the release of such flow to further enhance coldwater fisheries. Further, the Project will continue to eliminate most of the days when inflow from the Rock Creek-Cresta Project would otherwise result in boatable flows in the bypass reach. While it may enhance suitability for angling and wading, a new license will necessarily and significantly impair boating potential associated with the reaches' easy shuttle logistics, remarkable scenery, and proximity to Oroville, Chico, and the Sacramento and San Francisco Bay areas. Butte County, SD-1 Comments, *supra*, Exhibit B. By comparison with a non-power license that permits release of all inflow, a new license will reduce net economic value of all forms of river recreation by $10.8 *million per year* (2005) (if the license does not require a recreational flow schedule), or $10.1 million per year (if it does). *See* Attachment 3, p. A3-8.

Condition 6 requires PG&E to fund a North Fork Feather Enhancement Fund for such off-site mitigation. It requires total funding of $20 million (2006) over a 30-year license. If the new license does not contain a recreational flow schedule, Butte County requests that this funding level be increased by $500,000 per year, which is roughly the economic benefit of such schedule. *See* Attachment 3, p. A3-8.

Paragraph A provides that certain public agencies responsible for resources management in the Project vicinity will govern the Enhancement Fund. PG&E's enforceable obligation will be limited to funding. The trust instrument that PG&E will establish will require that the agencies (as a condition of trusteeship) will report annually on expenditures and will be accountable for expenditures pursuant to their own public procedures and requirements not administered by the Commission.

Paragraph B provides that one-half of the funding will be used for off-site fisheries mitigation. Potential measures include purchase and enhancement of riparian lands to provide anadromous and other coldwater habitat in waters elsewhere in Butte County (*see* Attachment 1, p. A1-5) and removal of barriers on such waters.

Paragraph C provides that the other half of the funding will be used to undertake off-site recreational measures. These agencies have considered all of the listed measures as potential off-site mitigation in the relicensing proceeding for the Project and Oroville Facilities downstream. None of these measures will require Commission approval, since the Licensee's obligation is limited to funding the Enhancement Fund. As a result, Butte County does not explain the specific benefits of these measures, although we will do so for the completeness of the record if requested by the Commission. *See generally* Butte County, SD-1 Comments, *supra*, Exhibit B (which discusses many of these measures).

III. *FURTHER PROCEDURES*

Butte County requests the following procedures for this proceeding.

A. ***Technical Conference***

PG&E will likely dispute many of these recommended conditions, including fish passage or decommissioning at Big Bend Dam, the recreational flow schedule, and the Enhancement Fund, and the legal and factual basis. Pursuant to 18 CFR § 385.601, we request that Office of Energy Projects convene a Technical Conference once NREA comments and replies have been submitted, in an effort to identify, discuss, and resolve any differences in analytical data or method that underlie such disputed conditions.

We recommend against the Commission's standard practice of relying on paper hearing, the back-and-forth submittal of pleadings. However, if OEP elects to proceed in this manner, the applicant for a discretionary approval, here PG&E, has the burden of proof on any disputed issue. 5 U.S.C. § 556(d). For example, the NLA argues that certain alternative measures, such as a boating flow schedule, cannot be proven to have net benefits, given the potential for adverse impacts on frogs and eagles. It is true that, in the absence of a controlled experiment where one variable is varied at a time, the actual impacts of such measures cannot be known with certainty. *See, e.g.,* D. Ludwig, "Uncertainty, Resource Exploitation, and Conservation, Science (Apr. 2, 1993), p. 17; D. Castleberry, "Uncertainty and Instream Flow Standards," Fisheries (Aug. 1998), p. 20. At the end of the day, however, PG&E has the burden of proof to justify the Project's continued diversion of flow from the bypass reach. If PG&E disputes the analytical method used in any of our expert reports, we will request that PG&E submit an alternative method for hearing on the disputed issue.

B. ***Coordination of Several Proceedings***

We request that the Technical Conference be noticed to the parties in the relicensing proceedings for the upstream North Fork Feather Project and the downstream Oroville Project.

These projects plainly have cumulative impacts on fish passage and river recreation. Many disputed issues are common to these proceedings. We request that, in the agenda and at the conference itself, OEP ask the parties in the several proceedings to consider whether and how to coordinate mitigation measures to achieve efficiencies and avoid duplication.

C. ***Disclosure in Environmental Document***

We request that OEP publish, in its NEPA document, its recommended conditions for a new license. This will become the standard practice under the Integrated Licensing Process after July 23, 2005, and it will benefit all parties in this proceeding to understand the extent to which OEP disagrees with their respective recommendations.

In turn, we request that the NEPA document state the specific basis for each such condition. As a general matter, the Commission must have and state a rational basis for choosing among competing methods or evidence. Farmers Union Central Exchange v. FERC, 734 F.2d 1486 (D.C. Cir. 1984). The Commission must exercise independent judgment and may not assume that evidence submitted by the applicant or any other party is adequate as the basis for its decision. 40 CFR § 1502.14(a); Scenic Hudson Preservation Conference v. Federal Power Commission, 354 F.2d 608, 620-1 (2nd Cir. 1965). Any model on which the Commission relies must be consistent with scientific method, reliable, and probative. Fed. Rules Evid. 702; Daubert v. Merrell Dow Pharmaceuticals, 113 S.Ct. 2786 (1993). More generally, in any finding based on the record, the Commission must identify the facts on which it relies, explain why these facts are reliable and relevant, and then demonstrate how the facts support its decision. *See* 5 U.S.C. §§ 556, 557, 706(2); Motor Vehicle Manufacturers Association v. State Farm Insurance, 463 U.S. 29 (1983); Burlington Truck Lines v. United States, 371 U.S. 156 (1962).

IV.
CONCLUSION

Butte County respectfully requests that the Commission adopt these recommended conditions in any new license.

Dated: April 11, 2005

Respectfully submitted,

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On behalf of BUTTE COUNTY

DECLARATION OF SERVICE

Pacific Gas and Electric Company
Poe Hydroelectric Project (P-2107-016)

I, Shane Conway, declare that I today served the attached "COMMENTS OF BUTTE COUNTY ON NOTICE OF READINESS FOR ENVIRONMENTAL ANALYSIS," by first-class mail to each person on the official service list compiled by the Secretary in this proceeding.

Dated: April 11, 2005

By: ______________________________

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Attachment 1

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Coldwater Fisheries Impacts and Mitigation
Pacific Gas and Electric Company, Poe Project (P-2107)
North Fork Feather River, Butte County, California

Gayland Taylor
Retired Fish and Game Warden, and Fisheries Consultant

1. **Executive Summary**. This memorandum will provide the basis for the following conditions recommended in Butte County's comments on the "Notice of Readiness for Environmental Analysis" in this proceeding: (1) an ecological flow schedule; (2) a fisheries enhancement plan addressing tributary access, passage over Big Bend Dam, and the importation of spawning gravel; and (3) a North Fork Feather Enhancement Fund. These recommended conditions will benefit efforts to restore viable coldwater fisheries on the North Fork Feather River (NFFR) and mitigate for loss of such fisheries as caused by Big Bend Dam (which was the first significant barrier to fish passage on the North Fork) and subsequent facilities now included in the Poe Project.

2. **Objective**. This memorandum was prepared to address the project's adverse impacts to the NFFR anadromous and other coldwater, and to recommend measures to mitigate for such adverse impacts.

3. **Documents Reviewed**. I used PG&E's Application for New License (2003) and documents prepared by the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service (FWS) in the preparation of this memorandum. The mitigation measures proposed were derived using a combination of agency reports from FWS, NMFS, California Department of Fish and Game, the State Water Quality Control Board, and the U.S. Forest Service, and 25 years of experience with management and enforcement activities related to fishery issues in Butte County.

4. **Qualifications**. My professional qualifications are Attachment 2.

5. **Ecological Flow Schedule**.

5.1. Agencies' Flow Proposal. The North Fork Feather River was historically an important recreational fishery that attracted anglers to Butte County from around the country.

The runs of rainbow trout, spring-run Chinook salmon, and steelhead were particularly impressive. The ecological flows we expect to be included in the Forest Service's Section 4(e) mandatory conditions and the State Water Board's water quality certification will partially correct for the loss of habitat that existed prior to the construction of hydroelectric facilities on the NFFR. Licensee's studies related to the flow proposals, however, were not designed specifically to mitigate for loss of anadromous fish and did not incorporate flows that may be needed if NMFS modifies its current trap-and-haul proposal again. A complete review of proposed flow requirements will be needed if anadromous species are reintroduced into the Poe reach of the NFFR.

5.2. Temperature Regulating Flows. FWS has stated: "[T]he waters of the North Fork Feather River watershed have beneficial uses that include coldwater habitat and coldwater spawning habitat. Under these use designations, waters must be maintained in a condition that will support a coldwater ecosystem." FWS, "Comments on Scoping Document 1 for Relicensing of the Poe Hydroelectric Project (FERC Project No. 2107-016)", p. 3 (2004). FWS's "water temperature goal in the Project area is to maintain a mean daily maximum water temperature of < 20°C at all times. This water temperature goal prevents undue stress to aquatic resources .... [M]inimum flows, within a variable flow regime, should be proposed so that the < 20°C water temperature goal can be maintained . . . ." *Id.* I agree. Additional flows should be designed to cool water in the Poe reach through the warmest summer months, in order to insure that the added benefits to the fishery created by other mitigation measures are not negated. Licensee should evaluate various ways of reducing temperatures when necessary to protect recreational fisheries. Options may include: (1) Increasing flows within the project boundaries in an effort to reduce the length of time of exposure to ambient air temperatures; and (2) Regulating release points within the Poe reach by utilizing releases from Poe dam or the tunnels that supply water to the Poe powerhouse at various points along the Poe reach. If NMFS does not modify its trap-and-haul proposal, a review of temperature maintenance conditions will be required.

6. **Fisheries Enhancement Plan**.

6.1. General. Measures that are being reviewed for on-site fishery improvement will help to reestablish a viable recreational fishery in the Poe reach of the North Fork Feather River. Agency reports and conclusions helped in the formation of some of my recommendations.

6.1. Tributary Access. FWS has stated: "Two major tributaries, Flea Valley Creek and Mill Creek are important spawning areas for trout. Suitable access for trout and other fish species should be maintained throughout the term of the license." FWS, "Comments and Additional Information Requests Concerning FERC's Notice of Application Tendered for the Poe Hydroelectric Project, No. 2107-016," p. 14 (2004). I agree. Trout have been routinely viewed using or attempting to use these streams, as both have adequate flow and temperature regimes to support a limited amount of spawning activity. Both Mill and Flea Valley Creek would benefit, however, from implementation of measures to aid fish passage. Fish ladders at one or both sites could be engineered and constructed within three years to allow for existing trout populations to begin recovery. Physical manipulation of the streambed of one or both streams should be undertaken to aid in fish passage. The streambed enhancement should be undertaken within three years or within a mutually agreed upon time decided by Licensee and the Fishery Advisory Board. Maintenance of the fish passage facilities should be insured to allow passage for spawning trout throughout the life of the project. Money set aside for enforcement of fishery protection issues in the North Fork Feather Enhancement Fund could be used for increased levels of protection for migrating trout and for stream habitat protection in both important spawning streams.

6.2. Big Bend Dam. Trout and salmon in Oroville reservoir currently attempt upstream migration into the Poe reach. Under most conditions, access to the Poe reach is blocked by Big Bend Dam. Licensee has contented that passage at Big Bend Dam is inconsistent with overall fishery management strategies, but FWS has not accepted this argument. FWS, "Comments and Additional Information Requests Concerning FERC's Notice of Application Tendered for the Poe Hydroelectric Project, No. 2107-016," p. 5-6 (2004). I agree with FWS. Improving fish passage over the Dam will enhance recreational fisheries in the Poe reach. Passage of game fish from Oroville Reservoir into the NFFR would create safer conditions for anglers. Any fish passage structure at Big Bend Dam, including a fish ladder, should be designed to selectively allow only recreational fish to pass upstream into the NFFR and thus prevent an influx of non-game fish.

6.3. Import Spawning Gravels to Restore Fish Habitat. Licensee's NLA and agency reports indicate that lack of spawning size gravel currently limits the restoration potential of NFFR recreational fisheries. NLA, pp. PRS-17, E3.1-228; NMFS, "Comments, Modified Terms and Conditions, and Modified Prescriptions for the Upper North Fork Feather River Project, No. 2105, p. 22 (Mar. 11, 2005). In addition, FWS has stated that Licensee's gravel analysis was incomplete. FWS, "Comments and Additional Information Requests Concerning FERC's Notice of Application Tendered for the Poe Hydroelectric Project, No. 2107-016," p. 4 (2004). I agree. Gravel importation will add spawning habitat, and it will provide better habitat for aquatic insects, which are an important source of food for fish in the river. Licensee should review the potential for adding spawning size gravel to the Poe reach, and to Mill and Flea Valley Creeks, to compensate for the loss of gravel that is captured by upstream dams. Gravel replacement should continue for the life of the project.

6.4. Off-Site Mitigation Measures. NMFS has proposed a plan to reestablish an anadromous fishery in the NFFR. NMFS anticipates a complex trap-and-haul program to restore the NFFR anadromous fishery. The advantage of the NMFS plan is that it puts many miles of stream back into anadromous fish production. In the event that the trap-and-haul plan is not required for this project, I believe that additional off-site measures for mitigation for the loss of anadromous fisheries habitat should be required. While difficult to estimate, the economic value of these lost fisheries is probably enormous, especially since some salmon and steelhead species that existed in the NFFR have since been listed as threatened or endangered. This listing has forced protective measures to be implemented on a vast array of everyday life activates in Butte County. Conducting everyday activities for Butte County residents including farmers, fishermen, and many others has become more regulated and more expensive.

7. North Fork Feather Enhancement Fund.

7.1. Funding for Law Enforcement to Protect Fishery Habitat. Law enforcement must be active to assure the effectiveness of measures for fisheries mitigation and enhancement in the NFFR. By upgrading law enforcement protection with supplemental funding, we can ensure that fisheries gains will not be lost. An increased enforcement presence is essential to public education, use, and security in what has been a remote and largely unpatrolled area of Butte County. I estimate that a fund of $ 120,000 be allocated annually for enforcement use, to protect against poaching and further habitat destruction. Funding should be made available within one year of license issuance.

7.2. Ecological Management Committee. I believe that the Licensee should establish and thereafter administer am Ecological Management Committee (EMC) that includes FWS, NMFS, USFS, DFG, and Butte County. The purpose of the EMC will be to further advance the health of existing fisheries in the NFFR and to evaluate and implement proposals that enhance salmon and steelhead recovery in and outside the project area, within the scope of the approved Fisheries Management Plan. The EMC should also coordinate with other agencies and private entities that are planning salmon and steelhead enhancement projects, including evaluating water transfers or purchases. It should examine off-site enhancement measures, including riparian land purchases from willing sellers in Butte County. Land purchases should equal the amount of stream lost to salmon and steelhead production because of Licensee's activities on the NFFR. Purchases should include a sufficient amount of land adjacent to streamside to protect the stream from degrading or polluting activities. It should be able to link salmon and steelhead enhancement land purchases with other sources of money to maximize fishery recovery potential.

7.3 Poe Fisheries Account. I believe that the License should establish a North Fork Feather Enhancement Fund, including a Poe Fisheries Account. The fund could be used to purchase riparian land along other coldwater streams in Butte County, in order to mitigate significant project impacts that cannot be mitigated even if the ecological flow schedule is adopted. The level of funding should reflect cost to acquire like properties. I calculate the appropriate funding as follows. (1) The Project eliminates 10 miles of anadromous habitat. (2) An acre-wide corridor along that reach is 506 acres. (3) Riparian land costs $5,000 per acre in Butte County. (4) This results in funding level of $2,530,000.

7.4. Natural Resources Damage Assessment. I believe that the Commission should also account for economic losses associated with the lost anadromous fisheries, by conducting a natural resources damage assessment (NRDA). DFG has a standard assessment method. See http://www.dfg.ca.gov/ospr/organizational/scientific/nrda/nrda.htm.

8. **Conclusion**.

I conclude that Licensee has not sufficiently addressed the measures necessary for recovery of fisheries in the North Fork Feather River. The conditions set forth by NMFS and other agencies will lead to a net benefit to NFFR fisheries, but the alternate and complementary measures proposed by Butte County will achieve a greater beneficial result.

Attachment 2

Gayland Taylor
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Chico, California 95928
phone (530) 345-0219, fax (503) 345-0219, e-mail gtxfg@aol.com

PROFESSIONAL EXPERIENCE

California Department of Fish and Game: 1971 to 2003

1971 to 1976
Performed all the varied duties of a warden in a southern California district, including marine resource protection. Initiated a strong pollution response and prevention program in an area devoid of such activity in the past. Created an atmosphere of trust between the public and the Department in a district which lacked confidence in the Departments= ability to protect fish and wildlife. Initiated projects aimed at protection of steelhead fisheries in Ventura and Santa Barbara Counties.

1976 to 2003
Performed all the varied duties of a warden and Lieutenant in the Central Valley/Central Sierra Region of California. Supervised a squad of wardens who were trained to respond to environmental threats to fish and wildlife and their habitat. Initiated strong public support for protection of critical habitat, and wrote grants for the public and other conservation groups to provide funding for habitat improvement projects. Trained and supervised other Department and non Department personnel in effective administration of stream protection laws. Trained and supervised Department personnel and other agencies in the fields of hazardous materials response and incident command systems. Drafted a manual for wardens to use in response to pollution events. Directed cleanup and completed detailed investigations on several major pollution cases. Accomplished a much higher degree of protection for Spring-run salmon and other anadromous fish species by directing prioritized protection efforts and securing and managing grants to allow for this extra work. Effectively worked with a variety of special interest groups in the State who are affected by actions taken to protect fish and wildlife and their habitat.

2004 to present
Consultant (part time) providing expertise and assistance to individuals with the environmental permitting process related to stream work in California .

2004 to present
Serve on the California Advisory Committee on Salmon and Steelhead Trout. A committee

formed by the legislature to provide guidance to the Legislature and to the Department of Fish and Game regarding salmon and steelhead management and protection.

JOB RELATED SKILLS, TRAINING AND ACHIEVEMENTS

- Grant writer and administrator for various projects, including stream rehabilitation projects, and increased protection for anadromous fishery resources
- Manage and supervise a squad of wardens who evaluated, wrote and monitored sensitive environmental permits. Supervise this process when enforcement action was necessary.
- Serve as the contract manager for grants obtained to manage and protect threatened and endangered species of salmon.

Certificate(s) of Appreciation

- Chico State University for guest lecturing on fish and wildlife issues, 1990 - 1999
- Certificate of Award from North American Wildlife Enforcement Officers Association for serving as Director, Art Project Director, and Vice-President, 1990
- Numerous certificates of appreciation for guest lecturing to schools, service groups and fish and wildlife stake holder groups, 1974 - 1999
- Certificate of appreciation from California Fish and Game Wardens Protective Association for serving as Director and job steward, 1986 - 1989

Letters of Commendation

- Commendation letter from my supervisor for my investigation, enforcement, and cleanup actions taken in response to a major pollution event which destroyed a trout stream and damaged a mountain lake.
- Commendation letter from the Butte County District Attorney for work on a train derailments along the North Fork of the Feather River and subsequent investigations which lead to a leadership role in developing a Feather River Spill Response Plan.

Committee Work (act as advisor, draft management plans or serve as liaison for DFG)

- Anadromous Fishery Enforcement Committee, 1999 - 2003
- Pesticide Training Committee, 1998 - 2003
- Governors Select Committee on pollution revision laws, 1998
- Pollution Response Manual Committee, 1994 - 1998
- Environmental Crimes Task Force, 1997- 2003
- Hooked on Fishing Not Drugs, 1995 - present
- Spring-run Salmon Recovery Work Group, 1993 - present

- Butte Creek and Big Chico Creek Watershed Work Groups, 1996 - present
- Feather River Spill Contingency Committee, 1995 - 1998
- Deer Creek Spill Contingency Committee, 1999 - 2003
- Butte County Committee on Water, 1998
- Butte County Committee on Mining, 1989
- Suction Dredge Regulation Review committee, 1982
- Committee on Law Enforcement Policy, 1980 - 1984
- Ventura County Committee on Oil Pollution, 1974 - 1976

Pollution/HazMat Instructor

- Pollution instructor for the Captains squad for pollution response while assigned to Ventura County, 1972 - 1976
- Pollution response instructor for the Central Valley/Central Sierra Region on pollution, 1984 - present
- Hazardous Materials AFirst Responder@ instructor for regional personnel, 1999-2001
- Incident Command Systems instructor for all Department personnel, 1994-2001

Other Projects/Assignments

- Served as incident commander on several pollution events and on several salmon rescues
- Organize and write an informational brochure about California Fish and Game Wardens for legislative and public distribution
- Provide training and lead wardens in issues dealing with anadromous fish protection,1981 to 2003.
- Act as Department representative on various environmental crime task forces
- Field Training Officer and Lieutenant

RELATED PROFESSIONAL AND SUPERVISORY EXPERIENCE

Act as the legislative representative for the Wardens Association and later serve in this same role for the Wardens Supervisors and Mangers Association. Provide bill analysis, drafted letters of support or opposition on bills, gave advise to legislators and gave testimony on issues affecting fish and wildlife or the wardens role in protection of fish and wildlife, 1995 - 2004.

Member and Former Director and Vice-president of the North American Wildlife Enforcement Officers Association. 1982 - present

Participated in the formation of this organization whose purpose is to advance the goals of natural resources conservation in North America and to increase the level of professionalism for Wildlife Conservation Officers. Aided with the transformation of this association from a few hundred officers to membership which now includes officers in most States and all the Canadian Provinces. Organized and directed a National convention and independently managed an art project fund raiser for North American distribution.

California State University at Chico 1985 to 1989
Planned and taught lessons in natural resources law enforcement and conservation education. Participated in career counseling for students and assisted the Department of Fish and Game with affirmative action recruitment.

Butte Community College 1984 to1985 Ventura Community College 1974
Planned and taught lessons in natural resources conservation.

EDUCATION

Rio Hondo Community College, Associate of Science Degree, 1968

Humboldt State University, Bachelor of Science Degree, 1970 majoring in Fishery Biology.

Riverside City College, Peace Officers Standards and Training (POST), Basic Certificate, currently upgraded to Advanced Certificate.

SPECIAL ACHIEVEMENTS

Wildlife Enforcement Officer of the Year in 1992 in Region 2
Selected by my supervisors in recognition and appreciation for protecting the fish and wildlife resources of California with enthusiasm, diligence, and integrity.

Sustained Superior Achievement Award in 1998 in Region 2
Received in recognition of accomplishments toward protecting California waters from pollution and for extraordinary efforts toward protecting threatened salmon populations.

Proclamation of Achievement from the Governors Office in 2003 for work in protection of natural resources in California

PERSONAL

Married: Nancy for 35 years, (retired from Paradise Unified School District).

Children: Brooks, who works for a environmental consulting company.
Bryan, who is a State Park Ranger now working at Folsom State Park

Attachment 3

WRC ENVIRONMENTAL
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Impacts of Poe Project on Economic Value of River Recreation
Pacific Gas and Electric Company, Poe Project (FERC P-2107)
North Fork Feather River, Butte County, California

Chuck Watson,
River Recreation Specialist

1. **Executive Summary**. In this preliminary analysis, I conclude that a New License for the Poe Project, even if conditioned to include recreational flow schedules as Butte County has proposed, will result in a net loss of more than $ 10,100,000 per year in economic benefits for the County. This net loss compares a New License against an alternative, such as a non-power license issued under 16 U.S.C. section 808(f), where the project does not regulate in-flow from the North Fork Feather. I have considered angling, wading, boating, and other forms of contact recreation. The net loss reflects the fundamental reality that Poe Diversion Dam will continue to divert from the bypass reach most of the flow useable for recreation and other beneficial uses, during the late spring through early fall.

2. **Objective.** This memo analyzes how alternative flow schedules for a new license for the Poe Project will affect the economic value of contact recreation on the North Fork Feather River within Project boundaries. This memo address all forms of contact recreation. I prepared this memo on behalf of Butte County, with the assistance of Marvin Feldman, economist.

3. **Qualifications**. My professional qualifications include 35 years of canoeing and whitewater rafting experience in the western United States and Canada, and 27 years of experience in conducting studies and analytic assessments concerning Class I to Class V, and general river and river-corridor recreational resources in the region. These studies, both river-specific and programmatic, have involved over 30 rivers and specific whitewater runs, and addressed issues such as: instream flow need assessment, user and activity-type conflict resolution, carrying capacity assessment, balancing conflicting activity-type instream flow needs, river/reservoir recreation tradeoff assessment for hydro-operations, river recreation management plan development, user and use-sector allocation, demand and visit estimation, activity-type safety/conflict assessment, and wild and scenic river analysis and management planning. I have served as an expert witness in river recreation dispute proceedings. My qualifications are Attachment 4 to Butte County's comments in response to the Notice of Readiness for Environmental Analysis. Mr. Feldman's qualifications are Attachment 5.

4. **Hydrologic Data**. I used three hydrologic datasets for this memo, as shown in Table 1. The first dataset describes mean daily unimpaired flows, assuming that PG&E's hydropower system, which consists of the North Fork Feather Project (P-2105), Rock Creek-Cresta Project (P-1962), and the Poe Project, does not regulate flows. The second is the mean daily flows of a baseline scenario where the hydropower system regulates flows as today. The third describes mean daily flows in both the bypass reach and through the Poe powerhouse. I modified this dataset to reflect flows that would occur in the bypass reach if the Poe powerhouse was not operating. The parameters I used to modify this dataset were provided by both Bruce McGurk (PG&E) and Bob Hawkins (U.S. Forest Service Southwest Regional Office) on typical Poe powerhouse operational regimes and variable maximum diversion capacities. The various Water Year assignments used in Mr. McGurk's datasets were given to the years and months of the flows in the Mr. Hawkins' dataset. These steps provide that each of the three datasets reflect the expected flows in the bypass reach during the hours of likely recreation activity. I integrated the three datasets for the purpose of this analysis. I will make the datasets (including the protocols used to integrate them) available to the Commission or any party on request.

Table 1.
Flow Datasets

Dataset	Description	Source	Start of Record	End of Record
Bypass reach	Unimpaired flow in North Fork Feather	PG&E (Bruce McGurk)	1974	2004
Bypass reach	Baseline flows, inc. P-2107, 1962, and 2105	PG&E (Bruce McGurk)	1974	2004
Poe PH and Bypass reach	Flows regulated only by P-1962 and 2105	USFS (Bob Hawkins)	1967	2003

5. **Licensing Alternatives**. I considered a baseline scenario and four action alternatives.

5.1. **Baseline Scenario**. The baseline describes existing conditions, including renewal of the original license for the Poe Project and continued operations of Rock Creek-Cresta Project (P-1962) and North Fork Feather Project (P-2105).

5.2. **Action Alternatives**. I considered four action alternatives.

5.2.1. North Fork Feather System Non-Regulation. In this alternative, PG&E's hydropower system does not modify unimpaired flows into the Project. This alternative would occur only if the Poe Project were issued a non-power license and the two upstream projects do not store or otherwise modify in-flow (e.g., operate run-of-river). I do not advocate this alternative and instead use it to evaluate the influences of the North Fork Feather Project and the Poe Project on recreation uses and economic impact in the Poe Bypass reach.

5.2.2. Poe Non-Regulation. In this alternative, Poe Project does not divert flow from the bypass reach under a non-power license. The in-flow is the discharge from the Rock Creek-Cresta Project. This alternative would occur, for example, under a non-power license. I do not advocate this alternative and instead use it to evaluate the economic impact of a New License.

5.2.3. New License with Recreational Flow Release Only. In this alternative, the New License contains a recreational flow release comparable to what Butte County proposes in its comments on the Notice of Readiness for Environmental Analysis. It continues the minimum flow schedule in the original license for protection of environmental quality.

5.2.4. New License with Ecological Minimum Flow Schedule Only. In this alternative the New License contains ecological flow releases comparable to what Butte County proposes in its comments on the Notice of Readiness for Environmental Analysis. It omits any recreational flow schedule as in the original license.

6. **Estimates of Recreation Visits and Associated Economic Benefits to Butte County**. I estimated the number of recreation visits according to flow suitability, then translated the number of visits into economic benefit to Butte County.

6.1. **Flow Suitability for Activity Type**. I estimated the range of flow suitable for different forms of contact recreation in the project reaches. I define suitable flows as those that should attract recreation visits and provide adequate recreation experiences to the large majority of potential users in each specific activity type. This includes both Minimum Flow Conditions and Optimum Flow Conditions as functionally defined in the Analytic Method report.

6.1.1. I relied on the New License Application (Dec. 2003) (NLA) where it had such estimates. However, the recreation flow study did not exercise sufficient constraint and control over assumptions, definitions, field methods, and survey techniques, nor did it investigate flows over a sufficient flow range. I am not convinced that its analytic results, as they are applied to its findings and conclusions, are defensible. To establish reliable flow verses recreation visit estimates either more extensive flow tests are needed. Such tests should address all flow related activity types that may be supported in the bypass reach along with the use of adequately constrained methods (including functional definitions), or the use of inadvertent bypass flows and opportunistic assessment methods during the early years of the New License (conditioned adequately to allow modified recreational release schedules to accommodate new findings) to develop refined flow need estimates.

6.1.2. I developed a set of flow suitability ranges for each of the flow dependant activity types based on observed characteristics of the bank and channel configuration in the reaches and expected hydraulic conditions at various general flows. The suitable flow ranges are based on a combination of NLA findings and my professional experience with similar reaches of regional rivers where I have conducted similar studies. I am willing to participate in any flow study which PG&E may be willing to conduct to confirm or modify these estimates.

6.1.3. For the purpose of this memo, I use the term "upper reach" to describe the bypass reach between Sandy Flat and Bardees Bar (approximately 3.0 miles). I use the term "lower reach" to describe the reach between Bardees Bar and the Poe powerhouse (approximately 4.4 miles). This analysis does not address the recreational activities in that portion of the Project area between the Cresta powerhouse and Sandy Flat (approximately 2.3 miles) that is generally inundated by Poe Reservoir, and the 0.6 miles of channel below Poe Dam which currently does not have practical recreation access.

Table 2.
<u>Flow Suitability</u>

Recreational Activity	Suitable Flow (cfs)	Data Source
Wading and similar primary contact in upper and lower reaches	10-200	Professional experience
Angling in upper and lower reaches	50-500	Professional experience
Casual floating in lower reach	200-800	Professional experience
Class V kayaking in upper reach (optimum)	1000-1200	NLA Whitewater Study (ex. E5.2.5)
Class V kayaking in upper reach (minimum)	800-1000, 1200-1300	NLA
Class III-IV kayaking in lower reach (optimum)	1200-2500	NLA
Class III-IV kayaking in lower reach (minimum)	600-1200, 2500-3500	NLA modified by professional experience
Rafting in lower reach (optimum)	1500-2500	Professional experience
Rafting in lower reach (minimum)	1000-1500, 2500-3500	Professional experience

6.2. **<u>Estimation of Annual Average Recreation Opportunity Days under Action Alternatives by Water Year Type</u>**. I used the suitably flow ranges for each activity type to determine the annual average number of opportunity flow-days under each Action Alternative.

I distinguished opportunity flow-days as High Value Days (HVD) (weekends and holidays) for Low Value Days (LVD) (other days) by month, based on their probabilities of occurrence, for each of the three Water Years (Wet, Normal, and Dry/Critically Dry). I then filtered each of the flow scenarios for the likelihood that opportunity flow-days are frequent and reliable enough to support commercial rafting operations given their sensitivity to proximity to bases of operations, trip scheduling, and trip cancellation/client satisfaction concerns.

6.3. **Nexus with Lake Oroville**. I distinguished Activity Types that are affected only by Poe Project, from whose that are affected cumulatively by the project and Lake Oroville. The lake level affects the latter Activity-Types because it determines whether users may continue the activity below Big Bend Dam and the conditions necessary to attract a site visit (in the project reach) and to provide adequate recreation experiences to the large majority of potential users in any of the activity types.

6.3.1. Activity Types subject to Direct Impact only are Wading, Angling, Casual Floating, and Class V Kayaking.

6.3.2. Activity Types subject to Direct-Cumulative Impact are Class III-IV Kayaking and Rafting, both Commercial and Non-Commercial.

6.4. **Parameters Used to Estimate Recreation Visits by Activity Type**. I developed parameters to estimate visit rates for each Activity Type over the term of the New License that reflect general regional recreation demand for that period. A variety of sources were used in developing the parameters, including evaluation of visit and use parameters that occur on similar regional rivers developed from review of agency management plans and documents, interviews with resource managers, information found in NLA documents, and my own professional experience with previous river recreation studies. Factors for visit estimates include: annual visit magnitudes, typical seasonal/monthly distribution of visits, the relationship between HVD and LVD visits, typical ratio of out-of-County visits, carrying capacity caps (based on functional definitions presented in Analytic Methods) for facilities and river-transit rates, and available substitutable regional resources by month and Water Year. These factors result in estimated visitor rates and permit the distinguishing of visits by HVD and LVD, and local versus-out-of-County visits for each activity type by month and Water Year for the opportunity flow-days determined by the flow scenarios.

6.5. **Estimation of Annual Average Recreation Visits under Action Alternatives by Water Year Types**. I then combined the calculated opportunity days (in paragraph 6.4) and the recreational visit parameters (in paragraph 6.6) to estimate average annual visits by activity type, by month for the three Water Years. I distinguished local and out-of-County visits.

6.6. **Aggregation of Annual Average Recreational Visits under Action Alternatives**. I then aggregated the estimated average annual visits by Water Year, under the

Action Alternatives. I weighted the estimated annual visits of each Water Year by the reported frequency of Water Year type occurrence, per the databases described in paragraph 4. The result is the average annual visits by Activity Type, under the baseline scenario and each of these Action Alternatives, over the term of the New License.

6.7. **Comparison of Average Annual Out-of-County Recreational Visits**. I then compared the average annual out-of-county recreational visits under the Baseline Scenario and the Action Alternatives. While some Activities (such as wading) benefit from project regulation, others (including Rafting) are impaired. On balance, recreation visitation would be substantially greater in the absence of project flow regulation. Indeed, given the general remoteness of the reach setting, its hydraulic characteristics, challenge, and reliable year-round flow, the Poe reaches would be among the most sought-after whitewater experiences in the region. In the absence of project regulation and direct-cumulative impact complications, the Poe reaches would develop into one of the most reliable and among the highest-visitation commercial rafting resource in California and could draw about 100,000 out-of-county recreation visits annually.

Table 3 is a display of spreadsheet results. It is not intended to offer false precision. A zero entry in any column of Table 3 is a function of the assumed flow range suitable for an activity. While there will be some activity even when flows are outside of the suitability range I have assigned, the purpose of Table 3 is to show relative use by activity under different flow schedules. Thus, a zero value in Table 3 should be understood to mean very little use.

Table 3.
Comparison of Average Annual Recreational Out-Of-County Visits

Recreational Activity	Baseline Scenario	North Fork Feather Non-Regulation	Poe Non-Regulation	New License with Recreational Release	New License with Ecological Flows
Wading	4,857	18	13	4,132	- 0 -
Angling	3,361	260	50	3,031	3,361
Casual Floating	26	393	48	- 0 -	1,033
Class V Kayaking	111	2,091	466	273	111
Class III-IV Kayaking	777	12,552	12,097	2,380	777
Commercial Rafting	- 0 -	54,187	70,944	1,606	- 0 -
Non-Commercial Rafting	3,369	18,796	22,469	5,544	3,369

6.8. **Economic Benefit by Activity Type**. The economic benefits to Butte County per out-of-county visit are based on the value-added resulting from expenditures associated with the number and type of recreational visits associated with each alternative. First Marvin Feldman, Ph.D calculated the direct expenditures associated with each visitor-day for each activity type. He used several sources to estimate visitor day expenditures. For example, expenditures for boating activities were estimated based on the mail-back survey results of a study of boating on the South Fork of the American River (Chili Bar) conducted for Sacramento Municipal Utility District and PG&E. *See* Devine Tarbell & Associates, Inc. and The Louis Berger Group, "Socioeconomic Conditions in the Reach Downstream of Chili Bar Technical Report" (Dec. 2004). He only counted out-of-county visitor expenditures because local visitor expenditures would not add new economic activity to the county.

6.8.1. Mr. Feldman used the IMPLAN regional modeling system to estimate the effect of recreation at the Project on Butte County's economy. The IMPLAN model provides a basis for estimating value added to Butte County based on direct expenditures generated by recreation activities associated with the Project.

6.8.2. He determined which economic sectors receive expenditures in order to derive the effects of direct expenditures. For example, economic sectors for boating activities were based on the expenditures surveyed in the Chili Bar study. Then the sectors were assigned output, earnings and Revenues Multipliers using the IMPLAN regional Modeling System.

6.8.3. The output multipliers indicate the total respending impacts of direct expenditures on Butte County's economy. The output multipliers for all sectors was close to 1.1, indicating that every $1 million in direct expenditures results in a total of $1.1 million in economic activity throughout the County. The economic output can then be applied to the local earnings and revenues impacts to derive a total local value added multiplier.

6.8.4. Finally he multiplied the direct expenditures by the value added multipliers to estimate the value added impact per day by activity type.

Table 4.
Economic Benefits by Activity Type
(2005 Dollars)

Recreational Activity	Expenditure per Visitor Day	Total Value-Added Multiplier	Value-Added Per Visitor Day
Water-contact	$35.35	1.055	$37.30
Angling	$43.78	1.123	$49.19
Casual-Floating	$35.35	1.055	$37.30
C-V Kayaking	$86.12	1.105	$95.17
C-III/IV Kayaking	$86.12	1.105	$95.17
Rafting (Commercial)	$108.28	1.057	$114.40
Rafting (Non-commercial)	$86.12	1.105	$95.17

6.9. Comparison of Annual Average Economic Benefits to County under Action Alternatives. I the compared the economic benefits to Butte County under the baseline scenario and the Action Alternatives. The estimates of annual average economic benefit to the County are developed by multiplying the estimated out-of-county visits (Table 3) by the estimated per/visit value-added benefits to the local economy (Table 4).

Table 5
Annual Average Economic Benefits to Butte County
(2005 dollars)

Recreational Activity	**Baseline Scenario**	**North Fork Feather Non-Regulation**	**Poe Non-Regulation**	**New License with Recreational Release**	**New License with Ecological Flows**
Wading	181,166	671	485	153,788	- 0 -
Angling	165,328	12,789	2460	149,095	165,328
Casual Floating	970	14,659	1790	- 0 -	38,531
Class V Kayaking	10,564	199,000	44,349	25,981	10,564
Class III-IV Kayaking	73,947	1,194,573	1,151,211	226,505	73,947
Commercial Rafting	- 0 -	6,198,993	8,115,994	183,726	- 0 -
Non-Commercial Rafting	320,628	1,130,582	2,138,375	527,622	320,628
Subtotal(All Activities)	752,603	8,701,267	11,454,664	1,266,717	608,998
Net Change (All Activities) Calculated as Baseline Minus Action Alternative	NA	- 7,948,664	- 10,702,061	- 514,114	143,605
Net Change (All Activities) Calculated as New License with Recreational Flow Minus Poe Non-Regulation	NA	NA	NA	- 10,187,947	NA

Net Change (All Activities) Calculated as New License with Ecological Flows Minus Poe Non-Regulation	NA	NA	NA	NA	- 10,845,666

Attachment 4

WRC-Environmental
Water Resources Consulting

Chuck Watson

River Corridor Planning and Management
River Recreation Specialist

Education:

Master of Regional Planning; University of Pennsylvania, Phil. PA, 1974

Bachelor of Arts; Environmental Studies/Park and Recreation Management. California State
University, Sacramento CA, 1972

Experience:

Summary

- active in environmental and river resource planning for over 27 years
- over 35 years of experience in whitewater rafting and river canoeing on a wide range of river resources in the western US and Canada
- unique combination of skills and experience to problems of river corridor, stream channel, watershed, and river recreation analysis and planning.
- designed, managed, and conducted many studies that combined issues of physical and biological resources of riverine environments with issues of community-based recreation and wildland-based recreation.

Project Work

- wild and scenic river management plans
- river recreation management plans
- instream recreation flow needs and carrying capacity assessments
- planning and design of floodway/open space/parkways
- water resource development project impact/mitigation studies dealing with:
    - river, reservoir, and bed-bank recreation associated with proposed projects

  - FEREC license/re-license studies
  - state water rights analyses
  - litigation related to riverine and river recreational resources

- served as an Expert Witness in recreational resource disputes.

Project Work Noted

- by project proponents, regulatory agencies, the environmental community, and the affected recreational user groups

- for an emphasis on quantification, objectivity, and creative solutions to difficult and subjective recreation use problems.

Specific Recreational Activities Addressed

- river wading and swimming, angling, casual-floating, and C-1 through C-V canoeing, kayaking, and rafting, commercial/non-commercial sector uses, and jet-boating

- lake wading and swimming, angling, and power-boating

- shoreline and riparian, hiking, camping, and various day-uses.

Wild and Scenic River Management Plans

- five major rivers and river systems in California.

- project management and lead professional investigator

- conducted technical evaluations of:
  - recreation
  - watershed management
  - slope stability
  - visual resources
  - river corridor land uses
  - institutional authority/policy.

- Conducted six studies which addressed conflicts and compatibilities between wild and scenic river resource values and hydro-project development.

- addressed the evaluation of area-wide and river recreation resources including:
  - river use patterns
  - access facilities, stream-side day-uses, and adjacent car camping facilities
  - carrying capacities

  - demand/visitation
  - conflicts between user-groups, conflicts between recreation uses and other wild and scenic river values, and conflict resolution in the management approach.

Seventeen Hydro-Project Studies

- FERC licensing/re-licensing studies, water rights evaluations, wild and scenic river compatibility assessments, project operation assessments, and Public Trust issues.

- *river* recreational resource impact and mitigation evaluation studies addressed:
  - physical/facility/environmental/social carrying capacities
  - instream flow needs
  - activity-type instream flow need conflict analysis
  - regional resource context (resource substitutability and significance)
  - demand and visitation estimates
  - trade-off analysis of river/reservoir recreation consequences of hydro-project operations
  - recreation facility development and streamflow regime analysis and recommendations.

- *reservoir* recreation analyses included:
  - analysis of reservoir stage and recreation value and use relations
  - facility/space/resource/social carrying capacities
  - influences of seasonal and WY operations on recreation resources and visitation
  - regional resource context (resource substitutability and significance)
  - demand and visitation
  - trade-off analysis of river/reservoir recreation consequences of hydro-project operations
  - development and management plans of boat launching, boat camping, car camping, and car related day-use facilities.

Seven Studies on Other Aspects of River Recreation

- Responsible for managing user-group, river corridor residence, and agency staff focus-groups and panels to develop study approaches and the final management plans

- Most of these studies for agency whitewater management plans that included:
  - carrying capacity analyses and activity-type and commercial/non-commercial use sector allocation programs
  - kayak slalom racing management planning
  - jetboat operations safety and conflict analysis
  - river corridor carrying capacity assessments.

- Analytic aspects:
  - developing detailed use
  - use level
  - use pattern
  - user-behavior characterizations
  - identifying and resolving user-group, activity-type, and commercial/ non-commercial sector conflicts
  - conducting carrying capacity analyses and identifying carrying capacity thresholds for various recreational product objectives
  - developing instream flow relationships to resource qualities, use conflicts, and carrying capacities

Attachment 5

RESOURCE DECISIONS

Mar eldma D

Resource Decisions
934 Diamond Street
San Francisco CA 94114
415-282-5330
e-mail: <mfeldman@resourcedecisions.net>

EXPERTISE

Water Resource Economics
Energy Economics
Socioeconomics
Recreation Economics
Environmental Economics
Decision Analysis

ACADEMIC BACKGROUND

BS Geology, 1965, City College of New York
MS Water Resource Management, 1970 U. of Wisconsin
MS Agricultural Economics, 1978, U. of Wisconsin.
Ph.D. Natural Resources Economics, 1979, U. of Wisconsin
Dissertation: "Portfolio Multiattribute Utility Analysis: An Application to The Wisconsin Energy Conservation Plan

EMPLOYMENT HISTORY

1988 to Present: Principal, **Resource Decisions**

1987-1988: Associate, Manager of Economics, **Dames & Moore**
o Managed firm-wide Policy & Economics Group
o Line management and sales responsibility

1984-86 Senior Economist, **Dames & Moore,** San Francisco

1980-83 Project Economist, **Dames & Moore**, San Francisco

1976-79 Assistant. Editor **Land Economics** Journal (Part time)

1973-75 Research Associate, **Washington State University**:
o Supervised major study of conjunctive use of groundwater and surface water
o Developed economic model of deep well irrigated agriculture
o Engineering economic simulation of irrigation well investments.

1970-72 Hydrologist (GS-9) **National Park Service:**
o Supervised water resource studies of National Parks
o Coordinated development of agency-wide water quality standards program.

1967-69 High School Earth Science Teacher

1966-67 **Columbia University:** Research Assistant in Geophysics:
o Arctic geophysical and hydrologic surveys

WATER RESOURCES AND RECREATIONAL VALUATION

California Urban Water Conservation Council (CUWCC): Project manager of a study of the state-of-the-art of water conservation benefit evaluation techniques. Based on a literature search covering both water and energy utilities, identified promising methods for application by CUWCC member water agencies in evaluating their conservation options.

Pacific Gas & Electric: Project manager - economic cost benefit evaluation of power and non-power values on the North Fork of the Feather River (Rock Creek-Cresta Project) in support of FERC relicensing.

Monterey County Water Resources Agency: Analysis of the effects of proposed re-regulation of Lake Naciemento on property values and local tax revenues.

Pacific Gas & Electric: Project manager - economic analysis of the effects of Lake Almanor water levels on recreation and property values in support of FERC relicensing.

Pacific Gas & Electric: Project manager - economic analysis alternative flow regimes on the recreational values of the Pit River (Pit 3,4,5) in support of FERC relicensing.

Idaho Power: Evaluated the recreation and power production benefits associated with alternative hydroelectric by-pass flows at Shoshone Falls.

Pacific Gas & Electric: Analyzed the non-market values associated with hydroelectric generation facilities in the Plumas and Stanislaus National Forests.

California Division of Water Resources: Analyzed the agricultural and aquacultural impacts of alternative levels of Mono Lake for the Mono Lake EIR/EIS.

Glenn-Colusa Irrigation District: Analyzed the economic impacts on agriculture of diversion alternatives and constraints on Sacramento River irrigation water supplies.

Santa Clara Irrigation District: Modeled the regional economic impacts of water shortages using an input-output model of the county economy.

Corps of Engineers: Developed and applied a methodology for the incremental analysis of alternative mitigation measures to enhance the habitat of the endangered winter-run salmon on the Sacramento River.

Bureau of Reclamation: Evaluated national and regional economic benefits of a major flood control and regulatory storage project.

Michigan DNR: Estimated the benefits of reducing power plant emissions in protecting recreational fisheries from acidification.

Northern States Power: Analyzed the natural resource damage to a recreational fishery using a multinomial logit travel cost model.

ENVIRONMENTAL ECONOMICS

USAID, Sri Lanka: Conducted a seminar in environmental economics for Sri Lankan economics professors and government officials.

USAID, Philippines: Assisted in the preparation of an action agenda for projects to foster environmental improvement an economic development in urban environments.

Taiwan Power Company: Developed a standard practice manual to assist professionals in evaluating the economic effects of environmental externalities in power production.

California EPA: Prepared a guide to cost-benefit analysis and other economic techniques for use by CalEPA environmental decision makers.

California Division of Oil and Gas: Assessed the status of the California petroleum industry. Provided policy guidance in identify environmental regulations which are redundant or have an unfavorable benefit cost ratio.

Eight Central California Counties: Prepared a guide for natural resource damage assessment to assist coastal counties in their oil spill contingency planning efforts.

California Dept. of Health Services: Provided economic basis for forecasting hazardous waste generation trends for all manufacturing industry sectors in "California.

Ford Motor Company: Analyzed present and future hazardous waste streams and recommended waste disposal options. Evaluated environmental liabilities and estimated associated costs.

San Diego County: Projected solid waste generation rates and analyzed their implications for landfill siting alternatives.

Kings County: Analyzed the financial and fiscal implications of alternative landfill sites and transportation configurations.

Phillips Oil: Applied Input-Output analysis to project the economic impacts on Oklahoma of alternative rates of production from the Hugoton Gas Field.

ENERGY ECONOMICS:

California Energy Commission (under subcontract to RER): In support of the Renewables Program, conducted a survey of manufacturers of renewable electric generation equipment. Also conducted a survey of renewable generation end-users. Assisted in the consumer education program support.

California Energy Commission: Developed a method for measuring the risk mitigation effects of increasing fuel and technology diversity in electrical. Applied this method to California's historic electricity system data to develop policy recommendations for fuel diversity. Phase 2 of this project applied the risk mitigation methodology to projection for California's restructured electricity system.

Western States Petroleum Association: Policy analyses of the impacts of proposed electricity industry restructuring proposals.

California Energy Commission: Forecast the electricity prices and the prospects for emerging technologies under alternative restructuring proposals.

California Energy Commission: Analyzed a survey of qualified facilities to evaluate the current status of cogeneration opportunities.

California Energy Commission: Analyzed the economic costs and benefits associated with developing a strategic petroleum products reserve in California.

California Energy Commission: Evaluated the impacts of price and supply disruptions on California households. Identified target groups and existing programs to assist these groups.

Minerals Management Service: Analyzed cumulative economic impacts of Bering Sea petroleum development.

Minerals Management Service: Forecasted the marketability of Bering Sea natural gas on the U.S. West Coast.

Yukon Pacific: Forecasted impacts on domestic gas prices due to exporting North Slope LNG to the Orient. Prepared documentation used to obtain export authorization.

Alaska Power Authority: Analyzed economic feasibility of providing geothermal electric power to Dutch Harbor, Alaska.

Alaska Power Authority: Assessed Technical and Economic Feasibility of Development of Northwestern Alaska Coal Resources.

Phillips Oil: Projected economic impacts of exporting LNG from Cook Inlet Alaska to Japan.

Prepared documentation used to obtain export authorization.

Minerals Management Service: Evaluated the technical and economic feasibility of deep water far offshore petroleum development on southern California's outer continental shelf.

DECISION ANALYSIS AND OPERATIONS RESEARCH

Sacramento Municipal Utility District: Developed and implemented a multiattribute approach evaluating environmental impacts of powerline corridor alternatives.

National Science Foundation: Developed a linear programming model for using location decisions to mitigate seismic damage to structures.

Office of the Governor of California: Performed a preliminary analysis of regional indirect and induced loses associated with the 1994 Northridge earthquake.

Applied Technology Council: Developed and implemented a methodology for assessment of economic damage to lifelines resulting from earthquakes as part of ATC-25.

Contra Costa County: Developed an economic model for maximizing net benefits (avoided costs minus project costs for evaluating seismic improvements to the county water system.

California Energy Commission: Critiqued and modified the R & D screening tool used to evaluate Opportunity Technologies.

Department of Energy: Developed a multiattribute site selection model for evaluating alternative sites for a High Level Nuclear Waste Repository.

Corps of Engineers: Developed multiattribute utility analysis of environmental, social, and costs considerations of a major water resource project.

Alaska Dept. of Natural Resources: Applied Risk/Cost/Benefit analysis to environmental protection methods for petroleum exploration in the Beaufort Sea.

ACADEMIC AWARDS:

Scholarship--New York State Regents (1961-65)
Fellowship--Federal Water Quality Administration (1969-70)
Research Assistantship (1976-79)

PROFESSIONAL MEMBERSHIPS:

Association of Environmental and Resource Economists
Society for Risk Analysis
American Economics Association
National Association of Business Economists

PERSONAL DATA:

Citizenship: U.S.
Languages: French, Nepali, some Spanish
Interests: Sea Kayaking, Swimming, Tai Chi

Health: Excellent
DOB: 2/22/45
Married, 2 grown children

Attachment 6

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Power Generation Impacts of Alternative Flow Schedules
Pacific Gas and Electric Company, Poe Project (P-2107)
North Fork Feather River, Butte County, California

Jeffrey T. Payne
Senior Water Resources Engineer

1. **Executive Summary**. I conclude that a New License for the Poe Project, even if conditioned to include ecological and recreational flow schedules as Butte County has proposed, will result in a power value which averages $31.8 million (2005) per year, which is 6.9% less than under the baseline scenario of renewal of the original license. This power value assumes the value of a kilowatt-hour of replacement power as stated in PG&E's New License Application (December 2003). Under this action alternative, the project will continue to divert from the bypass reach most of the flow up to project capacity of 3,700 cfs.

2. **Objective**. This technical memo describes hydrologic analysis performed at the request of Butte County, in connection with relicensing for PG&E's Poe Project on the North Fork of the Feather River. The objective is to estimate the hydrologic and financial impact of alternative flow release schedules for the protection of the bypass reach below the Poe Diversion Dam. I prepared this memo on behalf of Butte County.

3. **Qualifications**. My professional qualifications are Attachment 7 to Butte County's comments on the Notice of Readiness for Environmental Analysis.

4. **Input Data**. I used the input data as described in this section.

4.1. I used two data sets to model the Poe Project: (A) hydrologic data, obtained from the USGS, and (B) Feather River historical data, obtained from the California Department of Water Resources (DWR) water resource planning model, CalSim-II [version CA_2020D09D]. I selected the overlapping time period of the data sets, 10-01-1967 through 09-31-1994, as the period of study. I will make the datasets available to the Commission or any party on request.

Table 1.

Input Data for Model

Dataset	Description	Source	Start of Record	End of Record
Bypass gage	North Fork Feather R. at Pulga	USGS (11404500)	04-01-1911	09-30-2000
Powerhouse gage	Poe Powerhouse Below Poe Dam	USGS (11404900)	10-01-1967	09-30-2000
Oroville Dam elevation	Monthly dam stage based on current operations	CalSim-II	10-01-1921	09-31-1994
Oroville Dam Annual Inflow	Total inflow to Oroville Dam, from October to September	CalSim-II	10-01-1921	09-31-1994

4.2. I obtained the hydrologic data used to simulate daily operations of the Poe Project from two USGS gage records. PG&E staff suggested that these gages are the most relevant to the management of the Poe Project. Table 1 provides basic information on these gages.

4.3. Water year types categorize water availability in a given year in relation to the historic pattern. I identified four water year types for the Feather River: Wet, Normal, Dry, and Critically Dry. Table 2 explains how the water years are indexed, based on ranges of total annual inflows in TAF. In actual operations, the water year type is predicted in late winter (such as February) and updated continuously through March. For simplicity, this study predicts and applies the eventual water year type in all months.

Table 2.

Feather River Water Year Types

Index	Percentile Range	From... (TAF)	To... (TAF)
Wet	70-100%	5,679	∞
Normal	40-70%	3,288	5,678
Dry	30-40%	2,505	3,287
Critical	0-30%	0	2,504

5. Model Protocols.

5.1. Since the Poe diversion dam has negligible carry-over storage capacity, I assumed that the inflow is equal to the sum of average daily flows recorded at the bypass and powerhouse gages. This model evaluates change in power generation and value, assuming that the given inflows are re-distributed between the powerhouse and bypass reach as described in flow release schedules described in Section 6. I will make the model available to the Commission or any party on request.[1]

5.2. An objective of this memo is to estimate the gross revenue that PG&E is generating through its operation of the Poe powerhouse. This was accomplished through the following four calculations.

5.2.1. *Calculate the gross head*. The head at the Poe powerhouse is related to the water surface elevation in the tailrace, which is related to the rate at which water is released through the powerhouse. The greater the flow the higher the water surface elevation in the tailrace and the lower the total dynamic head over which water falls in generating electricity. PG&E staff provided Table 3, which describes the relationship between flow and water surface elevation in the tailrace.

Table 3.

Relationship Between Powerhouse Release And Tailrace Elevation

Powerhouse Release (cfs)	Tailrace Elevation (MSL)
0	896
150	896
500	896.1
750	896.2
1000	896.3
1250	896.5
1500	896.7
1750	896.9
2000	897.2
2250	897.5
2500	897.9
2750	898.3
3000	898.7
3250	899.2
3500	899.7
3750	900.2
4000	900.5

5.2.2. *Estimate the powerplant efficiency*. I derived the following information from the New License Application.

- The design capacity of the Poe powerhouse is 3,700 cfs.
- The maximum gross head is 493 ft.

[1] If the requesting party has its own hydrologic model, I will also request the courtesy of disclosure so that I can evaluate the comparative merits of the modeling efforts.

- The powerhouse capability is 120 MW.

Based on these numbers the efficiency of the power plant was estimated as: *Efficiency = (120 MW*1000 kW/MW*11.8)/(3700 cfs*493 ft)*, or 77.6%.

5.2.3. Calculate power production. Assuming this efficiency value, I calculated the gross daily power production on the following formula: *Power = (Flow * Head * Efficiency)/11.8.*

5.2.4. Estimate power value. In the New License Application, PG&E states the cost of replacing power production foregone at the Poe Project in order to increase flow in the bypass reach is $0.0544/kw-hr. I used this value to calculate power value on an annual basis. I used the following equation: *Ave. Ann. Gross Revenue = 365 day/yr * (∑Daily Gross Revenue/days in record).*

5.3. The model does not include ramping rate for boating flow release or other purpose. I believe that the New License Application does not propose such a rate. This model may be adjusted to include a ramping rate, once proposed by the resource agencies.

6. Action Alternatives for Project Operations

6.1. I modeled a baseline scenario (Section 6.2) and five alternative scenarios for flow releases for protection of environmental quality and recreation.

6.2. Baseline Operations (Scenario A). I treated existing operations under the original license as the baseline. Thus, the minimum flow schedule under the original license is the baseline minimum flow schedule (MFS).

6.3. Action Alternatives for New License. I considered the following alternatives scenarios for flow releases for protection of environmental quality and recreation.

6.3.1. Ecological Minimum Flow Schedule (Scenario B). Based on preliminary conversations with Butte County and other resource agencies, I assumed that the ecological MFS in the New License will be in the amounts stated in Table 4 as indexed by year-type. Of course, the model may be adjusted to address any alternative ecological flow schedule under consideration in this relicensing proceeding.

Table 4.

Ecological MFS at Poe Diversion Dam (cfs)

	Water Year Type			
Month	***Wet***	***Normal***	***Dry***	***Critically Dry***
October	250	250	150	150
November	275	275	150	150
December	300	300	180	150
January	325	300	180	150
February[2]	350	325	225	225
March	350	350	280	270
April	400	375	280	270
May	425	325	250	250
June[3]	350	300	220	220
July[3]	300	275	200	180
August[2]	300	250	200	180
September[3]	300	250	180	180

When inflow to Poe Dam is less than the scheduled release requirement, the model routes the available inflow to the bypass reach. When the inflow exceeds the release requirement, the model routes the scheduled release into the bypass reach, and it routes the additional inflow to the powerhouse (up to the powerhouse capacity of 3,700 cfs).

6.3.2. Baseline MFS + 950 cfs Recreational Flow Release (Scenario C). This scenario assumes that the recreational flow release from Poe Dam is a constant 950 cubic-feet per second (cfs) on the applicable schedule. In this scenario, the model calculates the volume of water necessary to provide 950 cfs of recreational flow release plus the baseline MFS required by the original license. The recreational flow release occurs from 9:00 am through 5:00 pm of each day one weekend per month, in the months of July to October during Wet and Normal Years. The recreational flow release does not occur in this (or subsequent) scenarios in Dry or Critically Dry Years. This flow release is illustrative of the range that may be appropriate for boating navigation. Thus, I understand that Butte County is proposing a similar but different flow release in its comments on the Notice of Readiness for Environmental Analysis. The model may be adjusted to analyze any specific flow release proposal.

6.3.3. Ecological MFS + 950 cfs Recreational Flow Release (Scenario D). This scenario provides for release of the ecological MFS, plus 950 cfs as a recreational flow release on the same schedule specified in Section 6.3.2.

---

2 Exclusive of any pulse flow that may be required.

3 Exclusive of any additional release that may be required for temperature moderation.

6.3.4. Ecological MFS + 1,200 cfs Recreational Flow Release (Scenario E). This scenario provides for the release of the ecological MFS, plus 1,200 cfs as a recreational flow schedule on the same schedule described in Section 6.3.2.

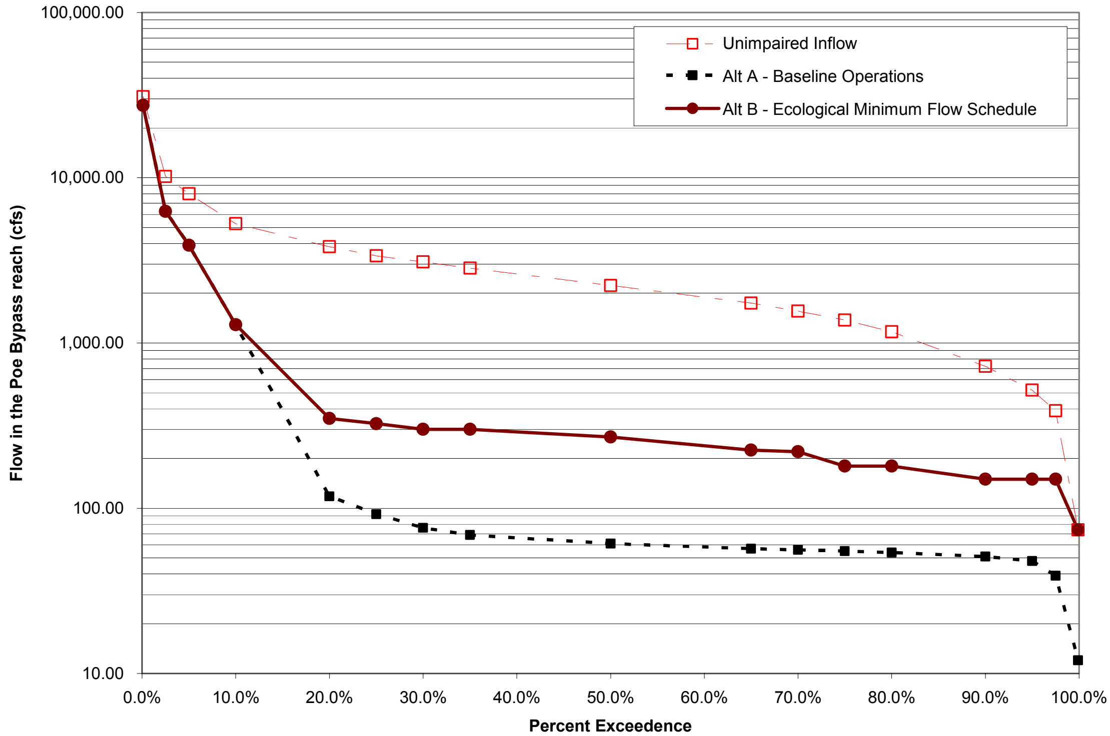
6.3.5. Ecological MFS + Recreational Flow Release up to Inflow (Scenario F). This scenario provides for release of the ecological MFS, plus any additional inflow at Poe Dam as the recreational flow release (thus resulting in zero power generation) on the same schedule specified in Section 6.3.2.

7. **Hydrologic and Power Value Impacts of Action Alternatives**. This section shows how baseline scenario changes the frequency of unimpaired flows in the bypass reach, and then how alternative scenarios change the baseline, in the form of a flow-duration curve.

7.1. Flow Duration Curve. Figure 1 displays the probability that a flow will exceed a certain amount in the Poe bypass. The y-axis is plotted on a logarithmic scale. As an example, unimpaired flows in the bypass reach exceeded 1,150 cfs 80% of the time. Under the baseline scenario, flows in the bypass reach exceed 54 cfs 80% of the time.

Figure 1.

Flow Duration Curve under Baseline and Alternative Scenarios



7.2. Power Value. Based on the flow duration curve, and using the model for calculation of power value described in Section 5, Table 5 estimates power value under each scenario.

Table 5.

Power Value under Alternative Scenarios

Alternative	Description	Average Annual Value	% Change from Baseline
A	Baseline Scenario	$ 33,623,682	0.00%
B	Ecological MFS	$ 31,441,428	-6.49%
C	Baseline MFS + 950 cfs Recreation Flow (summer schedule)	$ 33,457,247	-0.49%
D	Ecological MFS + 950 cfs Recreation Flow (“”)	$ 31,316,769	-6.86%
E	Ecological MFS + 1,200 cfs Recreation Flow (“”)	$ 31,272,607	-6.99%
F	Ecological MFS + Remaining Inflow (“”)	$ 31,017,641	-7.75%

8. **Conclusion.** This is a preliminary analysis of the impacts on hydrology and power value resulting from alternative flow release schedules for protection of environmental quality and recreation. I am not aware of any similar analysis in the record of this proceeding. I welcome comments or questions on data, methods, or conclusions, and I will adjust the model as appropriate as alternatives are developed.

Attachment 7

820 26TH STREET, APPARTMENT 4, SACRAMENTO, CA 95816
CELL (916) 215-2403 • E-MAIL JTPAYNE@GMAIL.COM

JEFFREY T. PAYNE

PRACTICAL EXPERIENCE

2003 – Present Natural Heritage Institute Sacramento, California

Senior Water Resources Engineer

- Working with water resource stakeholders to understand the complex tradeoffs between the various beneficial uses of regulated river systems
- Grant & technical paper writing

2002 – 2003 DHI Water & Environment Hørsholm, Denmark

Research Engineer (Valle Fellowship)

- Research on error propagation in distributed runoff models
- Investigations into radar-based flood warning triggers

2000 - 2002 University of Washington Seattle, Washington

Research Assistant

- Computer Modeling: California and Columbia River Systems
- Analysis of climate change impacts on system reliabilities
- Design of supply-side strategies to adapt to climate changes

1999 - 2000 University of Kentucky Lexington, Kentucky

Research Assistant

- Small stream eutrophication modeling
- Point and non-point phosphorus loading study

1997 - 1999 EA Partners, PLC Lexington, Kentucky

Part-time Student Engineer (EIT)

- Watershed Analysis & Retention Design
- Land Development Design & Drafting
- Transportation Design & Drafting

EDUCATION

2000 - 2002 University of Washington Seattle, Washington

M.S. Civil Engineering: Water Resources Management

- Valle Fellowship Recipient (Scandinavian Exchange/Research Scholarship)
- Research Assistantship

1995 - 1999 University of Kentucky Lexington, Kentucky

B.S. Civil Engineering (Hydrology and Geography)

- Honors Program Graduate
- Jones Scholarship Recipient

COMPUTER SKILLS

Modeling Environments: Extend, MIKE 11, MIKE SHE, .NET (C#), Visual Basic, FORTRAN; limited ESRI/ArcHydro and OASIS

Planning Model Experience: CalSim-II (California Water Resource Model), ColSim (Columbia River projects), SRM (North/South Carolina Water Resource Planning model), KB-HEM (integrated Klamath hydrology simulation/crop optimization model)

GRANTS AUTHORED & AWARDED

$20,000 February 2005. Co-Author with Susan Cielinski. (U.S. Department of Fish and Wildlife) "Improving Ecosystem Services to Riparian Lands in North and South Carolina." Awarded by USFWS.

$30,000. March 2004. Co-Author with Assoc. Prof. John Grego (University of South Carolina) "Modeling the Impact of Reservoir Management Regimes on Important Ecosystems in the Santee River Basin." Awarded by the South Carolina Water Resource Center through U.S. Geologic Survey

PEER REVIEWED PUBLICATIONS

Butts, MB, JT Payne, M Kristensen, and H Madsen. 2004. "An evaluation of the impact of model structure on hydrological modeling uncertainty for streamflow simulation." *Journal of Hydrology* Vol. 298, 242-266, December.

Payne, JT, AW Wood, AF Hamlet, RN Palmer, and DP Lettenmaier. 2004. "Mitigating the effects of climate change on the water resources of the Columbia River Basin." *Climatic Change* Vol. 62, Issue 1-3, 233-256, January.

INVITED PRESENTATIONS

Payne, JT March 4, 2005. "Introduction to modeling the Catawba-Wateree with the Santee River Basin Model (SRM)." *American Rivers and Catawba-Wateree Relicensing Coalition. Charlotte, North Carolina*

Payne, JT October 7, 2004. "Assessing Catawba-Wateree Instream Flow Alternatives using the Santee River basin Model." *Catawba-Wateree Relicensing Coalition Annual Stakeholder meeting: Instream Flow Conference. Charlotte, North Carolina*

Payne, JT April 27-9, 2004. "Introduction to the Santee River basin Model." *South Carolina Coastal Conservation League: Stakeholder Conferences. Moncks Corner & Charleston, South Carolina*

CONFERENCE PAPERS & PROCEEDINGS

Payne, JT, MB Butts, J Overgaard, M Kristensen, and H Madsen. 2004. "An evaluation of model structure uncertainty effects for hydrological simulation" *EOS Trans. AGU, 85*(47), Fall Meet. Supplement

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Butts, MB, JT Payne, M Kristensen, and H Madsen. April 25-30 2004. "Model structure effects on modelling uncertainty for hydrological simulation." *Proc. Of European Geosciences Union, Nice, France.*

Palmer, RN, NT Van Rheenen, DP Lettenmaier, JT Payne, AF Hamlet, and AW Wood. December 10-14, 2001. "Projected climate change implications for Western U.S. water resources management." *Proc. of the American Geophysical Union Conference, San Francisco, California.*

Van Rheenen, NT, AW Wood, RN Palmer, JT Payne, and DP Lettenmaier. May 20-24, 2001. "The effects of climate change on water management strategies and demands in the Central Valley of California." *Proc. of the World Water and Environmental Resources Congress, Orlando, Florida.*

Attachment 8

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Cost of Decommissioning Big Bend Dam
Pacific Gas and Electric Company, Poe Project (P-2107)

Dennis Gathard, P.E.
Principal, G&G Associates

1. **Objective**. I prepared this memo at the request of Butte County, California. It includes my review and comments on PG&E's report in the New License Application (NLA) (2003) recommending against the decommissioning of Big Bend Dam. It also includes an appraisal-level study that I undertook regarding the feasibility and cost to remove Big Bend dam.

2. **Qualifications**. I have worked as an engineer continuously since 1971. I have been a licensed engineer since 1976 and currently am licensed as a Civil and Structural engineer in the state of Washington and a Civil Engineer in the state of California. Since 1971 I have designed structural elements of bridges, piers, buildings, and dams. Since 1989 I have also worked in the field of hydraulics and hydrology specifically relating to sediment removal and transport issues and dam removal projects. I have worked on over 15 dam removal projects since that time. I was project manager for the development of the approach to remove 2 dams on the Elwha River in Washington State that resulted in a Report to Congress, which I prepared and was a member of the American Society of Civil Engineers Task Committee on *Guidelines for Retirement of Dams and Hydroelectric Facilities*. My qualifications are Attachment 9.

3. **Documents Reviewed**. I reviewed PG&E's "Big Bend Dam Report" (NLA Appendix E3-15) (September 17, 2001) (Big Bend Report), which described and analyzed an approach to dam removal. Unless otherwise noted, this report is the basis for my analysis in this memo. I also reviewed other relevant parts of the NLA.

4. **Summary.** The analysis of dam removal in the Big Bend Report is an appraisal level estimate without a great deal of discussion of the removal approach. Because no detailed information was available, I was unable to resolve questions I had about their removal process. Unfortunately the written descriptions were also insufficient to allow for a clear understanding of the demolition approach they propose to use. The cost shown for individual elements, such as sediment removal or dam concrete removal is based on the experience of the individual cost estimator and cannot be independently verified. More in-depth descriptions would be needed for a complete understanding of

how the demolition was intended to occur. A better description of the criteria for removal would also be needed to support the basis for more costly elements such as sediment removal. I analyze PG&E's demolition approach in Section 5, below.

4.1. Because of the limited information available for reviewing the removal, I developed an independent approach for estimating the cost of removing Big Bend Dam based on sources such as *Means Heavy Construction Cost Data* and other dam removal cost estimates for dam removal projects that I have personally been involved with. I analyze this alternative approach in Section 6 below.

5. **PG&E Demolition Approach**. The following discussion is based on the available information regarding PG&E's dam removal approach. Some of the details of the approach are inferred from information presented in the spreadsheet provided with the cost estimate.

5.1. Site Access. In order to remove the dam large excavating and demolition equipment must be able to gain access to the site. Access from the right bank of the river does not appear feasible, based on my visit to the site. Aerial photographs and topographic maps show a small road from Big Bend Road down to near the top of the dam.

5.1.1. The first activity of the project would be to re-establish the access road from Big Bend Road down the embankment to the top of the dam. This road was apparently used for dam construction and access to the site while the dam was in operation. I was not able to visit the road during my site visit but could see it from the opposite bank. The road is visibly overgrown and would clearly require fairly extensive work. The road consists of switchbacks up a steep hillside but appears to terminate about 30 feet above the dam. A new road, approximately 500 feet long, would need to be constructed from a level site at the road terminus to the top of the dam. It is not clear from information available whether modern equipment of the size described in the PG&E cost estimate and required for the demolition would be transportable along this alignment. However, from a review of the maps and visiting the site, my conclusion is that this proposed means of access would be most likely be feasible even if some size limitations were imposed on vehicles and materials. Other alternatives that could be investigated further but do not appear to provide the most cost effective means of accessing the site would be as follows:

A. Construct a new low elevation roadway along the right bank along an abandoned roadway apparently used to construct the railroad bridge located ¼ mile upstream of the dam. From the railroad bridge to the dam the feasibility of constructing this access along the river's left embankment is unknown. The advantage of such an approach would be to allow direct access to the dam without switchbacks and steep grades and rebuilding the abandoned dam access roadway. This could possibly provide safer construction.

B. If construction from the railroad bridge to the dam along the embankment were not feasible a rock roadway against the right bank in the river on the sediment surface could be constructed. This may require construction activities to occur at low flow to expose sediment surfaces. Road construction material could include some of the sediments schedule for removal.

5.2. Dam Structure Access. After establishing equipment access to the dam, an upstream cofferdam would be constructed to divert flow through ten culverts each with a ten-foot diameter laid in the river oriented in line with the notch in the top of the dam. PG&E proposes to use sheet piles driven into the sediment to create an impervious wall that diverts flow into the culverts. Driving sheet piles in large boulders and gravel can sometimes prove not to be feasible if individual rocks in the sediment are too large. Driving sheet piles in granular sediments to eliminate flow is a method proposed at other dam removal locations and is probably feasible here. The upstream cofferdam would be constructed by driving two parallel rows of sheet piles 30 feet deep. Based on the quantity of sheet piles included in the detailed spreadsheet, it appears that only one row of piles be used to construct the downstream cofferdam. Typical applications in loose gravel such as those contained in the forebay of the dam would use a double row of tied piles to ensure stability of the piles when the gravel against the back of the dam begins to erode as the dam is removed. From the information available it does not appear the sheet pile cofferdams were intended to be tied.

5.3. River Diversion. Placing culverts in a flowing river will be challenging and the feasibility of accomplishing this task successfully would need to be investigated further. Sediment excavation for placement of the culverts will be required. I assumed that the sequence of constructing the cofferdam and culverts would be as follows.

- Drive sheet piles from embankment with crane
- Place material for access road across culverts behind sheet piles
- Move crane onto placed fill material to excavate for placement of culverts
- Excavate, place culverts, and fill over the top of the culverts
- Drive sheet piles on opposite side of river and fill
- Construct a downstream cofferdam around concrete removal area.

5.3.1. Excavating and placing culverts would need to be accomplished from a stable location above water level. The top of the culverts would need to be no higher than the surface of the current reservoir elevation to take full advantage of the flow capacity of the culvert. This would require excavating at least ten feet of sediment at the culvert location in flowing river water.

5.3.2. Without a better understanding of the grain size distribution of the sediment immediately upstream of the dam it is impossible to determine the potential for in-water excavation. Usually the finest material (smallest grain size) is located immediately adjacent to the dam. These smaller particles usually have a very flat angle of repose, which causes limits on the depth of excavation possible. At Milltown Dam reservoir, a dam removal project on the Clark Fork River near Missoula, MT, the depth of excavation in fine sediment was limited due to sloughing of material into the excavation pit. This occurred in areas where no flowing water existed. It would be reasonable to assume that if water were flowing though the excavation, keeping the excavation open to place culverts would be even more difficult and perhaps not possible. No description of how placing culverts would be accomplished was provided. If excavation depth were in fact limited, culverts would not be able to be placed to the depth required to allow passage of the design flow of 4,000 cfs.

5.4. Dam Demolition. Once the 30 foot wide access road is constructed, demolition of the dam structure would proceed using saw cutting and hoe rams. Saw cutting is relatively expensive compared to blasting and hoe ram demolition. The *Report on Big Bend Dam* states that blasting, generally the least expensive method of concrete demolition, was not considered as an option because of the proximity to the railroad bridge. However, this restriction may not be necessary. I have personally designed projects that included demolition of bridge structures adjacent to highway structures in use. These structures were much closer to each other than the dam and railroad bridge. I also worked extensively with blasting contractors on the demolition methodology for the removal of Condit Dam on the White Salmon River in southwestern Washington State. Condit Dam, which contains about twice the volume of concrete in Big Bend Dam, is scheduled to be removed using long hole blasting techniques. There are several structures nearby. Blasting contractors and engineers have reviewed the proposed procedures and believe that work can be conducted without damaging nearby structures. The U.S. Fish and Wildlife Service has also reviewed the plans and believes that blasting can be conducted without significant impacts to Endangered wildlife.

5.4.1. Blasting could be accomplished by pre-drilling all locations and using controlled timing of the charges to create concrete rubble without creating a high energy wave that could adversely affect the foundation of the railroad bridge. Individual concrete pieces would be small enough to be removed using a backhoe or crane. A cost estimate using long hole blasting techniques is included, below, with a description of a dam removal technique that avoids potential problems placing culverts.

5.5. Sediment Removal. Approximately 100,000 cubic yards of sediment would be removed. I could find no explanation for the need for this action. Removing some sediment on the upstream face of the dam may be required to access and remove the lower part of the structure. If a 20 foot deep by 20 foot wide section of sediment were removed for access immediately upstream of the dam, this would account for a about 4,500 cubic yards of sediment. I found no explanation for the removal of the remaining 95,000 cubic yards. The cost of sediment removal is the single most expensive part of the project, representing about 39% of the total cost.

5.5.1. The Report describes construction of a rip-rap lined channel extending 500 feet upstream of the dam location. It is very unlikely that such a channel would remain in the constructed form after the first high flow event. Constructing artificial channels generally requires more than rip-rap for stability. Maintenance would be required to retain the form of the channel. No maintenance costs were found in the cost estimate. If not maintained then I see no rationale for the construction.

5.5.2. I found no description of how the material would be removed. Some form of access to the channel would be required; possibly driving a backhoe onto the sediment surface after the dam was removed. Based on regime equations developed for similar environments a flow of 4000 cfs could quickly erode a channel of over 150 feet wide. The actual channel dimensions will depend on the sediment sizes trapped in the reservoir behind the dam.

5.5.3. The major issue that I see with sediment and its removal is the possibility of contamination. The license application discusses the possibility of toxic substances being present in the sediment but concludes that contamination in the sediment behind the dam is unlikely. I would recommend sediment testing be conducted prior to any dam removal project. Contaminated sediment generally must be removed before dam removal activities.

5.6. Disposal Site. I could find no exact description of the disposal site location. For the comparison cost estimate I prepared, I used the same cost figure presented in the PG&E cost estimate for the disposal site.

6. Alternative Dam Removal Approach and Cost Estimate. As a means to illustrate other possible approaches and compare cost of dam removal based on methods used and developed for similar projects at other sites, I developed a removal approach with several sub options described below.

6.1. Access. The approach to site access described in the PG&E report appears to be the most feasible of the alternatives investigated. To ensure feasibility, the approach I describe would use equipment and materials no longer than about 40 feet. This length limitation is based on my review of topographic maps and consideration of equipment most likely used to construct the dam. The minimum vehicle length that could efficiently remove demolished concrete and travel this road would need to be at least 25 feet to make this access useful. The proposed temporary bridge upstream of the notch could be constructed at approximately the same cost if the length restriction were 25 feet. A new road way would be constructed from a flat area above the dam at the end of the existing road to the top of the dam on the right bank of the river. Figure 1 shows the proposed alignment.

6.2. Dam Structure Access. Sheet piles would be driven in the reservoir area just upstream of the dam to create a cofferdam structure 30 feet wide. The sheet piles would be tied across and back filled with imported gravel. The PG&E approach included divers to seal the cofferdam. The approach I used for concrete demolition does not require that all river flow be completely eliminated in the demolition area and would not require completely tight cofferdams. The Edwards Dam in Augusta, Maine was removed using the dam as the access surface. The dam structure was a relatively porous timber crib structure. The contractor was able to conduct demolition activities without an upstream cofferdam. The cofferdam would extend out from the right bank along the upstream face of the dam to the beginning of the notch in the top of the dam.

6.3. River Diversion. Because information regarding the sediment behind the dam is unavailable and the high volume of flow that would need to pass the dam during demolition, I would construct a temporary bridge structure at the current notch location to pass flow while the left side of the structure was demolished. The bridge would be constructed in three equal spans about 40 long. Five 21 inch deep beams, W 21x111, would be used to span between bents. Timber 12 x 12 decking would create the operating surface. Two bents constructed from H piles and a steel cap would be used to support the bridge. A cofferdam similar to the one constructed on the right bank would be constructed starting at the left end of the notch extending the left bank as illustrated in Figure 1. The river would continue to flow under the bridge and through the notch in the top of the dam for the Stage 1 demolition. Stage 1 demolition would involve removing dam concrete from the notch to the left bank. Stage demolition would occur after the river was diverted through the Stage 1 demolition area.

6.4. Dam Demolition and Removal. To demolish the concrete I would use long hole blasting techniques. A drilling contractor would pre-drill holes in the dam structure that would allow the concrete in the mid-section of the dam to be blasted into rubble-sized pieces. Demolished material would be removed using a backhoe or crane with a clamshell and placed in trucks for removal to the disposal site. As illustrated in Figure 2, a portion of the upstream and downstream faces of the dam would remain in place to contain the rubble and keep water out of the excavation. This method of demolition was thoroughly investigated by demolition contractors and selected as the preferred approach for removal of Condit Dam. The upstream and downstream face sections of the dam would be removed last after internal concrete had been removed.

This process would most likely occur in several vertical increments. Figure 3, illustrates where concrete would be removed in Stage 1.

6.5. Relocation of River Diversion. After removing the dam down to the pre-dam river elevation, the river would be diverted to flow along the left bank while demolition occurs to the remaining portions of the dam, Stage 2 removal. Figure 4 illustrates the relocated diversion. By relocating the river the central portion of the dam can be removed in the dry. Sheet piles would be pulled and relocated as shown in Figure 4 to help divert the flow. Some excavation of sediment may be required depending on conditions developed in the 401 water quality certification process. Construction of a downstream cofferdam may or may not be required. For the cost estimate I included a short downstream cofferdam constructed of individual concrete blocks approximately 2.5 feet by 2.5 feet by 6 feet long. These blocks are available from many concrete ready mix companies for temporary use. The downstream cofferdam would not seal out water but would protect against varying flow levels and splash back into the excavation. Excavation protection against water intrusion would be accomplished using upstream and downstream faces of the dam as described above.

6.6. Stage 2 Demolition. After diverting the river to the left bank the remaining dam concrete would be demolished using drilling, blasting, and rubble removal approaches described above.

7. **Cost Estimates.** Based on the dam removal approach discussed above, I developed an estimate of the cost for dam removal, shown in Table 1.

7.1. I used Means *Heavy Construction Cost Data* for materials and activities where possible. Material quantities calculations, such as dam concrete to be removed, were based on figures taken from P-2107 license application documents where possible. I estimate that approximately 17,000 cubic yards of concrete will need to be removed to take the dam down to the pre-dam riverbed surface. This is based on a very rough estimate of the width and depth of the dam. I used a width of 300 feet and an average depth of 38 feet for volume calculations. These estimates were not based on original drawings because I was unable to find that information and the drawings I did find were not to scale. To adequately assess the extent of removal and therefore the volume of concrete to be removed, pre-dam topography of the river and construction drawing would be required.

7.2. I believe the most accurate cost for dam demolition using the long hole drill and blast techniques for dam removal has been developed for the Condit Dam Removal project. I used cost for demolition for that project updated from the 1998 cost estimate to 2004 at 2.5% per year. I choose 2004 because the Means cost data was from that year. Hoe ram demolition may also be cost effective for this size. However no cost data is available for demolition of concrete structures such as a dam.

7.3. I used the PG&E cost estimate for spoils site development because they would have the best knowledge of available sites, I have no particular knowledge of the land use in the area, and the number appeared reasonable when compared to land use costs I have seen on other projects.

7.4. The cost of removing the dam structure in 2008 dollars is similar to the cost presented by PG&E for just the dam removal work. Including sediment removal PG&E's cost is over $10 million. I reconstructed PG&E's cost estimate in Table 2, leaving out the cost for sediment removal. Without sediment removal, PG&E's cost for structure removal only is approximately $6.2 million in 2008 dollars. This cost is very similar to the cost estimate I developed for structure removal only, shown below, of approximately $6.4 million in 2008 dollars.

Table 1.
Cost Estimate for Removal of Big Bend Dam

Item	Quantity	Unit	Unit Price	Item Cost	Means Item #	Page
Mobilize and Demob	1	LS	5.0%	$210,000		
Develop Spoils Site	1	LS	$ 40,000	$40,000		
Construct New Access Roadway						
Regrade Existing Rod from Big Bend Rd	10000	LF	$1.05	$10,500	02300-100-0200	45
Gravel Surfacing	5560	CY	$6.65	$36,974	02700-200-0100	96
Excavate Road - Bench to Dam	500	LF	$50	$25,000		
Install U/S sheet pile Cofferdam Left Bank						
Drive Extract and Salvage Sheet Piles	6000	SF	$25	$150,000	02240-400-1600	42
Import fill Material	800	CY	$22	$17,600	02300-520-1300	54
Wales and Ties	5000	LB	$2.00	$10,000		

Install Temporary Bridge						
Beams	56000	LB	$2.00	$112,000		
12 H Piles with Steel Cap	18000	LB	$2.00	$36,000		
Timber Lagging	3000	SF	$32	$96,000	02260-200-2350	44
Remove Bridge	3000	SF	$10	$30,000		
Install Cofferdam Right Bank						
Drive Extract and Salvage Sheet Piles	6000	SF	$25	$150,000	02240-400-1600	42
Import fill Material	800	CY	$22	$17,600	02300-520-1300	54
Wales and Ties	5000	LB	$2.00	$10,000		
Temporary Downstream Cofferdam						
Place Concrete Blocks	250	LF	$75	$18,750		
Place Sheathing	2500	SF	$1.30	$3,250	02500-300-0170	89
Remove Cofferdam	1	LS	$5,000	$5,000		
Stage 1 Demolition						
Drill, Blast, and Remove Rubble Stage 2	6000	CY	$140	$840,000	Condit	
Excavate Upstream Sediment behind Dam	1500	CY	$2.00	$3,000	02300-424-0250	49
Haul Material to Disposal Site	7500	CY	$10.85	$81,375	02315-490-540	53
Stage 2 Demolition						
Drill, Blast, and Remove Rubble Stage 2	11000	CY	$140	$1,540,000	Condit	
Excavate Upstream Sediment behind Dam	3000	CY	$2.00	$6,000	02300-424-0250	49
Haul Material to Disposal Site	14000	CY	$10.85	$151,900	02315-490-540	53
Site Clean Up	1	LS	$250,000	$250,000		
Subtotal in 2004 $				$3,850,949		
Contingency			25%	$962,737		
Subtotal				$4,813,686		
Engineering and Permitting			20%	$962,737		
Total in 2004				$5,776,424		
Escalation to 2008	2.5%/yr		10.4%	$599,667		
Total in 2008 Dollars				**$6,376,091**		

Table 2.
Cost Estimate without Sediment Removal

Item	% of Total	Item Cost	Subtotal
Mobilization			$215,000
Mob and Access	5.7%	$175,000	
Disposal site development	1.3%	$40,000	
River Diversion			$1,143,000
River Crossing w Culverts	12.5%	$384,000	
U/S sheet pile diversion	13.4%	$412,000	
D/S Cofferdam	6.3%	$195,000	
Access to River Outside Bend	2.1%	$63,000	
Divert River to one Side	0.9%	$27,000	
Create Access to Inside	2.0%	$62,000	
Remove Dam			$1,100,000
Waste Containment System	5.7%	$176,000	
Remove Right half of dam	15.0%	$462,000	
Remove left half of dam	15.0%	$462,000	
Remove Sediment			NA
Excavate Sediment Outside Bend	0.0%		
Excavate Sediment Inside Bend	0.0%		
Demob and Site Restoration			$613,000
Remove Sheet piles	5.1%	$157,000	
Demob and Clean Up	3.5%	$108,000	
Site Restoration	11.3%	$348,000	
Subtotal	**100.0%**		$3,071,000
			$2,310,928
O&P	15%	$460,650	.
Contingency	35%	$1,236,078	
Engineering, Permitting et	20%	$614,200	
Total (2001 $)			$5,381,928
Escalation to 2008	16%	$859,458	
Total (2008 $)			**$6,241,386**

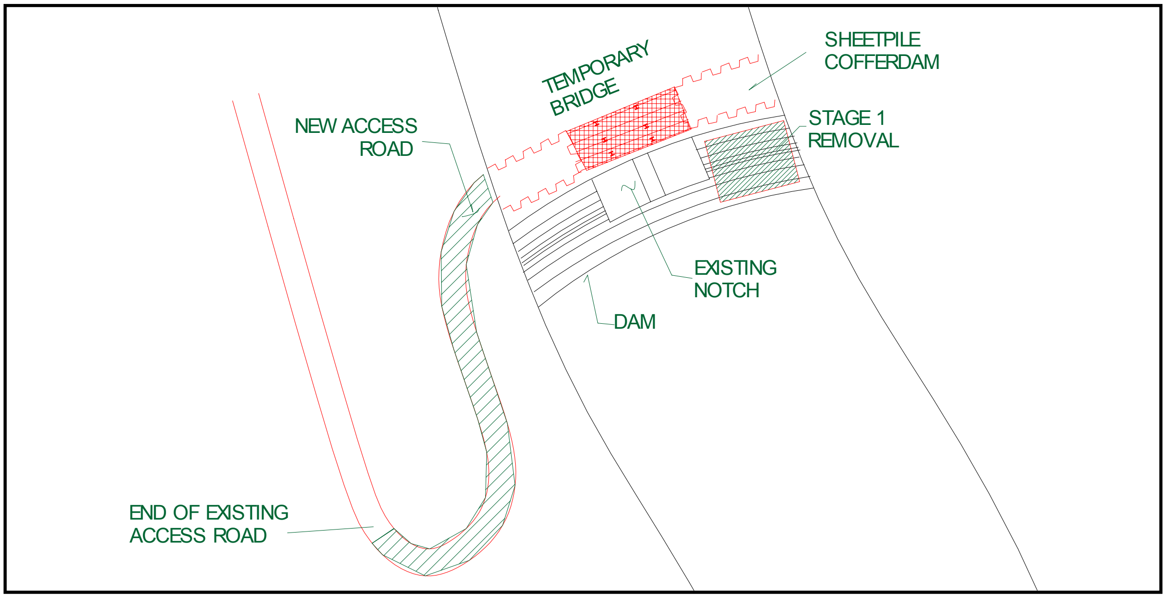

Figure 1. **<u>Plan View - Proposed Stage 1 Activity</u>**

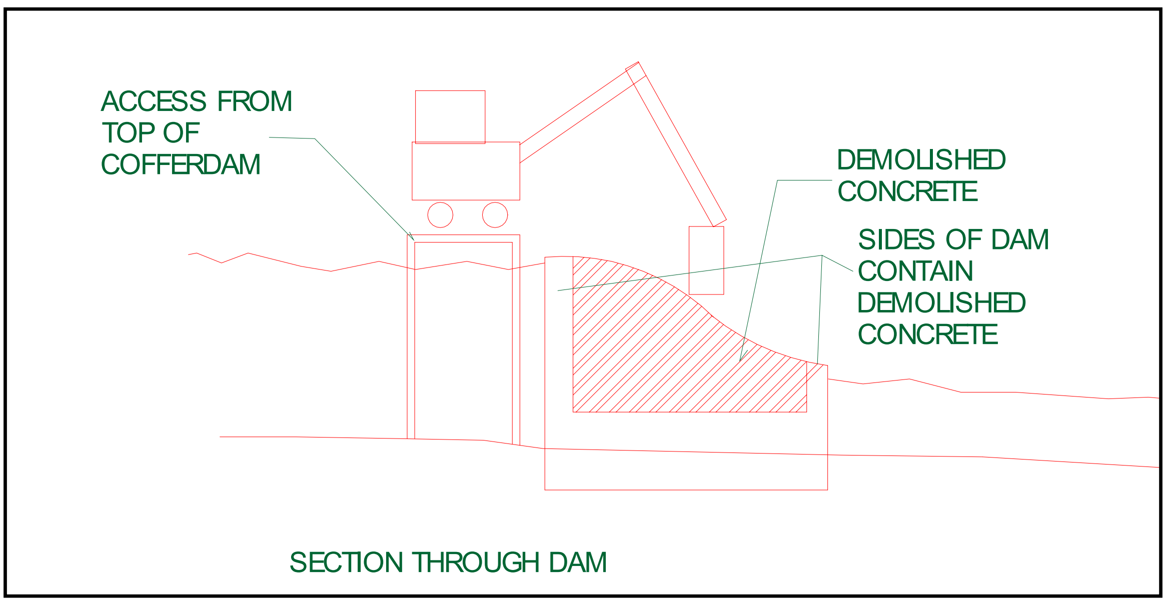

Figure 2. **<u>Section through Dam</u>**

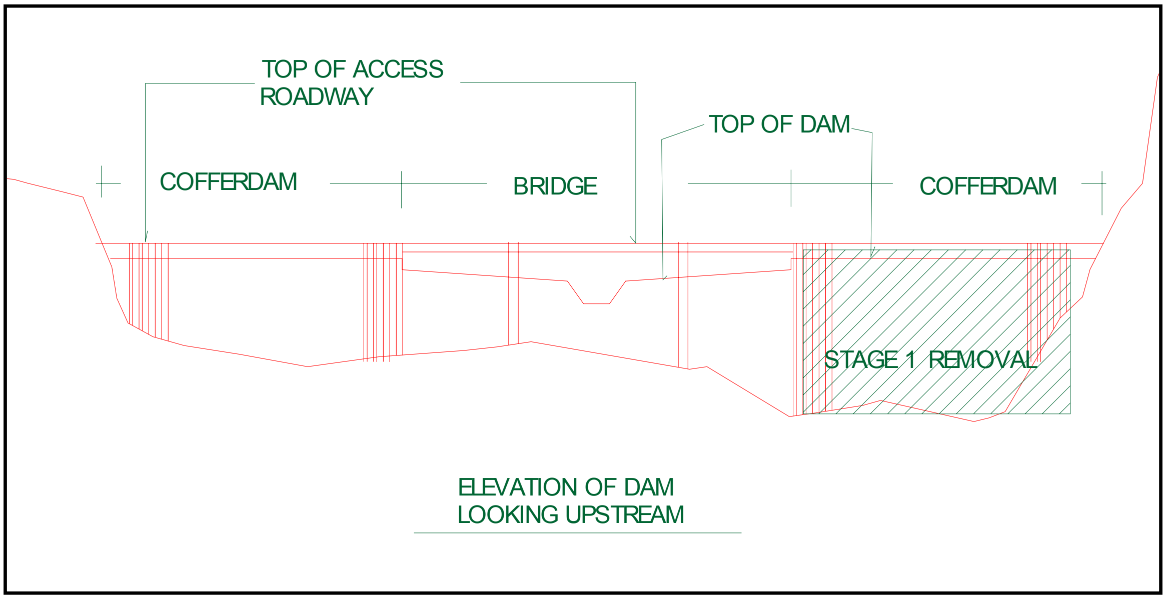

Figure 3. Elevation - Stage 1 Removal

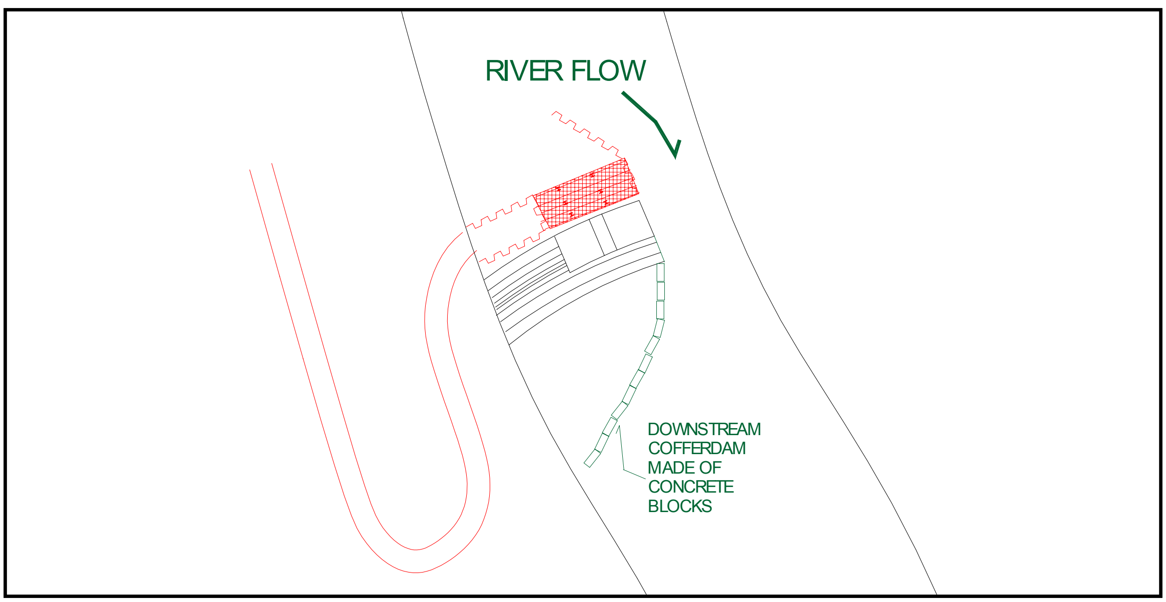

Figure 4. Stage 2 Demolition

Attachment 9

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Education: B.S. Aeronautical Engineering, University of Illinois, 1971
M.S. Civil/Structural Engineering, University of Illinois, 1976

Professional Registration: Civil Engineering and Structural Engineering -Washington and California

Experience

Working for several national A&E firms and as Principal of G&G Associates, Mr. Gathard has worked on projects conducting civil, structural and hydraulic engineering, and permitting for over 30 years. His primary areas of expertise are in structures, river hydraulics, and fisheries. He is a registered civil engineer and a registered structural engineer. For the last 15 years, Mr. Gathard has been primarily been involved with hydropower projects, consulting for the US Corps of Engineers, US Bureau of Reclamation, Native American nations, environmental organizations, and private hydropower facilities owners. Past project work has included dam removal design, concept development, safety reviews (FERC part 12); managing and removal of sediment trapped behind dams (sediment transport analysis); protecting water quality; fish passage design, hydrology and hydraulics; power production capacity analysis; flooding analysis.

He was also a member of the American Society of Civil Engineers Task Committee on Guidelines for Retirement of Dams and Hydroelectric Facilities, which produced the first set of specifications for dam removal, entitled ***Guidelines for Retirement of Dams and Hydroelectric Facilities***. As Project Manager for numerous dam removal projects, Mr. Gathard has been responsible for design, analysis and permitting projects including:

- Survey of barriers on California's coastal streams
- Sediment transport analysis after dam removal of Condit Dam in Bignen, WA
- Stream survey of all northwestern Washington streams to salmon passage and enumeration facility
- Sediment removal and fish passage alternatives for San Clemente Dam near Carmel, CA
- Structural, sediment transport, groundwater withdrawal, and fisheries facilities analysis and design for the Glines Canyon and Elwha dams near Port Angeles, WA
- Water quality protection, sediment transport, and structural analysis for Matilija Dam near Ventura, CA
- Turbine passage survival study for all of the dams on the Columbia and Snake Rivers

- Structural design for passage facilities for downstream migrants at Bonneville Dam on the Columbia River
- Analysis of removal of the Goldsborough Dam on Goldsborough Creek near Shelton, Washington
- Safety review and sediment removal analysis of Milltown Dam near Missoula, MT
- Flood protection and structural analysis of Jackson Dam in Hardwick, VT
- Review of Corps of Engineers approaches to removal of four dams (Ice Harbor, Little Goose, Lower Monumental, and Lower Granite) on the lower Snake River in Washington State
- Structural and removal analysis on Edwards Dam in Augusta, ME
- Review of removal for Soda Springs Project in southern OR
- River stabilization for structures in the Nooksack River in western WA
- Review of plans for upgrade of PG&E facilities on Battle Creek near Red Bluff, CA

Structural Analysis, Design and Concept Development
Dam Removal/Repair Projects

Project	***Location***	***Activity***	***Permitting Agencies Involved***
Holter Dam	Missouri River, MT	Flashboard replacement analysis	Fisheries
Milltown Dam	Missoula, MT	Review of Part 12 structural report	Ecology, FERC, EPA
Peterson Dam	Milton, VT	Power production and turbine modification analysis	State Environmental
Jackson Dam	Hardwick, VT	Removal, flood protection, and structural analysis	Drawings for permits, meetings with dept of Ecology
Little Hyatt Dam	Southern Oregon	Investigation of removal methods	Bureau of Land Management
Lower 4 Snake River Dams	Washington State	Review of Corps of Engineers approaches to removal of four dams (Ice Harbor, Little Goose, Lower Monumental, and Lower Granite)	Army Corps of Engineers (Corps)
Condit Dam	Bignen, WA	Sediment transport analysis after dam removal	WDOE
San Clemente Dam	Carmel, CA	Dam and sediment removal and fish passage alternatives	CA Coastal Conservancy (CCC), CA Dams Safety, CA Dept of Water, NMFS

Dam Removal Projects
Sediment Management and Removal
Design, Concept Development and Analysis

Project	***Location***	***Activity***	***Permitting Agencies Involved***
Matilija Dam	Ventura, CA	Water quality protection, sediment transport, and structural analysis	Corps, US BoR, CA Fish and Game, NMFS, USFWS
Klamath River Dams	Northern California	Analyze cost for dam and sediment removal	
Milltown Dam	Missoula, MT	Sediment removal analysis	Ecology, FERC, EPA
Glines Canyon Dam	Port Angeles, WA	Structural, sediment transport, groundwater withdrawal, and fisheries facility analysis	Corps, US BoR, WA Fish and Game, NMFS, USFWS
Elwha Dam	Port Angeles, WA	Structural, sediment transport, groundwater withdrawal, and fisheries facility analysis	Corps, US BoR, WA Fish and Game, NMFS, USFWS
Goldsborough Dam	Shelton, WA	Developed approach for removal and fish passage facilities	Corps, WA Fish and Game, NMFS, USFWS
Edwards Dam	Augusta, ME	Structural and removal analysis	Corps, Coast Gard, NMFS, USFWS
Soda Springs Project	southern OR	Review of removal approach	
Snake and Columbia River Dams		Turbine passage survival study for all of the dams	Corps
Bonneville Dam		Structural design for fish passage facilities for downstream migrants	Corps
John Day and Ice Harbor Dams		Feasibility level design of deeply submerged passageways for for Dissolved Gas Abatement Study Phase II	

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Selected Project Experience

Dissolved Gas Abatement Study Phase II- U.S. Army Corps of Engineers, Walla Walla District Project Engineer responsible for preliminary design and analysis of deeply submerged passageway alternative for fish passage at John Day and Ice Harbor dams. Project involved creating large diameter low level outlets for fish passage to reduce dissolved gas levels. Design involved structural, hydraulic, cost, schedule, and construction analysis to create openings in existing structures.

Elwha River Restoration Project – Lower Elwha Klallam Tribe – Principal-In-Charge and Project Manager for relicensing Report to Congress, Environmental Impact Statement, and River Restoration Implementation of Elwha River Restoration Project for Lower Elwha Klallam Tribe. This multi-faceted project on the Elwha River in Port Angeles, Washington began in 1989 as investigation of impacts associated with the re-licensing the Glines Canyon Dam. The project developed into investigation of means of removing the two dams on the river to restore native fishing rights, provide better flood protection, develop new sanitary sewage systems for the tribe, provide new water supplies for tribal domestic and fish hatchery uses, and provide domestic and industrial water diversion and supply facilities for the City of Port Angeles. Technical aspects of the project include reviews of dam safety for both dams, development of basin hydrology, design of hydraulic structures, flood analysis and levee design, sediment transport analysis, beach protection design, and dam project operations analysis.

Design of Juvenile Bypass Facilities at The Dalles Lock & Dam - U.S. Army Corps of Engineers, Portland District Project Structural Engineer assisting with the development of studies, plans, specifications and cost estimates relating to flume design to improve passage of juvenile fish. The system under design will intercept downstream migrant juvenile fish from the turbine intakes and divert them to a collection channel. The migrant fish and water will pass through a dewatering facility and then be transported by flume across the spillway. They will continue downstream to the juvenile evaluation facilities and then into the Columbia River. The project includes architecture, and hydraulic engineering, as well as civil, structural, mechanical and electrical engineering.

IDTC, Hydraulic Engineering Design Services, Delivery Order No. 4 - Turbine Passage Study - U.S. Army Corps of Engineers, Portland District Project Manager responsible for conducting a baseline turbine study which involved working with agency engineers and biologists in collecting as-built plans and operating information regarding flow range, head efficiency, intake, wheel case, draft tube and water passage characteristics of the turbine unit to the passage survival of juvenile fish. The work was conducted with professor emeritus, Milo

Bell. The following dams have been evaluated: Bonneville Powerhouse I and II, The Dalles Dam, John Day Dam, McNary Dam, Ice Harbor, Priest Rapids, and Big Cliff.

Flooding and Beach Erosion Mitigation Alternatives Analysis - Lower Elwha Klallam Reservation Lower Elwha Klallam Tribe Principal-In-Charge and Project Manager for investigation of flooding impacts and feasibility study of flood and beach erosion mitigation options for Tribe. Project involved analysis of dam operations, river hydrology, river morphology analysis, sediment transport analysis, groundwater investigations, and domestic water supply analysis.

Condit Dam Removal Investigation - Pacificorp - Conducted sediment removal analysis. PacifiCorp is currently in the process of examining re-licensing versus removal options for this 80 year 100 foot high concrete dam on the White Salmon River in Washington State. Mr. Gathard was responsible for analysis of sediment removal techniques and river impacts of dam removal. He has also developed mitigation alternatives for downstream impacts to water users for the ***US Bureau of Indian Affairs*** and related Tribes. Mr. Gathard has also been involved in structural evaluation of the dam removal techniques.

Peterson Dam Investigation – Trout Unlimited G&G Associates investigated power production capacity, and river restoration for the Peterson Dam, approximately 350 foot-long, 55-foot-high, concrete dam, located near Burlington, VT. Peterson Dam is one of four dams included in the Lamoille Project, Federal Energy Regulatory Commission (FERC) License Number 2205 owned by Central Vermont Public Service Corporation (CVPS). Peterson dam is the first dam upstream of the mouth of the Lamoille River at Lake Champlain. G&G provided engineering and economic analysis of removal options and environmental and economic impacts.

Holter Dam Flashboard Replacement Feasibility Study – Trout Unlimited G&G Associates investigated several approaches for flashboard removal and replacement for this 82 year old FERC regulated straight concrete gravity structure located near the head waters of the Missouri river about 43 miles north of Helena Montana, Holter Dam captures water from a drainage area for the dam is 17,150 square miles. Engineering tasks involved development of natural river flows, power production capacity analysis, spillway hydraulic analysis, structural analysis and design of floating cofferdam structures, cost analysis, and dam structure analysis. G&G provided several alternative approaches to reservoir drawdown proposed by the dam owners. Reservoir drawdown would result in fish population reductions, economic impact to surrounding communities, and recreation losses.

South Fork Tolt River Bridge - Seattle City Light Project Manager responsible for the design of a single span 225 foot steel inverted bowstring truss bridge. The bridge was designed to carry wind, snow, and earthquake loads, in addition to loads from a 66-inch diameter penstock for downstream power turbines. Bridge supports utilize grouted post-tensioned high strength bars to resist seismic loading.

Bonneville Dam 1st and 2nd Powerhouses; Conceptual Layouts for Construction of Juvenile Fish Monitoring Facilities - National Marine Fisheries Service Provided conceptual drawings with opinion of costs for collection and monitoring of downstream migrating salmonids from the powerhouse bypasses. Also made recommendation and developed preliminary design for the preferred alternatives at each dam.

Bonneville Dam 1st and 2nd Powerhouses Juvenile Fish Monitoring Facilities - National Marine Fisheries Service Project engineer responsible for assisting in the study of juvenile fish monitoring facilities. The study was conducted to assess concepts and feasibility of constructing juvenile fish monitoring facilities at both 1st and 2nd Powerhouses. Several alternatives were developed for each. A preferred alternative was selected and developed for consideration. The study estimated construction cost to be approximately $10 million, not including visitor facilities.

Deschutes River Juvenile Rearing Facilities Study - Washington State Department of Fish & Wildlife Project Manager responsible for conducting analysis of several streams along the Deschutes River for potential location of rearing facilities construction sites. Project involved hydrological analysis of streams and river, natural spawning and rearing habitat evaluation, site location studies, water quality studies, and constructibility studies. Issues involved siting the facility for best water use, access, reliability and utility accessibility.

Toutle River Hatchery Feasibility Study - Washington State Department of Fisheries Project manager for study involving a complete hatchery siting and redevelopment of a partially abandoned Chinook and Coho hatchery. The hatchery feasibility study included extensive river hydrology, water intake, and transportation design.

NOAA Montlake Facility Environmental Site Assessment **-** Conducted study to determine the source and extent of a petroleum product discharged onto Lake Washington's Portage Bay. Based on the investigation, a report was prepared describing extent of contamination caused by a leaking bunker oil fuel supply line. Proposed methods of clean-up, and periodic sampling and monitoring were also presented.

Salmonid Enumeration Facility - Lower Elwha Klallam Tribe Project Manager responsible for conducting facility design and hydraulic analysis of several streams along western Straight of Juan de Fuca for potential location of enumeration facilities construction sites. Project involved hydrological analysis of streams and rivers, natural spawning and rearing habitat evaluation, site location studies, fish passage structures design, water quality studies, utilities access and constructibility studies. Issues involved siting the facility for best site access, least cost structure design, water use, reliability and utility accessibility.

Owl Creek Rearing Station Study - HOH Native American Tribe Project Engineer responsible for the design of four 100-foot long raceways, river intake structure, 1200 lf of 24-inch diameter pipeline, fishway, pollution abatement pond and associated buildings.

Wishkah Hatchery Expansion - Washington State Department of Fisheries **-** Project Engineer responsible for conducting a study and submitting recommendations for the expansion of the existing hatchery. As a result of the study, the existing hatchery was modified to facilitate Chinook salmon and steelhead trout in an incubation capacity. This project provided operation and maintenance instructions to the hatchery staff.

John's Creek Hatchery - Washington State Department of Fish & Wildlife Project Manager responsible for site work and piping required to modify the Hatchery water intake system piping, equipment building and electrical grid necessary to disinfect the water supply. The facility required installation of new piping, valves, controls and safe operating electrical systems. At John's Creek Hatchery "salmon poisoning disease" (Nanophyetus salmincola) infestation called for the installation of an electric grid for control of a water borne parasite.

Edwards Dam Investigation - Kennebec Coalition Project Manager for alternatives analysis of removal techniques or fisheries by-pass this 20 foot high timber crib and concrete dam. This 850-foot-long, 24-foot-high, timber-and-crib dam, located in Augusta, Maine, rises to elevation 19.5. As part of the FERC Draft Environmental Impact Statement for the Kennebec River Basin, a report discussing an approach to removal of Edwards was conducted by Stone & Webster Environmental Consulting and Services.

Goldsborough Dam Removal Investigation - Simpson Timber Company Project Manager for investigation of removal and by-pass alternatives for a small hydroelectric dam constructed on Goldsborough Creek in Mason County, Washington in 1921. Mr. Gathard was project manager and engineer for alternatives analysis studies including fish by-pass (ladders) alternatives and removal alternatives. Tasks included techniques for diversion of the stream, fish ladder design, studies of dam removal, and analysis of sediment impacts from removal. The project is currently in the permitting phase of development.

Bridge Seismic Retrofit Program, Phase II Needs Assessment Study - City of Seattle Engineering Department

Project Manager for this engineering assignment which assesses the seismic vulnerability of 17 significant bridges in the City of Seattle. The project is divided into two parts, ten bridges constructed prior to 1936 and seven bridges constructed after. The bridges vary in structural complexity from simple spans to large concrete arch structures of architectural significance.

On-call Seismic Retrofit Bridge Projects - Washington State Department of Transportation

Project Manager responsible for conducting bridge seismic retrofits of bridges located on I-90 Seattle, I-5 Central Seattle, and SR2 in Everett following recent seismic events. This design project was accomplished in three construction projects.

Emerson Street Viaduct Seismic Retrofit - Seattle Engineering Department Design Manager responsible for conducting full seismic retrofit of a 12-span "lifeline" viaduct. Project included seismic and cost analysis of alternate methods for upgrading the bridge to withstand a seismic event. Comparison of ATC-6 "stiff" and new developed "flexible" approaches to retrofit were presented, allowing for a much less costly retrofit.

San Juan Terminal Access Bridge - Crowley Marine Services Project Engineer responsible for the design of bridge deck repairs. A structural inspection of the bridge girders was conducted for rating purposes. Design solutions involved staged construction to allow continual use during construction. Removal and replacement of the concrete deck were necessary to provide adequate structure.

Dock Construction - Covich & Williams This 258 feet long dock was constructed from hollow core prestressed precast concrete panels. The panels are structurally composite with a topping slab. A concrete apron at the beginning of the pier was integrated with an existing wood apron. Construction included fuel lines, fire protection and shore power.

Dock Analysis - Crowley Marine Services Project involved inspection of existing timber pile bulkhead and analysis for large crane loads. Initial phase involved a condition survey of dock. Analysis provided determined effects of 500,000 pound crane loads on dock and bulkhead.

Indefinite Quantity Contracts - U.S. Navy, EFA NW Project Civil Engineering Manager responsible for providing civil engineering services for eight delivery orders at Subbase Bangor and supported commands under this IQ contract. These projects included a sanitary sewer study, civil design for a retention facility, KB Dock dredging at Bangor, and design of an oily bilge water separator facility at Keyport.

KB Dock Dredging - U.S. Navy, EFA NW Mr. Gathard was responsible for developing a Puget Sound Dredged Disposal Analysis (PSDDA) sampling plan and implement the plan with the required sampling and testing. A hydro-survey of the areas will also be provided. The project also includes AutoCAD generated engineering drawings, specifications (SPECSINTACT) and cost estimating.

Submission Contents

Butte County's Recommended Conditions for New License
20050411bc.pdf.. 1-97

Attachment 2

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September 19, 2006

Honorable Magalie Roman Salas
Secretary,
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: **Pacific Gas and Electric Company, Poe Hydroelectric Project (P-2107-016-CA): Amended Comments of Butte County and American Whitewater on Draft Environmental Assessment**

Dear Secretary Salas:

Enclosed please find an amendment to the comments which Butte County and American Whitewater timely filed on September 18th. The amendment corrects typographic and citation changes in the main text of the original filing.

Any person who wishes to review the amendment in redline form may contact NHI paralegal, Rachel Golden, rgolden@n-h-i.org.

Thank you for your consideration.

Respectfully submitted,

Richard Roos-Collins

Richard Roos-Collins
Special Deputy District Attorney,
BUTTE COUNTY

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On behalf of BUTTE COUNTY

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

DEPARTMENT OF AGRICULTURE
DEPARTMENT OF COMMERCE
DEPARTMENT OF INTERIOR

Pacific Gas and Electric Company,	)
Poe Hydroelectric Project	) P-2107-016-CA

AMENDED COMMENTS OF BUTTE COUNTY AND AMERICAN WHITEWATER ON DRAFT ENVIRONMENTAL ASSESSMENT

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COMMENTS

Butte County and American Whitewater file these amended comments on the "Notice of Availability of Draft Environmental Assessment" (DEA) (Aug. 2, 2006).

Our comments consist of six parts: Introduction, Aquatic Flows, Fish Passage, Recreation, County Economic Welfare, Consistency with Comprehensive Plans, and Further Procedures. These requested procedures, which are intended to contribute to the timely resolution of disputed issues of law and fact, are addressed to FERC and the U.S. Departments of Agriculture, Commerce, and Interior.

I. INTRODUCTION

In the DEA, Office of Energy Projects (OEP) Staff recommend measures for incorporation into any new license for the Project. DEA, pp. 10-14, 207 *et seq*. (Staff Recommendation). We agree that these recommended measures will enhance the baseline condition of aquatic, terrestrial, and recreational resources, as described in the associated Rationale. *Id,* pp. 211 *et seq*. We generally support such measures to which we do not take exception below. However, the DEA, including the Staff Recommendation and Rationale, is deficient in fundamental respects.

A. Failure to Restore Non-Developmental Uses of Coldwater Fishery and Recreation to Good Condition

If the recommended measures are adopted, the Project will convert most of the value of these public waters into power for the term of the new license, or until 2037 or later. Under the recommended minimum flow schedule (MFS), Poe Dam will divert most natural in-flow. *Compare* DEA, p. 207 (resulting in average MFS below 300 cfs) *with* New License Application (NLA), App. B-1, Chart 39 (showing average natural in-flow exceeding 1,000 cfs). This diversion will result in warmwater conditions 17-61% of summer days, thus impairing the suitability of the bypass reach as a coldwater fishery. Robert W. Hughes, "PG&E Poe Project Temperature Modeling" (Sept. 5, 2006), Table 1 (Exhibit 1). It will reduce by 90% the days when natural flows (ranging from 800 to 2,000 cfs) in the bypass reach would be suitable for boating by private or commercial boaters. *See* "Butte County's Recommended Conditions for a New License" (Butte NREA Comments), pp. 19-20. It thus would forego use that otherwise would reach 100,000 boater-days/year and generate $10.8 million/year in tourism revenues. *Id.,* pp. A.3-6, 3-8 – 3-9.

The North Fork, including this reach, was once a world-renowned destination for angling and other recreation, which contributed significantly to the local economy. *See* Declaration of James Lenhoff (Sept. 18, 2006), ¶¶ 14-19 (Exhibit 2). The North Fork fishery was extremely robust. *See* W. Rowley, California Department of Fish and Game, 1*954 Feather River Streamside Creel Census* (Inland Fisheries Administrative Report 55-10 (1955)); U.S. Forest Service, Region 5, *Report to the Federal Power Commission on The Application of the Pacific Gas and Electric Company for a Preliminary Permit for the North Fork Feather River Project No. 1391 - California, within the Lassen and Plumas National Forests* (June 1938); E. Gerstung, "Fish Populations and Yield from Selected California Trout Streams," *Cal-Nevada Wildlife* (1973), pp. 9-19.

That historical use represents the restoration potential of the bypass reach under an alternative where the Project releases a more natural flow pattern. Our NREA comments proposed measures that would have this effect. For example, we proposed the release of boating flows two days per summer month. While this is much less than the potential (which ranges from 6 to 19 days between June and August of an average year), the County proffered it as a generous balance between this use and power generation. Butte NREA Comments, p. 19; p. A6-7 (estimating a 7% loss in power generation as a result of the County's proposed aquatic and boating flows). The DEA rejects this proposal and indeed any boating flow schedule whatsoever. In doing so, the Staff limits boating use to unpredictable spills, which tend to occur only in the colder spring months, and effectively recommends against the development of substantial boating use of this reach. In this and other respects, the DEA's balance favors power generation at the unnecessary expense of non-developmental uses. We respectfully disagree with the conclusion (DEA, p. 205 lines 3-8) that the recommended measures are "best adapted" to a comprehensive plan of development of all affected uses of these lands and waters for all beneficial uses recognized under Federal Power Act (FPA) section 10(a)(1).

B. Failure to Consider a Reasonable Range of Alternatives

The DEA addresses the Proposed Action, PG&E's NLA (DEA, pp. 5-10), the Staff Recommendation which modifies the NLA (*id.*, pp. 10-14), and the No-Action Alternative (p. 14) which is renewal of the original license. Since no party has advocated denial of new license, these action alternatives only differ in their mitigation measures, including MFS.

The DEA discusses measures proposed by the County, agencies, and others, in the context of its analysis of the NLA and the Staff Recommendation. It does not treat as separate alternatives the MFS proposed by the agencies and County (*see* Butte NREA Comments, pp. 5-6) (hereafter, Agencies/County MFS Proposal (March 2005)), or the different flow proposals made by American Whitewater and angling groups in their NREA comments. Indeed, it discusses proposals outside of the Staff Recommendation for the primary purpose of rejecting them. *See, e.g.*, DEA, pp. 211-229. In Section VI, the DEA does not provide a developmental analysis of the rejected proposals. *See id.,* p. 185 (which presents such analysis only for the No-Action Alternative, NLA, and the Staff Recommendation in two forms). Thus, the DEA does not show the total cost of the County's proposals (as proffered in our NREA comments), instead piecemealing the analysis of cost and benefit by measure. *See id.,* pp. 186-204. At the end of the day, the DEA includes only one action alternative to the NLA, the Staff Recommendation.

This is an improper form which frustrates the purpose of the environmental document: namely, "sharply defining the issues and providing a clear basis for choice...." The National Environmental Policy Act, 42 U.S.C. §§ 4321 *et seq.*, requires that the environmental document must: include, *as action alternatives*, "all reasonable alternatives..." not eliminated from detailed study. 40 C.F.R. § 1502.14(a). This requirement is particularly important when the proposed action "involves unresolved conflicts concerning alternative uses of available resources...." 42 U.S.C. § 4332(E). The document must "rigorously explore" these action alternatives in a manner that permits evaluation of their "comparative merits." 40 C.F.R. § 1502.14(a) – (b).

Flow schedule is the primary variable in this proceeding, like most relicensing proceedings. FERC must separately analyze alternative flow schedules as action alternatives. At a minimum, these include: the MFS proposed in the NLA, Staff Recommendation, Agency/County MFS Proposal (March 2005), the revised proposal described in Argument Section II.B (Agency/County MFS Proposal (Oct. 2005)), and the several proposals advanced separately by boating and angling groups.

In its "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations," 46 Fed. Reg. 18026 (March 23, 1981), the Council on Environmental Quality explained the form and substance of this obligation.

> "Q. How many alternatives have to be discussed when there is an infinite number of possible alternatives?
>
> A. For some proposals there may exist a very large or even an infinite number of possible reasonable alternatives. For example, a proposal to designate wilderness areas within a National Forest could be said to involve an infinite number of alternatives from 0 to 100 percent of the forest. When there are potentially a very large number of alternatives, only a reasonable number of examples, covering the full spectrum of alternatives, must be analyzed and compared in the EIS. An appropriate series of alternatives might include dedicating 0, 10, 30, 50, 70, 90, or 100 percent of the Forest to wilderness. What constitutes a reasonable range of alternatives depends on the nature of the proposal and the facts in each case."

C. Failure to Mitigate the Significant Present Impacts of this Project

The DEA concludes that the recommended measures, if adopted in a new license, will not result in any significant impacts on the environmental quality of the North Fork Feather. DEA, p. 239 lines 2-7. This overall conclusion appears to be based on the assumptions that the Project's impacts are insignificant if: (A) the future condition of a given resource is better than the environmental baseline or (B) the recommended measures to minimize impact on a resource are more cost-effective than alternatives. These assumptions are fundamentally wrong under NEPA.

1. <u>Change in Baseline</u>

DEA Section V makes a series of findings that the proposed action will improve the existing conditions of various resources. *See, e.g.*, DEA, p. 24 (defining existing conditions as baseline), p. 44 (showing that recommended MFS will reduce the water temperature which occurs under the original license). We agree that the environmental baseline is the existing conditions of the lands, waters, and other resources of the North Fork Feather. *American Rivers v. FERC*, 201 F.3d 1186, 1199 (9th Cir. 2000). We agree that the impact of a measure *relative to the baseline* is the incremental change to existing conditions expected to result from that measure.

However, FERC must also compare alternatives to the NLA. Indeed, that "comparative form" is the "heart" of the environmental document, "…sharply defining the issues and providing a clear basis for choice among options…." 40 C.F.R. § 1502.14. The purpose of the comparison is to "…avoid or minimize adverse effects…." *Id.*, § 1500.2(f). Adverse impacts include cumulative impacts. *Id.*, § 1508.25(c)(25). Cumulative impacts are the totality of impacts "…which results from the incremental impact of the action when added to other past, present, and reasonably future actions…." *Id.*, § 1508.7.

Here, the original license is a present action, since it is still in effect. Thus, FERC must consider how to mitigate the continuing impacts of the Project as permitted under the original license. FERC must ask: how do the action alternatives compare in mitigating each continuing impact, such as the diversion of most natural inflow from the bypass reach? That necessarily follows from the definition of cumulative impact and the nature of a new license. Under FPA section 10(a)(1), a new license is a "new decision" whether to continue or change the original license. *Confederated Tribes and Bands of the Yakima Indian Nation v. FERC*, 746 F.2d 466, 476 (9th Cir. 1984). That new decision may improve the environmental baseline, insofar as the change is within the reasonable control of the project: among other things, FPA section 10(a)(1) authorizes "protection, mitigation, and *enhancement* of fish and wildlife…" (emphasis added).

Using plain logic, if an impact is partly mitigated, then it is partly unmitigated, and that unmitigated impact may be significant under NEPA. For example, the recommended MFS will cause exceedances of the coldwater standard on 17-61% of summer days. While that future condition will be better than baseline (exceedances 40-88% of those days), the fact is that the recommended MFS will only partly mitigate the continuing impact of the Project on water temperature in the bypass reach. That is clear if the recommended MFS is compared with the Agency/County MFS Proposal (Oct. 2005), which will cause such exceedances a mere 2-18% of the time. *See* Exhibit 1, p. 5.

2. Residual Impact After Cost-Effective Mitigation

The DEA appears to assume that cost-effectiveness of mitigation affects whether a proposed action has a significant impact. For example, the DEA (p. 44) finds that the next increment of flow release, after its recommended MFS, will provide a "minimal improvement" in the water temperature. It appears to use this law of diminishing returns as a basis for the conclusion (p. 51) that the MFS will not have a significant impact on water resources, including water quality. If so, this assumption is improper for the purpose of the NEPA conclusion.

While incremental cost-effectiveness of mitigation is plainly relevant to the balancing decision under FPA section 10(a)(1), an impact may be significant under NEPA if it is partly unmitigated, regardless of whether the next increment of mitigation is more costly than the prior increment. "A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial." 40 C.F.R. § 1508.27(b)(1).

3. Standards of Significance of Impact

In finding that the recommended alternative overall will not cause any significant impact on environmental quality, the DEA does not state any definition or standards of significance. *See* DEA, p. 239. Similarly, the DEA does not state any such definition or standards in reaching such conclusions for individual resources. *See id.,* p. 51 (concluding that the Staff Recommendation will cause "no[]" unavoidable adverse impacts on water resources"), p. 87 (finding that it will cause "some" adverse impacts on aquatic resources), or p. 162 (omitting any conclusion about unmitigated impacts on recreation). This failure to state standards of significance is wrong in two ways.

FERC does not acknowledge or apply the standards of significance stated in the NEPA rules. *See* 40 C.F.R. § 1508.27. We submit that the Project's future impacts, if the Staff Recommendation is adopted, will meet many of these standards. The impacts will be variously "beneficial" (relative to baseline) and "adverse" (by failing to mitigate the continuing impacts of the Project). *Id.*, § 1508.27(b)(1). The Staff Recommendation will be "highly controversial" (*id.*, § 1508.27(b)(4)), as already shown by the long-running disputes between PG&E, agencies, and stakeholders about the appropriate flow schedule and other mitigation measures – and as will be shown again by the DEA comments. Its impacts on certain resources are "highly uncertain" (*id.*, § 1508.27(b)(5)), such as water temperature (*see* DEA, pp. 46, 50-51). The Staff Recommendation may establish a "precedent" (*id.*, § 1508.27(b)(6)) for the treatment of fish passage, temperature, and other common issues in the future relicensing decisions for Lake Oroville and the Upper North Forth Feather Projects. It is "related" to those other actions (*id.*, § 1508.27(b)(7)) and may cause significant cumulative impacts. In causing warmwater conditions, it "threatens a violation" (*id.*, § 1508.27(b)(10)) of the coldwater standard, which is a federal and state water quality standard for this reach.

The DEA does not acknowledge that the Staff Recommendation involves the original licensing of Big Bend Dam. Although this dam has existed since 1910, PG&E has never applied for or obtained a license for it. The NLA includes the dam as a new Project work. Unlike other project works included in the original license, this dam does not have a pre-NLA record of design, operation, and environmental impacts. For that reason, and also (as shown in Argument Section III) the failure to include this dam in the original license, FERC may not properly assume that continued operation of the dam is included in the environmental baseline. Indeed, for the purpose of NEPA compliance, including Big Bend in the new license is similar to the original construction of a new dam subject to an Environmental Impact Statement. 18 C.F.R. § 380.6(a)(4).

Finally, the DEA's conclusion of "no significant impact" (p. 239) merely tracks the terms of the NEPA obligation to determine whether such an impact will occur. This is impermissible under FPA section 313(b), 16 U.S.C. § 825*l*(b), and Administrative Procedures Act (APA), 5 U.S.C. §§ 556-7 and 706(2), which require a transparent basis for any such legal conclusion. *City of Gillette, Wyoming v. FERC,* 737 F.2d 883, 887 (10th Cir. 1984).

D. Failure to Mitigate Significant Cumulative Impacts of the Several Hydropower Projects on North Fork Feather

PG&E's system on this river – consisting of this Project, Rock Creek-Cresta (P-1962), and Upper North Fork Feather (P-2105) -- plainly has significant cumulative impacts. These impacts include: substantial increases in summertime water temperatures and the sequential blockages of movement of trout and other riverine fisheries. *See* DEA, pp. 50-51, 55-56. The DEA acknowledges that PG&E continues to study possible mitigation of the temperature impact in the relicensing proceeding for the Upper North Fork Feather Project. *See id.*, pp. 50-51. Similarly, Lake Oroville and PG&E's system have a cumulative impact on the movement of anadromous fish. The DEA acknowledges that NMFS' preliminary fish passage measure was to be implemented at the several projects. Indeed, FERC plainly has authority to include in this license measures which: (A) address the Project's proportionate contribution to such impacts or (B) are conditioned upon the adoption of related measures in other licenses.

However, the DEA does not recommend that the new license for this Project include *any* specific measures to mitigate any such cumulative impacts. At most it recommends that the license for the Rock Creek-Cresta Project may be adjusted at an indeterminate date in the future – for example, to meet boating demand. DEA, p. 226. The DEA does not specifically respond to the proposal (made by the County and National Park Service) for a system of boating and pedestrian trails linking all of these several projects. *See, e.g.*, Butte NREA Comments, pp. 21-23. It does not include any measure for mitigation of the cumulative impacts on passage of anadromous fish. *See* DEA, pp. 82-84. This general omission violates FERC's obligation under NEPA and FPA section 10(a)(1), respectively, to consider and adopt measures to "…avoid or minimize any possible adverse effects" of the licensing decision (40

C.F.R. § 1500.2(f)), including the cumulative impacts of this Project and others in this watershed.

E. Failure to Consider Compensation and other Off-Site or Out-of-Kind Forms of Mitigation

The DEA applies the law of diminishing returns to recommend mitigation measures while rejecting alternative forms of those measures (such as an increase in the value of the flow release in the MFS). For example, it rejects the Agency/County MFS Proposal (March 2005), in part because the incremental progress of .4 - .9 degree C towards a coldwater condition is purportedly exceeded by the cost of foregone generation. *See* DEA, pp. 43 - 44. The DEA rejects all off-site measures (e.g., those located outside of the Project boundaries) or out-of-kind measures (e.g., those which address an impact through mitigation of a different kind). Rejected proposals include: a watershed history museum (DEA, pp. 224-226) and a North Fork Feather Enhancement Fund (*id.*) to be used to establish boating and other angling opportunities in the Feather watershed.

As discussed above, if a scalable mitigation measure exceeds the point of diminishing return, Staff appears to assume that the adverse impact of the Project is adequately mitigated by whatever on-site measure is found to be cost-effective. This assumption is fundamentally wrong under NEPA. Using plain logic, if an impact is minimized but not avoided, then it is partly unmitigated. NEPA requires FERC to then ask the question: is there another form of mitigation that may address that unmitigated impacts? Indeed, NEPA rules require FERC to consider compensation in this circumstance. They define mitigation to consist of five forms, including compensation:

> "(a) Avoiding the impact altogether by not taking a certain action or parts of an action.
>
> (b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
>
> (c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
>
> (d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
>
> (e) Compensating for the impact by replacing or providing substitute resources or environments."

40 C.F.R. § 1508.20.

We understand that FPA Part I, as consistently interpreted in licensing decisions, limits the permissible forms of mitigation that may be included in a license. Plainly, any measure must be performed by and enforceable against the licensee, since FERC does not have jurisdiction over a non-licensee. Further, the project boundary must generally include the locations of measures that require operation and maintenance. There must be a nexus between the Project and the measure. A cash fund (as an alternative to specified measures) must have specific purpose and governance, in addition to such nexus, to assure accountability. Consistent with such limitations, FERC has approved off-site and out-of-kind mitigation measures, including cash funds, when framed in an enforceable form and justified by clear nexus to Project impacts. *See, e.g.*, *PacifiCorp*, 105 FERC ¶ 62,207 at ¶ 64,478 (2003); *New York Power Authority*, 105 FERC ¶ 61,102 at ¶ 61,602 (2003); *PPL Holtwood, LLC*, 112 FERC ¶ 62,012 at ¶ 64,032 (2005); *New England Power Company*, 79 FERC ¶ 61,006 at ¶ 61,041 (1997).

Accordingly, the County proffered the North Fork Feather Enhancement Fund and other off-site measures in an enforceable and otherwise permissible form. While we discuss below Staff's specific objections to these proposed measures, the DEA improperly recommends that FERC cause unmitigated impacts on environmental quality, by failing to take a hard look at compensation and forms of mitigation (other than mere minimization) of such impacts.

F. Failure to Disclose Method and Evidence Relied upon for Factual Findings

The DEA is a careful description of the disputed factual issues. It identifies evidence, mostly the NLA, as the basis for its many findings. Nonetheless, it is not based on substantial evidence as required by FPA section 313(b), 16 U.S.C. § 825*l*(b) and the APA sections 556-7 and 706(2).

The DEA appears to assume that substantial evidence is the existence of record evidence consistent with a finding. Under that assumption, if evidence in a proceeding is consistent with findings X or –X, FERC could pick either result and, without more, recite that evidence supports that result. If so, FERC would have largely unreviewable discretion in its findings in a typical relicensing proceeding (like this one) where evidence is potentially consistent with competing results.

As required by FPA section 313(b) and APA sections 556(d)-557 and 706(2), substantial evidence is record evidence which is expressly found to be: (A) reliable and probative for the purpose of supporting a finding and (B) superior to competing evidence with respect to a given finding. *See* Fed. Rules Evid. 702; *Daubert v. Merrell Dow Pharmaceuticals*, 113 S.Ct. 2786 (1993); *Motor Vehicle Manufacturers Association v. State Farm Insurance*, 463 U.S. 29 (1983); *Burlington Truck Lines v. U.S.*, 371 U.S. 156 (1962). Thus:

> "[i]f the administrative action is to be tested by the basis upon which it purports to rest, that basis must be set forth with such clarity as to be understandable. It will not do for a court to be compelled to guess at the theory underlying the agency's action; nor can a court be expected to chisel that which must be precise from what the agency has left vague and indecisive."

Securities & Exchange Commission v. Chenery Corporation 332 U.S.194 at 196-7 (1947); *see also FPC v. Texaco, Inc.*, 417 U.S. 380, 397 (1974); *Columbia Gas Transmission Corporation v. FERC*, 628 F.2d 578, 593 (D.C. Cir. 1979). Similarly:

> "We noted in [a prior case] that we do not pretend to have the competence or the jurisdiction to resolve technical controversies in the record, or … to second-guess an agency decision that falls within a 'zone of reasonableness.' Rather, our task is to 'ensure public accountability,' by requiring the agency to identify relevant factual evidence, to explain the logic and the policies underlying any legislative choice, to state candidly any assumptions on which it relies, and to present its reasons for rejecting significant contrary evidence and argument."

United Steelworkers Of America et al. v. Marshall, 647 F.2d 1189, 1207 (D.C. Cir. 1980) (internal citations omitted).

1. Citation to Whole Documents

The DEA repeatedly cites to the NLA and other documents as the basis for findings. *See, e.g.*, DEA, p. 24 ("Unless otherwise noted, the source of our information is the license application (PG&E 2003)"). This form does not establish substantial evidence in support of such findings. The DEA generally does not explain why the evidence is reliable or probative for that purpose. It repeatedly cites to the NLA exhibits without acknowledging that, as applicant, PG&E has the burden of proof on disputed factual issues. 5 U.S.C. § 556(d). While FERC may rely on PG&E's evidence, it must have and state an independent basis for such reliance. 40 CFR § 1502.14(a); *Scenic Hudson Preservation Conference v. FPC*, 354 F.2d 608, 620-1 (2nd Cir. 1965). Finally, the practice of citing to a whole document effectively obliges an objecting party to infer which part was relied on or to challenge the entirety. This is an unreasonable burden, given the complexity and length of the NLA exhibits.

2. Citation to Disputed Evidence without More

The DEA repeatedly cites to the NLA on disputed issues where the County and other parties submitted competing evidence. It generally does not explain why the evidence it relies on is superior. For example, it accepts PG&E's argument that the bypass reach has limited potential for boating use (DEA, p. 158); it does not acknowledge the declaration by Chuck Watson, a recreational planner with decades of experience in such boating, showing potential use of 100,000 boater-days/year (Butte NREA Comments, Attachment A); and it does not explain why PG&E's evidence is reliable or superior for the finding on this issue. DEA, pp. 159, 226. This practice violates FERC's obligation, as discussed above, to test competing evidence in a transparent manner, before deciding which evidence to rely upon. *Farmers Union Central Exchange v. FERC*, 734 F.2d 1486 (D.C. Cir. 1984). Further, Staff has not responded to our request for a technical conference (Butte NREA Comments, p. 23), which FERC may use to test the testimony of qualified experts who have used conflicting methods or reached conflicting findings. 18 C.F.R. §§ 385.501 *et seq.; see, e.g.*, *General Motors Corp. v. FERC*, 656 F.2d 791, 795 (D.C. Cir. 1981).

3. <u>Incomplete Information</u>

The DEA acknowledges that the record is incomplete or inconclusive on many factual issues. *See, e.g.*, DEA, p. 84 (no information about potential toxicity of reservoir sediments at Big Bend Dam), p. 104 (no information about what change in baseline habitat condition is tolerable to foothill yellow-legged frog (FYLF)), or p. 226 (no information about boating demand in response to boating flow schedule). That uncertainty is a basis for rejecting County's related proposals to remove Big Bend Dam and establish a boating flow schedule. *See, e.g.*, DEA, p. 226 ("…the extent of boater usage that would actually develop there [in response to boating flows] is unknown"). The DEA fails to explain why Staff, in the many years since the September 22, 1998 Notice of Intent, did not require PG&E to undertake additional studies or otherwise gather such information, pursuant to 18 C.F.R. Parts 4 and 16 and § 380.3(b)(2). It does not describe any effort by Staff to undertake an independent investigation to resolve such uncertainties.

This passivity constitutes an abuse of discretion under FPA section 10(a). "…Congress gave the [Commission] a specific planning responsibility …. The Commission must see to it that the record is complete. The Commission has an affirmative duty to inquire into and consider all relevant facts." *Scenic Hudson,* 354 F.2d at 620.

> "In this case, as in many others, the Commission has claimed to be the representative of the public interest. This role does not permit it to act as an umpire blandly calling balls and strikes for adversaries appearing before it; the right of the public must receive active and affirmative protection at the hands of the Commission."

Id.

Indeed, NEPA rules establish a presumption that the action agency, here FERC, will resolve or minimize such record uncertainties before publishing an environmental document, unless the cost is exorbitant.

> "When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or

> unavailable information, the agency shall always make clear that such information is lacking.
>
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.
>
> (b) If the information relevant to reasonably foreseeable significant adverse impacts cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement:
>
>> (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason."

40 C.F.R. § 1502.22.

G. Failure to Disclose Standards Used for Balancing Decision

Finally, the DEA applies the law of diminishing returns to dismiss the Agency/NGO MFS Proposal (March 2005) and other measures which, in scale and cost, exceed their counterparts recommended in the Staff Recommendation. We acknowledge that the balancing decision under FPA section 10(a)(1) permits and even requires a consideration of incremental costs and benefits of such measures. However, the DEA does not disclose the standards which Staff applies to determine how much enhancement of the baseline condition is enough, and what is too much, to assure that the new license is in the public interest.

FPA section 10(a)(1) requires that each license is "best adapted to a comprehensive plan for improving or developing a waterway…" for the beneficial uses specifically listed in the statute, including power, water supply, recreation, and the "protection, mitigation, and enhancement of fish and wildlife." Section 10(a)(1) requires such adaptation to "…*all* beneficial uses" (*Scenic Hudson,* 354 F.2d at 612) (emphasis added)), since those uses "while unregulated, might be contradictory rather than harmonious" (*FPC v. Union Electric Co.*, 381 U.S. 90, 98 (1965)).

"In licensing a project, it is the duty of the [Commission] *properly* to weigh each factor." *Scenic Hudson*, 354 F.2d at 614 (emphasis added). Some of these uses may be quantified in financial or other ways, while others may not. This license will necessarily value disparate uses, like "apples and oranges," for the purpose of balancing required by FPA section 10(a)(1). However, the DEA does not explain how Staff valued and compared such disparate uses as: (A) the impact to reliable power supply resulting from reduced operation of this 143-megawatt powerplant, in a regional system where generation capacity exceeds 56,427 MW (DEA, p. 4); (B) the incremental improvement in water temperature associated with the Agency/County MFS Proposal (March 2005); or (C) the potential to restore boating use to this river. This non-disclosure of the balancing standards is impermissible.

> "Where the Commission balances competing interests in arriving at its decision, it must explain on the record the policies which guide it. Only if the Commission observes these minimum standards can we be confident that missing facts, gross flaws in agency reasoning, and statutorily irrelevant or prohibited policy judgments will come to a reviewing court's attention. Moreover, by requiring that the Commission fully articulate the basis for its decision, we assure the Commission, itself, the first opportunity to correct any defects which may emerge from such disclosure."

Columbia Gas Transmission Corp. v. FERC, 628 F.2d 578, 593 (D.C. Cir. 1979).

Such transparency is a fundamental principle of good government under the APA and also is necessary for accountability under FPA section 10(a)(1).

> "The grant of authority to the Commission to alienate federal water resources does not, of course, turn simply on whether the project will be beneficial to the licensee. Nor is the test solely whether the region will be able to use the additional power. The test is whether the project will be in the public interest. And that determination can be made only after an exploration of all issues relevant to the 'public interest,' including future power demand and supply, alternate sources of power, the public interest in preserving reaches of wild rivers and wilderness areas, the preservation of anadromous fish for commercial and recreational purposes, and the protection of wildlife. [¶] The *need* to destroy the river as a waterway, the *desirability* of its demise, the *choices* available to satisfy future demands for energy – these are all relevant to a decision under [FPA section 10] but they were largely untouched by the Commission. [¶] On our remand there should be an exploration of these neglected phases of the cases."

Udall v. FPC, 387 U.S. 428, 450 (1967) (emphasis added).

II.
AQUATIC FLOWS

A. Water Temperature

The Project under the original license causes warmwater conditions in the bypass reach. As the DEA explains:

> "The operation of the Poe Project modifies the hydrology of the NFFR by impounding water above, and decreasing the volume of water in the river below the dam (i.e., in the bypassed reach). This results in increased bypassed reach water temperature in the summer months because of a lower water volume, decreased depth and velocity, and the resulting increase in radiational heating. Both the inflows to the project and Poe bypassed reach water temperatures have historically exceeded the 20 C maximum target …."

DEA, p. 40. Indeed, in the bypass reach above Poe Powerhouse, the water temperature exceeds 20 degree Centigrade 68% of summer days. *Id.*, p. 40. PG&E's system on the North Fork Feather continues to cause cumulative impacts in exceedance of these water quality standards. *See id.,* p. 50 ("The construction and operation of upstream hydroelectric projects and their reservoirs have generally increased summer water temperatures over historical conditions").

The Staff Recommendation includes two measures to mitigate Project impacts on water temperature: a new MFS (DEA, p. 11), which is roughly half-way between PG&E's proposal and the Agency/County MFS Proposal (March 2005); and a "Poe bypassed reach water monitoring plan" (*id.*, pp. 207-08). While acknowledging that the recommended MFS will still result in exceedances of the coldwater standard, the DEA anticipates that the future relicensing decision for the Upper North Fork Feather Project may enhance the benefit.

> "As such, the higher flows would help achieve the target of no greater than 20 C, at least in some months and meteorological conditions. Among the three alternative instream flow regimes assessed, the agencies' flow regime would lower water temperatures the most, followed by the staff alternative. Another consideration related to water temperatures is the potential that future measures implemented by upstream entities could result in reductions in water temperatures in the inflows to the Poe Project."

Id., p. 212.

The Staff rejects the Agency/County MFS Proposal (March 2005) on the basis of its finding that the incremental cost in foregone power generation outweighs the incremental benefit of colder water temperature.

> "After considering the effects of the three instream flow alternatives on aquatic flow alternatives on aquatic habitat, the potential for enhancement (reduction) of water temperatures, and project economics, we recommend the staff-identified minimum flow regime. The staff alternative would provide substantially greater aquatic habitat improvement than the PG&E flow regime, but would result in substantially less impact on project economics than the agencies' flow regime."

Id., p. 212.

The DEA rejects the Water Temperature Moderation (WTM) policy in the Agency/County Proposal for the same reason.

> "Our analysis indicates that the temperatures of inflows to the Poe reach are the primary determinant of water temperature in the reach and that although higher flow releases into the reach would have some effect on lowering water temperatures, the volume of flow required to reduce temperatures to below the 20 C maximum target would be high.... Because of the potential for adverse effects to some aquatic biota, high cost, and the limited ability to actually achieve the maximum temperature target, we are not recommending the water temperature moderation flows."

Id., p. 213.

We agree with the DEA's finding that the staff MFS will enhance the baseline condition for water temperature. The legal issue, however, is whether the extent of enhancement, or conversely, the extent of unmitigated impacts, complies with water quality standards. This issue turns on two objectives, which are enforceable water quality standards under the Clean Water Act section 303, 33 U.S.C. § 1313, for the purposes of FERC's balancing under FPA section 10(a)(2) and the State Water Resources Control Board's (SWRCB) water quality certification under CWA section 401(a)(1), 33 U.S.C. § 1341(a)(1). These standards are: the coldwater objective, which provides that a facility shall not cause water temperature to exceed 20 degrees Centigrade (Argument VI.D), and a prohibition against any facility's causing more than 5 degrees Fahrenheit increase in the receiving water temperature (*id.*).

The Staff Recommendation plainly does not comply with these standards. As a result of diverting most inflow, the coldwater standard will be exceeded on 17-61% of summer days in the bypass reach (Exhibit 1, Table 1), and water temperature will often increase more than 5 degrees Fahrenheit (DEA, p. 42). These adverse impacts are controllable – and will be substantially reduced – by increased Project releases recommended in the several Agency/County MFS Proposals. *See* Exhibit 1, Table 1.

The County agrees that, under FPA section 10(a)(1), FERC may base its selection of a measure on the law of diminishing returns. Here, however, the Staff Recommendation does not state any standards used to balance temperature benefit and power generation. Staff also appears to assume that CWA section 401(a) permits voluntary non-compliance with these standards. To our knowledge, FERC has not requested interpretation of these standards by the SWRCB, which administers these standards, or the Forest Service, whose Forest Plan incorporates them. It is black-letter law that a facility must comply with all applicable water quality standards and specifically, must avoid those exceedances within its reasonable control. *See PUD No. 1 of Jefferson County v. Washington Dept. of Ecology*, 511 U.S. 700, 711 (1994).

The DEA finds that inflow is a primary determinant of water temperature in the Poe reach. "For the Poe reach, the current failure to consistently meet water temperature goals during the summer months is primarily related to the temperature of water entering the upstream boundary of the Poe reach." DEA, p. 56. We agree that the inflow temperature (e.g., the operation of the upstream projects) is a variable, along with the flow release schedule at Poe Dam. However, the DEA does not recommend any additional measures which may be implemented through license reopener for the Rock Creek-Cresta Project, or through a condition in the anticipated new license for the Upper North Fork Feather Project, to reduce cumulative impacts on Poe reach. As discussed above, the DEA must do more than identify cumulative impacts: it must also recommend appropriate measures to mitigate such impacts. *See* 40 C.F.R. § 1502.14(f). Further, since FPA section 10(a)(1) requires that a license must be best adapted to a comprehensive plan of development for the NFFR, Staff's apparent decision to license each of PG&E's projects without coordination of their mitigation measures is arbitrary and capricious.

B. Impacts on Habitat Availability

The DEA finds that the recommended MFS will increase available habitat for seven of the eight fish species evaluated in the Project reach and will cost substantially less than the Agency/County MFS Proposal (March 2005). *See* DEA, pp. 211-12. In sum, the DEA finds that the last increment of cost in foregone power generation outweighs the last increment of aquatic habitat enhancement. Again, this conclusion does not explain the standards used to balance apples (aquatic habitat) and oranges (power generation). More importantly, the DEA apparently assumes that the physical availability of habitat is the controlling limiting factor for trout and other fish species in the bypass reach. It does not cite any evidence for this assumption. Plainly, as discussed elsewhere in these comments, warmwater temperatures and blockage of passage are also significant limiting factors for trout and possibly other such species.

C. Impacts on Coldwater Fishery

The DEA finds that "warm water temperature, reduced flow, and increased pool habitat likely improved conditions for native nongame species such as hardhead and Sacramento sucker, which at the same time reduced optimal conditions for rainbow and brown trout." DEA, p. 55. It acknowledges that the recommended MFS will not fully mitigate the Project's impacts on water temperatures of the bypass reach or the resulting impacts on the coldwater fisheries, and that the Agency/County MFS Proposal (March 2005) will provide greater enhancement. *See id,* p. 211; *see also* Declaration of Dr. Elizabeth Soderstrom (Sept. 18, 2006), ¶¶ 4-5 (Exhibit 3). The rejection of the Agency/County MFS proposal, based on the law of diminishing returns (DEA, p. 212), does not disclose the standards used for this cost-effectiveness judgment.

More importantly, the DEA does not articulate any standards for the future condition of the trout fishery. While it requires such standards in a future monitoring plan (DEA, p. 218), it does not state or use such standards for the purpose of determining the adequacy of the recommended enhancement from the baseline condition. The plan required by FPA section 10(a)(1) is more than a field of dreams -- "build it and they will come," or put differently, "whatever comes to the field is the dream." By definition, a plan is a deliberate statement of objectives and methods. The plans used by the SWRCB, Forest Service and other agencies for the management of the North Fork (*see* Argument VI) include standards for the future condition of each resource. The population of the trout fishery in the bypass reach is apparently very small (DEA, p. 59), by contrast to its historical condition and its restoration potential (*see* Exhibit 2, ¶ 19). It is arbitrary and capricious for the DEA to use a numerical estimate of habitat availability as the basis of its recommendation, while failing to state (or even consider) a standard for the restored population potential of the bypass reach to the extent such potential is under the control of Project releases.

D. Revised Proposed Flow Schedule

The regulatory agencies and County have revised our March 2005 proposal. The County and AW support and now proffer the October 2005 proposal below, as a substitute. In effect, this converts WTM policy into flow values. Its benefits are similar but superior to the earlier schedule, as will be explained in separate comments filed by the agencies.

Revised Proposed Minimum Flow Schedule (October 2005)[1]

Month	Release from Poe Dam (cfs)[2]			
	Water Year Type			
	Wet	Normal	Dry	Critically Dry
October	250	250	180	180
November	275	275	180	180
December	300	300	180	180
January	325	300	180	180
February	350	325	225	225
March	350	350	300	300
April	400	400	325	300
May[3]	500	400	350	300
June[3]	500	400	350	300
July[3]	425	400	350	300
August[3]	350	350	260	260
September[3]	300	300	180	180

III.
FISH PASSAGE AND NAVIGATION

Big Bend and Poe Dams are complete barriers to the upstream passage of fish as well as navigation. DEA, p. 83-85; NLA, p. E3.16, p. 1. The Staff does not recommend any measures for enhancement of the baseline condition of the North Fork Feather for fish passage or navigation. In effect, the Staff Recommendation is status quo. The DEA acknowledges that the blockage of fish passage is an unmitigated adverse impact. DEA, p. 87. We address potential measures mitigate this impact, below.

A. Big Bend Dam

Big Bend Dam was constructed in 1910. Not later than 1928, it had a fish ladder for anadromous and riverine fish. *See* California Division of Fish and Game, *Sacramento-San*

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1 Revisions are based on further analysis of Poe reach water temperature monitoring information and utilization of the SSTEMP water temperature model. Some shoulder month smoothing took place to avoid a summer "bump" in stream discharge.

2 Pulse flows are not shown.

3 Monitoring will continue for 5 years to determine effectiveness of the flow schedule to moderate stream temperature.

Joaquin Salmon Fishery of California (Bulletin 17) (1927), p. 37 (Exhibit 4 hereto). The ladder fell into disrepair and has been dysfunctional for a "long time." NLA, p. E3.16-1. The dam is 50-feet tall.

Since 1967, when the Big Bend Powerhouse was abandoned as a result of flooding by Lake Oroville, the dam has stored a regulating reservoir for Poe Powerhouse (NLA, p. E3.16-1). It was not included in the original license for the Poe Project as issued in 1953. The 2003 NLA now specifies the dam as a "necessary" Project work to provide backpressure for efficient operation of the Francis turbines at the Poe Powerhouse, and to protect the public against flow surges. *Id.*

1. Violations of Federal Power Act and State Laws

Big Bend Dam is a functional part of the Project. It has been used and useful since the Poe Powerhouse began operation in 1958. Its use has not changed since 1967, when it was modified (by cutting a notch in the spillway crest) to maintain the minimum tailwater elevation for the benefit of the powerhouse. NLA, p. E3.16-1.

To our knowledge, PG&E did not apply to FERC to incorporate the dam into the original license, or exempt it. If so, PG&E operated the dam over the term of the original license in violation of the FPA Part I. *See* FPA section 10(a)(1), 16 U.S.C. § 803(a)(1) (providing that a license shall cover the project as adopted); and section 3(11), 16 U.S.C. § 796(11) (defining project to be the "…complete unit of development, consisting of … all dams … and reservoirs … connected … or used and useful … therewith").

The adverse impacts of Big Bend Dam are thus not permitted under FPA Part I. Today, the dam blocks the passage of riverine trout from the North Fork below the dam into the bypass reach, which includes up to 7 miles of spawning habitat. *See* Soderstrom Declaration, Exhibit 3, ¶¶ 5-7; DEA, p.83. It also blocks the passage of boaters who use that reach (NLA, p. E3-16, p. 1) and would otherwise have passage for roughly 16 miles: 9 miles from Poe Dam to Big Bend Dam site, and then 7 more miles downstream when Lake Oroville is at elevation 650 feet MSL (DEA, p. 217).

Since the dam is not licensed, FPA Part I does not preempt applicable State laws. From the time the fish ladder became dysfunctional, the dam blocked fish passage in violation of California Fish and Game Code sections 5901, 5935, 4936, and 5937, which generally require that a dam operator provide for fish passage; California Penal Code sections 370 and 372, which provide that such blockage is a nuisance; the common law of nuisance and the public trust doctrine, which require that the private use of navigable waters avoid unnecessary harm to trust uses, including fishery and navigation (*National Audubon Society v. Superior Court,* 33 Cal.3d 419, 426 (1983)). The Butte County District Attorney, as the law enforcement official for the County, has authority to abate such a nuisance. *See* Cal. Government Code § 26528; Cal. Code of Civil Procedure § 3494.

2. Mitigation of Adverse Impacts on Fish Passage and Navigation

The DEA rejects the County's proposal for removal of Big Bend Dam to restore upstream fish passage and navigation. It offers several grounds for this rejection.

The DEA states that the dam provides tailwater regulation for the Poe Powerhouse. *See* DEA, pp. 83-84. True, although construction of a new afterbay immediately downstream of the powerhouse could provide that benefit. The DEA acknowledges that Staff did not estimate the cost of such an afterbay. *Id.*, p. 217. It does not address PG&E's estimate (NLA, p. E3.167) of $1 million for afterbay construction and $2 million for foregone generation.

The DEA states that the dam protects boaters and other recreational users on the reservoir against risks associated with flow surges. DEA, p. 84. The DEA acknowledges that a new afterbay could also provide that benefit. *Id.*, p. 217.

The DEA states that the dam blocks passage of warmwater, including nonnative, fish from Lake Oroville into the North Fork Feather. Such passage would result in predation on rainbow trout and FYLF. DEA, p. 217. However, the DEA acknowledges that most of these warmwater species are already present above Big Bend Dam. *Id.*, p. 59. In citing a 1996 study by California Department of Water Resources (DWR) as the only evidence for concluding that restoring fish passage at Big Bend Dam may not benefit the coldwater fishery (*id.*, p. 83), the DEA does not explain why that study is a reliable basis for any finding here, or why PG&E is not required to undertake a current study. Indeed, the DEA does not acknowledge that many of the comprehensive plans analyzed under FPA section 10(a)(2) expressly recognize that such fragmentation of passage is a significant threat to the sustainability of riverine fish, including rainbow trout, in the Sierra Nevada, including the Feather.

The DEA states that removal could release 900,000 cubic yards of sediment into Lake Oroville. DEA, p. 217. It does not state any facts that support that estimate. The NLA (which is the apparent source) estimates that the accumulated sediment may total 1/9th that amount, or 100,000 cubic yards. NLA, p. E3.16-7. The DEA does not explain how any discharge would affect the sediment load already accumulated in Lake Oroville. Staff did not require PG&E to undertake any study of the toxicity of those sediments. *See* DEA, p. 217.

The DEA estimates that a replacement fish ladder at Big Bend Dam would cost up to $8 million in capital expenditure and $1.3 million/year in operations. DEA, p. 217. It does not explain the basis for these estimates, attributed to "Staff" without elaboration. *Id.*, pp. 191, 203. PG&E estimates that a fish ladder would cost $4 million (NLA, p. E3.16-7), although it also does not state a basis for such estimate. The DEA does not respond to the County's evidence, prepared by a registered civil engineer, that a reasonable plan for removal of Big

Bend Dam – as an alternative to such ladder – would cost $6.4 million. *See* Butte NREA Comments, p. A8-9.

In sum, Staff did not require or undertake any study to determine the significance of the present adverse impacts of Big Bend Dam on the aquatic resources, including the rainbow trout fishery, of the North Fork. For example, Staff did not undertake a limiting factors study to assess how the blockage of upstream passage compares to flows and other limiting factors in their incremental impacts on that fishery. Staff did not undertake or require any study of mitigation alternatives for the enhanced passage of riverine fish.[4] The rejection of our fish ladder proposal is apparently based on a 1996 study by another licensee, a single sentence of analysis by PG&E in the NLA (p. E3.16-7), and undisclosed Staff analysis. At the end of the day, Staff recommends that Big Bend Dam continue, without any mitigation, to block upstream passage of riverine fish and navigation.

B. Poe Dam

Poe Dam, which is 60-feet tall, blocks upstream passage of riverine fish and navigation. Although it recites that the NLA includes a study of fish passage for the benefit of anadromous fish (DEA, p. 84), the DEA does not analyze the significance of the adverse impacts of blocked passage for riverine fish. It does not analyze any mitigation alternatives for the enhanced passage of such fish. *See id.*, pp. 84, 186-203 (omitting any such fish ladder from the developmental analysis). In sum, Staff recommends that Poe Dam continue, without any mitigation, to block upstream fish passage of riverine fish and navigation.

C. Access to Tributaries in Bypass Reach

The DEA recommends against any measure (or further study of any measure) to enhance access of rainbow trout to the tributary creeks. Staff accepts PG&E's conclusion that the Project does not cause "most" barriers in Mill and Flea Valley Creeks. DEA, p. 218. The DEA does not explain why the NLA's study is reliable evidence, given the concerns raised by the resource agencies. Indeed, the NLA does not specifically analyze whether or how the Project's flow release affects the depth of passage and other entry conditions at the mouths of these creeks. *See* NLA, p. E3.1-57 – 60. The DEA does not analyze any alternatives for mitigation of any such adverse impacts of the Project's flow release schedule.

D. Oroville Habitat Expansion Agreement

The DEA recites that NMFS and FWS have reserved their authorities under FPA section 18 to prescribe fish passage as a condition of the new license. *See* DEA, p. 82. It does not analyze the merits of the draft "Habitat Expansion Agreement," submitted as an attachment to the Oroville Facilities Settlement Agreement (March 2006) in a separate

[4] The NLA includes a study of fish passage for the benefit of anadromous fish. *See* NLA, p. E3.19. The County has not located any such study focused on riverine fish.

relicensing proceeding. It does not analyze whether and how that agreement may change the baseline condition of riverine fish in the Project reaches. It does not analyze whether, notwithstanding the Services' intent to reserve their Section 18 authorities, FERC should include any measures for mitigation of the Project's impacts on passage of riverine fish under authority of FPA section 10(a)(1).

IV.
RECREATION

The Staff Recommendation includes measures for enhancement of the recreational uses of the Project reaches. These include: new restroom and trail facilities and a Recreation Management Plan. The total estimated cost of these measures is $154,110/year, or .6% (less than 1%) of the baseline value of the Project generation. DEA, pp. 185, 195 - 203. The DEA rejects other measures proposed by the County that would cost $870,000/year or 3.6% of baseline power value.[5]

As shown below, the Staff Recommendation will permit more comfortable use of the Project reaches, as a result of limited enhancements in existing facilities. However, it will forego the substantial increase in use that would result from even better facilities and, most importantly, a boating flow schedule during the summer months. The Staff Recommendation deliberately fails to mitigate most of the Project's continuing adverse impacts on this beneficial use, by permitting reduction of 90% or more of the boating days that would otherwise occur as a result of inflow. In rejecting the North Fork Feather Enhancement Fund, which the County proposed as compensation to undertake off-site measures elsewhere in the watershed, the Staff arbitrarily chose not to complete the mitigation of the Project's on-site adverse impacts on this beneficial use.

In sum, the County respectfully submits that the Project, if relicensed per the Staff Recommendation, will not significantly enhance the beneficial use of recreation and the associated economic benefits for the County and regional economy. The Staff Recommendation is inconsistent with FERC's obligation to "…seek, within its authority, the ultimate development…" of recreational resources. 18 C.F.R. § 2.7.

[5] This total omits: (A) the proposed trail from Bardee's Bar to Poe Beach, which is estimated to cost $1.4 million/year (DEA, p. 197 (item 55)) or 6.2% of baseline power value; and (B) the boating flow schedule. We omit the trail, because it is an economic outlier which alone doubles the impact of all of the County's other proposed measures. We omit the boating schedule, because we disagree with the DEA's estimate of $343,380/year (p. 200). As shown in our NREA Comments, p. A6-7, the boating schedule does not increase the total cost of an aquatic MFS comparable to what the agencies and County now propose. If viewed in isolation, the boating schedule costs less than $150,000/year. *See* Declaration of David Steindorf (Sept. 18, 2006), ¶ 34 (Exhibit 5).

A. Demand for Riverine Boating and Hiking Opportunities

The DEA finds that the Project, modified per the Staff Recommendation, will meet demand for boating and other forms of recreation.

> "We agree that there is a need for recreational enhancements in the project area, which is in a particularly scenic reach of the NFFR, and these enhancements would likely be utilized immediately by recreational users. We are recommending most of the measures proposed by PG&E and some of the measures specified or recommended by other parties, but are not recommending other measures, including the provision of whitewater boating flows in the Poe bypassed reach."

DEA, p. 221. Although the DEA does not expressly adopt any estimate of future demand in these reaches, it justifies rejection of many of the County's measures by opining that demand is "light" or "low." *See id.,* p. 225.

In its NLA, PG&E acknowledges the growing demand for recreational opportunities and facilities in the County. Through 2035, population will grow at a rapid rate: 61% in California or 92% in Butte County. *See* NLA, p. E5-139. Demand for river recreation will increase even more quickly.

PG&E estimates that user-days in the Project reaches will increase by 94 percent, from 5,808 user-days/year today to 11,241 in 2035. *See* NLA, p. E5-139. This is an underestimate. PG&E did not use a demand-response model or other validated method for this estimated growth in recreational use over the next 30 years. PG&E's estimate is very low in comparison with observed trends. According to the National Survey on Recreation and Environment, demand for freshwater boating and hiking is growing more quickly than for many other types of outdoor recreation. In the 8-year period between 1994 and 2002, user-days of kayaking and rafting increased by 182% and 36%, respectively. The survey predicts that this trend will continue. *See* Gary T. Green *et al.*, "Boating Trends and the Significance of Demographic Change" (2003), pp. 26-27, 30, *available at* http://www.srs.fs.usda.gov/trends/NASBLALV.pdf. Similarly, trail hiking is also one of the top ten activities by participation in California, with high latent demand. *See* California Department of Parks and Recreation, *Comprehensive Outdoor Recreation Plan* (2002), p. 29, 33.

The DEA states: "While providing recreational boating flows would enhance recreational opportunities in the Poe bypassed reach, the extent of boater usage that would actually develop there is unknown." DEA, p. 226. The statement is mere speculation. In the absence of contrary evidence, FERC must presume that regional trends in boating and hiking use, which are widely known and summarized above, apply to these reaches, if suitable flows and facilities are provided. Those uses are plainly growing substantially faster than population, which will grow 92% over the term of the new license. The results of the Whitewater Controlled Flow Study confirm that the Project reaches, when suitable flows are released, provide high-quality whitewater opportunities, and that boaters uniformly desire to return. *See* NLA, p. E5-323. Indeed, use of the boating flows under the new license for the Rock Creek-Cresta Project shows that actual use will probably exceed whatever expectation may be reasonable on the basis of use under the original license. Actual use there has consistently exceeded estimates adopted by FERC in the new license, based on the expectations of PG&E, AW, and other signatories to the Settlement Agreement for that project.

Use of Scheduled Boating Flows in Rock Creek and Cresta Reaches (2002-5)

CRESTA REACH[6]					
		2002	**2003**	**2004**	**2005**
Month	Trigger (Up/Down)	Est. Boater Use	Est. Boater Use	Est. Boater Use	Est. Boater Use
June	60/40	160	NR	NR	NR
July	60/40	56*	220	132	83
August	80/50	n/a*	280	239	214
September	100/60	406	389	235	253
October	100/60	442	226	136	155

ROCK CREEK REACH					
		2002	**2003**	**2004**	**2005**
Month	Trigger (Up/Down)	Est. Boater Use	Est. Boater Use	Est. Boater Use	Est. Boater Use
June	120/60	114	104	46	47
July	130/60	277	161	113	102
August	150/60	250	218	171	262
September	180/80	261	270	149	251
October	180/80	300	155	84	186

See PG&E, *Rock Creek-Cresta Project: 2005 Recreation Monitoring Report.*[7]

[6] * means incomplete data. NR means to whitewater release due to biological concerns.

In expressing uncertainty about future boating demand, Staff confuses baseline and future conditions. Boating demand is low today, because the Project diversions eliminate 90% of the boatable days in the 7-mile bypass reach. The minimum flow release under the original license (DEA, p. 76), like the recommended MFS, provides inadequate passage for boating even by kayaks during summer months. In turn, during winter and spring months when spills may occur, flow variability is so extreme as to create substantial safety hazards for any boaters. *See* Steindorf Declaration, Exhibit 5, ¶ 16. For all these reasons, the commercial rafting outfitters in the region do not offer trips on the bypass reach. That, in turn, disenfranchises the majority of public members who do not have the skill or the equipment to run this reach. *See* Declaration of Nate Rangel, ¶ 11 (Exhibit 6 hereto). There is no evidence in the record that future use will be as limited as baseline, if (for the first time in 50 years) the Project releases scheduled boating flows during summer months.

The County submitted substantial evidence that boating use of the Project reaches could exceed 100,000 year-days/year if all boatable flow is released. Butte NREA Comments, p. A3-6. Use of whatever boatable flows are released will probably equal the capacity, taking into parking limitations, spacing between boats, and other factors. As shown by the Steindorf Declaration, opportunities on the Rock Creek-Cresta and Seneca reaches do not meet boating demand in the vicinity of the Project. *See* Steindorf Declaration, Exhibit 5, ¶¶ 16, 20. Indeed, the availability of multiple whitewater opportunities nearby actually will increase the attractiveness of the bypass reach as a new opportunity. *See id.*, ¶ 18. Experienced whitewater boaters are more likely to visit the North Fork if there is a third whitewater run, for the simple reason that a variety is more interesting and challenging than repetition of the same run. *See id.* Further, runs of varying difficulty will allow individuals with different skills to participate. *See id.* Finally, as demand grows because of improvements at one location, there will be natural spillover into areas that are not as densely crowded. *See id.,* ¶ 36.

Experience in the Rock Creek-Cresta reaches confirms that there is high unmet demand for whitewater opportunities in Butte County. *See* Steindorf Declaration, Exhibit 5, ¶ 20. In the first three years of releases, several thousand users have come from all over California and the western States to participate in these events. *See id.* Unfortunately these releases have only met a small portion of the demand, as participation is limited to experienced boaters with their own equipment, because no commercial outfitters currently operate in Butte County. *See id.; see also* Rangel Declaration, Exhibit 6, ¶ 10.

Finally, the NLA estimates that non-boating use of the beaches in the bypass reaches is roughly 5,000 user-days/year, including 3,073 at Sandy Beach. We submit that this limited use reflects the unattractiveness of these beaches for family recreation in the absence of

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[7] Much of the variability in these numbers is a result of the different survey methods used to count boaters in each of the four years. This information indicates use numbers which consistently exceed the use trigger in virtually every month on both the Rock Creek and Cresta reaches.

adequate facilities, including restrooms and parking. *See* Steindorf Declaration, Exhibit 5, ¶ 36. Even so, PG&E and Staff substantially underestimate current use. For example, on Labor Day 2006 and on other days in 2005, more than 1,000 people used Sandy Beach. *See id.;* Exhibit 5.A; Roger H. Alyworth, "Labor Day quiet: Sacramento River silent as crowds flock to the Feather," CHICO ENTERPRISE RECORD, (Sept. 5, 2006) (Exhibit 7 hereto).

B. Boating Flow Schedule

The County proposed that FERC require PG&E to release boatable flows by extending a springtime spill by 8 days, and also for one weekend per summer month. Butte NREA Comments, pp. 18-19. The DEA recommends against the proposal.

> "We do not recommend recreational flow releases in the Poe bypassed reach as proposed by Butte County and Boating Groups. While providing recreational boating flows would enhance recreational opportunities in the Poe bypassed reach, the extent of boater usage that would actually develop there is unknown. We note that similar whitewater boating opportunities are available just upstream at the Rock Creek-Cresta Project and also have been proposed at the Upper North Fork Feather River Project. We also note that any increased demand for recreational boating in the area can be met through the adaptive provision of additional recreational flow release dates at those projects .... In addition, the economic cost of these boating releases would be high ($343,380 annually) through the loss of energy generation."

DEA, p. 226. Indeed, Staff recommends against any boating flow schedule. *Id.* The DEA does not dispute our finding that the Project reduces the frequency of boatable flows in the bypass reach by more than 90% reduction or foregoes the value of tourism revenues of $10.8 million/year. *See* Butte NREA Comments, pp. 19-20, p. A3-9.

1. Unmitigated Impact on Boating Use

The DEA does not propose any boating schedule or comparable on-site or off-site measure to prevent or mitigate the Project's continuing impact on boating use. *See* DEA, p. 226. It speculates that licenses for upstream projects may be adjusted to meet any increased demand for recreational boating, but it does not propose any specific measures there, and it does not acknowledge the substantial and unresolved disputes in those upper reaches about impacts of boating flows on FYLF. *See id.* In sum, in violation of FERC's obligation under NEPA and FPA section 10(a)(1), the Staff Recommendation entirely fails to mitigate the Project's continuing impacts on boating use.

The DEA does not deny that any costs associated with boating schedule, including foregone power generation, is recoverable in retail rates. By contrast, the omission of a boating schedule will result in lost sales, employment, related tax revenues, and other economic benefits that the County cannot recover over the term of the new license. FERC staff acted in an arbitrary and capricious manner in concluding that the public interest permits a loss of $10.8 million/year in tourism revenues and benefits, but does not tolerate the $343,380/year loss in power value (DEA, p. 226) that Staff estimates will result from the County's boating flow schedule.[8]

2. Impacts on FYLF and Macroinvertebrates

The DEA uses the possibility of adverse impacts to FYLF tadpoles and macroinvertebrates as another ground for rejecting any minimum flow schedule. DEA, pp. 77-79. As the basis for this finding, the DEA cites to studies undertaken in the Rock Creek-Cresta Project, under the oversight of the Ecological Resources Committee (ERC). *Id.* (*citing* conclusions in Benthic Macroinvertebrate (BMI) studies). We respectfully submit that the DEA's analysis of this potential impact is defective in several respects. *See generally* Exhibits 8 – 13.

First, the studies were not a controlled experiment. They do not compare the impacts of natural flow variability, including spills, against the impacts of the boating release in the same reach and during comparable periods. Instead, the studies presume that any impacts observed following such releases were caused by the releases. This assumption violates a fundamental principle of science.

For example, the DEA cites to the GANDA BMI studies to find: "Pre- versus post-comparisons indicate that an initial rearrangement of the benthic invertebrate community occurs, which is followed by a general decline in abundance. Eventually, the benthic community re-establishes itself, but to a degraded state. Species richness, diversity, and abundance were negatively affected over time (June – October), although more so in 2003 than in 2004." DEA, pp. 78-79. Dr. Hauer, a peer reviewer of these studies, stated:

> "There is no specific logic given to this other than it is the belief of the investigators. It is completely unclear to me what the justification for this may be, unless they are arguing that some other factor (e.g., algal density, food resources, etc) are affected, which in turn has a direct or indirect delayed effect on the distribution and abundance of the macroinvertebrates. If this is true, then this is the first example that I am aware that a temporary increase in flow has such an effect."

Exhibit 8, ¶ 4(C). Indeed, the California Energy Commission and UC Davis commissioned a study to evaluate whether the observed seasonal BMI declines were inconsistent with the

8 That estimate of foregone power value is off by a factor of two. Staff does not show the formula used for calculation of that estimate. Our analysis shows that the value of foregone power is $145,297/year if viewed in isolation (*see* Exhibit 5, ¶ 34), or zero as an incremental cost to the Agency/NGO MFS Proposal (Butte NREA Comments, p. A6-7).

natural life stages. *See* Exhibit 13.[9] After comparing a reach with a pulse flow against a control reach, the study concluded that the differences between the reaches were not significant. *Id.,* unnumbered pages entitled "Results."[10]

Second, the study results do not consistently support the finding of potentially significant impacts as described in the DEA. For example, the DEA states: "... *it is likely* that whitewater recreational flows would adversely affect FYLF egg masses from early-April until they hatch, and the potential exists that they *could* also adversely affect FYLF tadpoles." DEA, p. 108 (emphasis added). One of the cited studies, GANDA 2005, does not support the finding at all. In that study, only two tadpoles were categorized as "stranded" in four years of surveys on the Rock Creek and Cresta reaches. *See id.,* p. 36. Even these tadpoles could not technically be considered stranded due to the fact that the study states they were found in the water and also that they could have been injured by predators. *Id.* Further, studies conducted during summer boating releases (July – October) have not shown any impacts to FYLF tadpole populations. *See* Steindorf Declaration, Exhibit 5, ¶¶ 30-32; Dave Steindorf, "Analysis of Project Impacts on Foothill Yellow Legged Frogs" (July 2006) (Exhibit 11).

Similarly, the DEA states that: "Catastrophic drift [of macroinvertebrates] (increases in drift during high-flows) was statistically significant in every month sampled." DEA, p. 78. This assumes that all such drift is unnatural. Because such drift occurs naturally,[11] the Rock Creek-Cresta ERC abandoned the use of drift studies after the first season of recreational releases on Rock Creek and Cresta reaches. Further, according to Dr. Hauer, "...the use of the term catastrophic is inappropriate and misleading....Typically throughout the literature, catastrophic specifically refers to macroinvertebrate drift associated with flows sufficient to mobilize the streambed." Exhibit 8, p. 2; *see also* Exhibits 9 – 10, *passim*.

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[9] From PowerPoint presentation by GANDA, CEC Pulsed Flow Workshop (July 2005). The final draft of this study has not yet been released.

[10] BMIs are only of interest because they are the primary source of food for trout in the controlled reaches of this and upstream Projects. Any impacts to BMI populations would logically also impact the "mean condition factor" of the local trout population. Fishery studies on Project 1962 reaches, however, have not shown adverse change in the mean condition factor of the local trout population over the past twenty-two years. In fact, local trout health, populations and angler catch rates have all improved since a flow schedule, including pulse flow releases for whitewater boating, was implemented in 2002 on the Project 1962 reaches. *See* PG&E, *Fishery Goals and Objective Attainment Status (Condition 17 Whitepaper)* (2006), which draws upon: T. Salamunovich, *Rock Creek-Cresta (FERC No. 1962) Backpack Electrofishing Surveys of Shallow Water Habitat – November 2004* (2005); Meadowbrook Conservation Services, *2004 Angler Creel Survey: Rock Creek-Cresta Project (FERC No. 1962) North Fork Feather River, Butte And Plumas Counties, California* (March 2005 draft).

[11] One of these problems is that macroinvertebrates drift constantly with or without changes in flow. *Effects Of Pulse Type Flows On Benthic Macroinvertebrates And Fish: A Review And Synthesis Of Information*, PG&E, *BMI Whitepaper* (2005).

Next, the DEA's findings address impacts of springtime pulse flows on FYLF egg masses. However, the County and American Whitewater proposed: (A) a continuation of a natural springtime spill and (B) "pulse flows" only from July to October of a natural spill during springtime. The DEA's findings about springtime impacts of pulse flows are largely irrelevant to the proposal.

Fourth, the Project causes pulse flows which are far more frequent and erratic, and of greater volume, than the boating schedule. These pulse flows include: spills into bypass reaches, started only once inflow exceeds diversion capacity and terminated as soon as inflow is less than capacity; and peaking discharges from the powerhouses. These flow fluctuations occur year-round, including springtime. Thus, the studies for the Rock Creek-Cresta Project show that, in 2006, such Project flows destroyed half of the FYLF egg masses. *See* Exhibit 11, p. 1.

While 2006 was a particularly wet water-year, the resulting Project flow fluctuations are not an anomaly. American Whitewater's Indices of Hydrologic Alteration (IHA) analysis[12] shows that the median fall rate for post-Project high flows was 1,422 cfs/day, substantially exceeding the pre-Project median rate of 305 cfs/day or the proposed boating flow release. *See* Exhibit 5, ¶ 27; Declaration of Kevin Colburn (Exhibit 14); Exhibits 15 - 16 (AW IHA analyses).

The DEA does not address the adverse impacts of Project flow fluctuations. In a typical passage, the DEA states: "Stable flows during the [FYLF] breeding season are optimal, to avoid egg mass desiccation from decreasing flows." DEA, p. 108. It does not evaluate the comparative impacts of the proposed boating flow schedule versus Project flow fluctuations during that breeding season. It does not consider any mitigation measures for Project flow fluctuations.

Finally, the Staff Recommendation compares apples (boating flows) against oranges (frogs and macroinvertebrates). It does not explain the standards used for that balance. FPA and the APA require disclosure of such standards. The DEA does not cite any legal basis for apparent standard which values FYLF more than boating use and associated tourism revenues. As discussed above, FPA section 10(a)(1) requires protection of all beneficial uses, or put differently, avoidance or resolution of any conflicts to the extent feasible. It does not permit the triage recommended here. CWA section 303 and 401(a)(1) likewise require protection of all designated beneficial uses. Staff acted in an arbitrary and capricious manner in: (A) failing

[12] The DEA does not cite to the NLA IHA analysis in this context. However, it relies on the NLA IHA in other contexts (see p. 49), and we therefore presume that it used that analysis for the purpose of analyzing how pulse flows may change the hydrologic pattern relevant to FYLF and macroinvertebrates. The NHA IHA is disputed evidence. It used synthesized data. AW conducted an IHA analysis, using the same TNC IHA upon which both the DEA and the NLA relied. The AW IHA analysis used actual USGS gage data compiled between 1906 and 2005, rather than synthesized data. The results of our analysis were markedly different than PG&E's. We request that Staff, in response to comments, consider the comparative merits of these analyses.

to require any mitigation for the adverse impacts of Project flow fluctuations on FYLF and macroinvertebrates and (B) foregoing any enhancement of boating opportunities because of speculative impacts of the proposed flow schedule.

3. Revised Proposed Whitewater Flow Schedule

After having consulted extensively with resource agencies, angling organizations and PG&E, we propose an amended boating flow schedule for the Poe Project. While we vigorously dispute the assertion that boating releases have caused any significant impacts on the Rock Creek and Cresta reaches, we seek to address other parties' interests in a fair way. We propose:

- Flow releases will occur one weekend per month in July, August, September and October.

- A test period of flow releases (not less than 600 cfs) and volume (not more or less than 4000 acre-feet per year, including ramping) will occur. Forest Service will determine the length of the test period.

- Site-specific studies will be conducted to monitor and assess impacts to FYLF tadpoles resulting from: (A) this boating schedule and (B) Project flow fluctuations. The study protocols will be developed by the resource agencies, in consultation with PG&E, County, and American Whitewater.

- Given that these flows are far below flows recommended in the Poe Whitewater Flow Study included in the NLA, the USFS will monitor these releases, in consultation with the County and American Whitewater, to determine the acceptability of these initial flow levels for whitewater recreation.

- The above flow schedule is subject to amendment by: (A) agreement between the resource agencies, County, and American Whitewater and (B) any necessary license amendment.

This proposal is modest, relative to the foregone opportunities that will result from continued diversion of most boatable flows. It also has flexibility to reflect monitoring results for both recreation and aquatic resources.

4. Whitewater Boating Feature Below The Cresta Powerhouse

The on-site opportunities for mitigating the Project's adverse impacts on boating use are limited by access limitations and the canyon form. We therefore propose that PG&E develop a whitewater play feature below the Cresta Powerhouse. This feature will consist of a limited modification of the channel, to create waves and related challenge for boaters. Such features have been built around the nation to improve whitewater recreation in such circumstances. This off-site measure has several advantages. It will not result in any loss of power generation. The value of the uninterrupted power generation will quickly exceed the capital cost of construction. It will not require any new assessment of biological impacts because of flow fluctuations. The Cresta Powerhouse has a large parking area that would facilitate use at this site. This feature will provide boating opportunities virtually every day, more fully mitigating the year-round boating opportunities that would have occurred on the North Fork Feather in the absence of Project flow regulation.

5. Real-Time Flow Information

The DEA requires publication of flow data from the compliance gage, NF23 (DEA, p. 210) in 100 cfs increments (*id.*, p. A-27). We support this recommendation, subject to modifications. We recommend that the new license require the publication of such flow data for the reach *between* Poe Dam and the current location of the NF23 gage. This is one of the few portions of the reach that is presently readily accessible to the public, and accurate flow data are critical to such use. We propose that either: (A) the compliance gage should be moved upstream of both Flea Valley Creek and Mill Creek; or (B) the inflow from Flea Valley Creek and Mill Creek should be measured on a real-time basis to the nearest cfs. We further recommend that these tributary flows be subtracted from the measured NF23 flow to determine compliance for any boating flow releases from Poe Dam.

Compliance data should be made available to the nearest cfs. The current method of displaying a “round up” to the nearest 50 cfs for the Rock Creek and Cresta reaches is confusing because 50 cfs is a very large increment.

C. Non-Boating Recreational Facilities

The DEA rejects most of the County’s recommendations for non-boating facilities, including additional restrooms, parking capacity, and trails. The Staff Recommendation is not based on substantial evidence, and is arbitrary and capricious in several ways. Among other things, Staff (A) assumes future use will be comparable to baseline use, even though baseline use is plainly limited by inadequate facilities; (B) assumes that visitors will prefer undeveloped condition to limited additional development which will improve public safety and sanitation; (C) assumes that additional facilities will cause adverse impacts to FYLF, absent any evidence; and (D) assumes that the Staff-recommended measures, which effectively preserve the baseline, will fulfill FERC’s obligations under FPA section 10(a)(1) and 18 C.F.R. § 2.7 to realize the recreational potential of this reach. These general objections apply to all of the rejected proposals. We focus on the most important below.

1. Poe Reservoir

The DEA agrees that providing recreational enhancements at the Poe Reservoir, near the Cresta powerhouse, will enhance use. It ultimately rejects such measures on the ground that they are more appropriate as amendments to the license for the Rock Creek-Cresta Project:

> "While we agree that providing recreational enhancements [near the Cresta Powerhouse and at Shady Rest] would benefit recreation in the Feather River canyon, we do not recommend them because we also recognize that both of these sites are either within the Rock Creek-Cresta boundary or immediately adjacent to it. Improvements at these sites should be provided within the context of the Rock Creek-Cresta Project license."

DEA, p. 224. We disagree. First, these locations have a nexus to the Poe Project, since they are located immediately upstream of the Project boundary. Second, the FPA and NEPA plainly permit FERC to require off-site mitigation when on-site measures are inadequate to mitigate adverse impacts.

2. Sandy Beach

The DEA does not recommend enhancements to recreational facilities at Sandy Beach additional to those proposed by PG&E. Rejected measures include a second restroom, as proposed by the County and the Forest Service in its Preliminary Section 4(e) Condition no. 29E. DEA, p. 223. According to the DEA, Staff "agree that providing a restroom facility would improve user comfort and enjoyment and address sanitization issues at the site, but we are not convinced of the need for two restrooms at this site at this time." *Id.*, pp. 224-25. As stated above, Staff bases this finding on a gross underestimate of baseline use at this location. Over 1,000 people visited Sandy Beach on Labor Day 2006 alone. According to the Forest Service's regulations, one portable toilet is only adequate for 1 to 15 people. Baseline use at Sandy Beach on weekends and holidays plainly justifies the additional facilities proposed by Butte County.

3. Bardee's Bar

The DEA recommends against "[p]roviding recreational enhancements at Bardee's Bar in addition to those proposed PG&E, including additional picnic tables and fire rings, and road maintenance as necessary, as recommended by Butte County." DEA, p. 223. The DEA assumes that baseline use will not increase if the road is properly maintained and access does not require a heavy-duty vehicle. That assumption is wrong, as shown above.

The DEA finds: "Butte County is currently responsible for the maintenance and operation of Bardee's Bar Road under a right of way and easement for the road that PG&E's predecessor, the Great Western Power Company, gave the county. Bardee's Bar Road was in existence when the Poe Project was constructed and currently provides access to some private lands, some NFS lands of the Plumas National Forest, and the PG&E parcel on which Bardee's Bar is located." This is incorrect. The easement does not require the County to undertake such maintenance. *See* Declaration of Sean O'Brien (Sept. 18, 2006), ¶ 18 (Exhibit 17). Further, most existing use is by PG&E for access to the powerhouse. *Id.,* ¶¶ 15-27.

Consistent with the DEA's recommendation for expansion of the Project boundary to include other off-site facilities (*see* DEA, p. 227), we recommend that the boundary include Bardee's Bar Road to the juncture with the primary road, as necessary to access project facilities and the river itself. Because the road's baseline use is primarily the maintenance of the Project powerhouse, and because of PG&E's obligation to provide recreational facilities in consideration of its use of Project waters, we propose that the new license require PG&E to upgrade and maintain this road so that it is safely and readily passable by two wheel drive vehicles, pursuant to the itemized estimate attached to the O'Brien Declaration. From the County's perspective, this is the most significant opportunity for improving recreational access to the lands and waters of the Poe Project.

4. Feather River Visitors Center

The DEA recommends against "[p]roviding a one-time contribution of seed money to a government agency or non-profit organization for possible development of a visitor center in the Feather River canyon, as [proposed] by PG&E and the Forest Service in its preliminary section 10(a) recommendation no. 29H" and by the County. DEA, p. 224. Staff offers two reasons for this rejection.

First, Staff claims that demand for such a visitors center does not exist.

> "...most people are on their way to a destination beyond the Feather River canyon and do not see the canyon as a destination in itself. Travelers on the highway may stop to use the restroom and may look at information provided on kiosks, and may take the time to eat a quick meal at a picnic table provided, but there is little need for facilities providing more than that. Providing a Visitor Center would increase the number of visitor opportunities in the area, but is not needed to enhance visits to, or through the Feather River canyon."

Id., p. 152. We disagree.

The historical record shows that, prior to the construction of PG&E's projects, the North Fork was a popular destination for fishing and camping. In the early 1930s, the canyon was known as a "River Wonderland" which had tourist lodges and campgrounds from Oroville to the Sierra Valley. PG&E's projects have impaired the fisheries and eliminated boating flows. However, the canyon still has the beauty and other features to become a popular destination, if recreational facilities and flows are provided. The visitors center will be the gateway to this destination.

The Mono Lake Basin demonstrates how such a visitors center, in concert with environmental restoration, can contribute to the restoration of an area as a tourist destination. Thirty years ago, Mono Lake was not a popular destination, because Los Angeles Department of Water and Power diverted all flow from the tributary creeks, eliminating their fisheries and impairing the navigability of the lake itself. Once the Mono Lake Cases resulted in restoration of flows, the Mono Lake Committee and Forest Service established two visitors centers. Today, the lake attracts over a quarter of a million visitors annually. *See* Declaration of Geoffrey McQuilkin (Sept. 18, 2006) , ¶¶ 8-9 (Exhibit 18). These visitor centers have materially contributed to this dramatic turnaround. *See id.*, ¶ 4 They elevate public awareness of the area and provide guidance as to specific destinations. *See id.,* ¶¶ 5-7. They contribute more than $4 million/year to the local economy. *Id.*, ¶ 10.

Second, Staff claims that the proposed Feather Visitors Center is not tied directly to the Project: "While we agree that providing a visitor center would enhance opportunities in the area, we do not believe that such a center can be tied directly to the project and that PG&E should be required to provide seed money." DEA, p. 225. We disagree. Consistent with the precedents cited in Argument Section I.E, the proposed off-site mitigation addresses unmitigated, cumulative adverse impacts of this and upstream Projects.[13]

D. Feather River Enhancement Fund

The DEA recommends against "[e]stablishing and funding a Recreation Account as part of a 'North Fork Feather Enhancement Fund' to be used for enhancement of river recreation in the Feather River Basin and elsewhere in Butte County, as recommended by Butte County and the Boating Groups." DEA, p. 226. Staff "find no basis for requiring PG&E to provide such funding for facilities that may enhance visitor opportunities elsewhere in the basin but have little or no connection to the Poe Project." *Id.* This logic is defective for several reasons: (A) the project has significant unmitigated impacts on the North Fork Feather, net of the enhancement caused by the Staff Recommendation; (B) precedents permit off-site mitigation, including cash funds, in this circumstance; (C) the County proposed direct linkages between

[13] The DEA omits any finding regarding cumulative impact of PG&E's system on riverine recreation on the NFFR. See DEA, p. 162. By contrast, the sections on water and fishery resources include such finding. *See* DEA, p. 25. The DEA also omits finding whether the project will have significant unmitigated impact (direct and cumulative) as a result of loss of more than 90% of boatable days and the associated economic value. These omissions are inconsistent with FERC's obligations under the FPA and NEPA, which plainly require that the Commission evaluate the cumulative impacts of a project and take these into consideration when the Commission makes its licensing decision. FERC staff's silence on cumulative impacts on recreation is glaring given the considerable evidence Butte County provided in its NREA comments that such impacts are significant and unmitigated to date.

the Enhancement Fund and the unmitigated impacts; and (D) the measure links with a counterpart in the Settlement Agreement for the Oroville Facilities now before FERC.[14]

V.
COUNTY ECONOMIC WELFARE

The DEA estimates how the action alternative may change the value of power generation revenue for the Project, as an impact on the interests of PG&E's ratepayers and the regional electrical system. That estimate is a factor in the balancing recommendation under FPA section 10(a)(1). However, the DEA does not estimate the impact of action alternatives on the economic welfare of Butte County, which includes the entirety of the Project lands. We respectfully submit that the value of tourism revenues is just as relevant as the value of power generation under FPA section 10(a)(1), and deserves "equal consideration" under FPA section 4(e). As shown above, the Staff Recommendation misses this unique opportunity to restore some part of the $10.8 million/year in tourism revenues, which the original license foregoes by diverting all boatable flow. That is inconsistent with a comprehensive plan of development of these waters for all economic uses, including non-developmental.

Butte County has historically been economically distressed, when compared to other California counties. The State of California designated the county as a "significantly distressed" county, in 2005 and several prior years. *See* Butte County Office of the Chief Administrative Officer, "Report on the Operational Impacts of the Oroville Facilities Project on Butte County" (e-Library no. 20060217-0110 (Feb. 2006), § 5.0). This finding by the Commission on State Mandates means that the County lacks sufficient financial resources to meet its residents' needs for public services, including public safety.

In its application for new license for the Oroville Project, DWR acknowledged the financial plight of Butte County:

> "The largest segment of employment is in the services sector, which is characterized by relatively low wages. Butte County residents receive a relatively high proportion of their total income derived from government transfer payments (i.e., Social Security payments, supplemental security payments, and public assistance). The median

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[14] That Settlement supports a significant commitment to river recreation development in the NFFR Feather below the project as a means to mitigate project impacts on recreation. Given the technical infeasibility for providing any significant whitewater recreation on the inundated reaches of the North Fork Feather within the Oroville boundary, the Settlement anticipates the development of an artificial whitewater facility downstream of Oroville Dam. The Oroville Whitewater and River Boating Report, R-16, explored the possible demand for the development of an artificial whitewater course on that project. The study found the potential benefits of a whitewater park to be considerable: "Development of a whitewater park could potentially set the Oroville area apart in a new way, making it unique among almost all water-based recreation areas in the region and creating year-round whitewater opportunities."

> household income of residents of Butte County is significantly below the regional, State, and national averages."

DWR, "Application for New License for the Oroville Project (P-2100)," Vol. III, Preliminary Draft Environmental Assessment (PDEA) (2005), § 5.12-6. DWR also noted that household incomes within the Feather River Service Area (FRSA), which includes Butte County, are below those elsewhere in California:

> "The FRSA has the lowest median household income of any service area, with the City of Oroville (included in the FRSA) having the lowest income level of any jurisdiction served by the [State Water Project]; median household income levels in both of these areas are lower than Statewide figures. The highest poverty rates occur in the San Joaquin Valley, followed by the FRSA and Southern California, all of which are higher than the State average. ...The majority of visitors had a total household income that was higher than the median income level for Butte County in 2000."

Id.

VI.
CONSISTENCY WITH COMPREHENSIVE PLANS

The DEA lists eighteen comprehensive plans which Staff reviewed under FPA section 10(a)(2), to determine "…the extent to which [the] project is consistent…" with such plans. DEA, p. 237. It concludes in seven words: "No conflicts were found with these plans." *Id.,* p. 238. This summary conclusion is unreviewable and violates FERC's obligation under FPA section 313(b) and the APA, as discussed above. Further, it violates FERC's obligation to take a hard look at such plans under FPA section 10(a)(2).

Under FPA section 10(a)(2), FERC must consider the "extent to which a project is consistent with a comprehensive plan…" adopted by another agency, "…in order to ensure" that the project is best adapted to the plan ultimately adopted under FPA section 10(a)(1) for advancement of all beneficial uses of these waters. 16 U.S.C. § 803(a)(2). This obligation extends beyond mere consideration of such other plans. FERC must seek "…to reconcile inconsistencies between those agencies' recommendations and the Commission's plans to the extent possible, and to explain its reasons for departing from the agencies' recommendations when it concludes it must do so in order to fulfill its statutory mandate." *Friends of the Ompompanoosuc v. FERC*, 968 F.2d 1549, 1554 (2nd Cir. 1992). In that case, FERC licensed a project to develop a waterfall in a manner inconsistent with a State plan that barred development of that waterfall for protection of its scenic beauty. The court found that the license's requirement for a continuous flow release over the waterfall "would minimize conflict with the [plan] and appropriately balance power needs and aesthetic values." *Id.* at 1554.

> "…The Commission is required to give due consideration to all recommendations from relevant agencies, to reconcile inconsistencies between those agencies' recommendations and the Commission's plans to the extent possible, and to explain its reasons for departing from the agencies' recommendations when it concludes it must do so in order to fulfill its statutory mandate."

Id.

A. Plumas Forest Plan

The DEA lists Forest Service, *Plumas National Forest Land and Resource Management Plan* (1988), as a comprehensive plan that is not inconsistent with the Staff Recommendation. DEA, p. 238 (item 12). It does not cite any of the Standards, Guidelines, or other management requirements in the Forest Plan for the 144 acres of Plumas National Forest lands occupied by this Project. The plan was prepared under authority of the National Forest Management Act, which requires that such "'[r]esource plans and permits, contracts, and other instruments for the use and occupancy of National Forest System lands shall be consistent with the land management plans.'" *Keating v. FERC*, 114 F.3d 1265, 1270 (D.C. Cir. 1997), *citing* 16 U.S.C. § 1604(i).

Diversion of most available inflow, resulting in frequent waterwater conditions, does not appear consistent with many of the applicable requirements of the Plumas Forest Plan, including:

> "Trout
>
> Improve and protect habitat for trout.
>
> Ensure that trout habitat quality and quantity are not reduced by streamflow-altering activities such as hydroelectric projects. Use Instream Flow Incremental Methodology (IFIM) or a comparable methodology to determine streamflow needs for Class I, II and III streams.
>
> Provide for fish passage on any drainage or stream where spawning activity occurs, except with concurrence by DFG.
>
> Riparian Areas
>
> Favor riparian dependant resources and limit disturbance in all riparian areas including riparian and aquatic ecosystems, wetlands, streambanks and floodplains.
>
> Water quality

Maintain or, where necessary, improve water quality using BMP's. [Best Management Practices].

Implement FS [Forest Service] Best Management Practices (BMP's) to meet water quality objectives and maintain and improve the quality of surface water on the Forest. Identify methods and techniques for applying the BMP's during project level planning and implement them into the associated project plan and implementation documents." *Id.*

Water Uses and Needs

Assure an adequate water supply for PNF [Plumas National Forest] and instream needs.

Conduct a Water Use; Needs, and Availability Survey where stream diversions or flow changes are proposed, except for FERC-regulated projects for which intensive studies are required. Allow new consumptive use only of those waters surplus to current uses, future PNF needs, and need [sic] needed instream flows. Base conclusions for Class I, II, and III streams on Instream Flow Incremental Methodology (IFIM) or comparable method approved by the Forest Service.

Watershed Protection

Preserve watershed conditions so that soil productivity and water quality are maintained.

Complete the Watershed Improvement Needs Inventory (WIN) and update annually by identifying all lands contributing to watershed degradation through analysis of NFS watersheds on a priority basis and by individual project assessment. Analyze and mitigate on a total watershed basis, not only on project areas.

Energy

Facilitate Hydroelectric development that provides protection of all resources."

Id., pp. 4-35 - 4-50.

B. Report of California Advisory Committee on Salmon and Steelhead Trout

The DEA lists California Advisory Committee on Salmon and Steelhead Trout, *Restoring the Balance* (1988) as a comprehensive plan that is not inconsistent with the Staff Recommendation. DEA, p. 237 (item 1). It does not cite any of the recommendations of this report. Diversion of most available inflow, resulting in frequent warmwater conditions, does not appear consistent with such recommendations, including:

> "The Legislature should declare the policy of the state to restore and protect the salmon and steelhead resources. The policy should prohibit any further loss of fisheries habitat, emphasize the improvement of in-stream habitat, and eliminate man-made factors that kill juvenile fish. It should regard fish production as a co-equal objective of water as a co-equal objective of water development and land management, rather than as a constraint upon development—as it is now perceived. (emphasis added)
>
> Water temperatures increase and even reach lethal levels (for fish) for extended periods during the summer months. This is especially critical for silver salmon and steelhead, which must remain in fresh water through the summer months.
>
> [I]nadequate stream flow and poor quality water consistently surface as the central causes of salmon and steelhead declines.
>
> Water is the key; water diversion and damage are the problems. The dewatering of rivers and the loss or degradation of spawning and rearing habitat must be addressed for the balanced recovery program envisioned.
>
> River temperatures must be kept below 56 degrees Fahrenheit, especially during incubation.
>
> The Legislature should declare the policy of the state to restore and the salmon and steelhead fisheries. This policy should encourage the improvement of instream habitat and elimination of man-made factors that destroy juvenile fish. It should prohibit any further loss of salmon and steelhead habitat and direct all state agencies to conform their activities to conform their activities to ensure the policy is achieved."

Id., pp. 15, 20, 21, 22, 25, 30.

C. California Outdoor Recreation Plan (1993, 2002)

The DEA lists California Department of Park and Recreation, *California Outdoor Recreation Plan* (1993), as a comprehensive plan that is not inconsistent with the Staff Recommendation. DEA, p. 238 (item 8). It does not cite any of the requirements, policies, or recommendations of that plan.

CDPR has published a 2002 update, *available at* http://www.parks.ca.gov/pages/795/files/2002corp.pdf. Since the 1993 plan is approved as a comprehensive plan, we move, pursuant to 18 C.F.R. § 385.212, that FERC: deem the update to be filed (via this web reference) under 18 C.F.R. § 2.19, and that it approve the update as a comprehensive plan for the purpose of further proceeding. Assuming that the motion is granted, the Staff Recommendation not to establish a boating flow schedule appears inconsistent with many such provisions of the 2002 update, including:

> “Heightened importance of outdoors for recreation
>
> More than 80 percent of the respondents [to the study on Public Opinions and Attitudes on Outdoor Recreation in California 1997] indicated that outdoor recreation is important or very important to their quality of life. The number of Californians who felt outdoor recreation was very important to their quality of life jumped from 44 percent in 1987 to 62 percent in 1997, when the last opinion poll was conducted….
>
> High Demand for traditional, outdoor recreation
>
> Traditional recreation [e.g., beach activities, trail hiking, swimming] remains popular, and as more Californians take advantage of state, local and federal parks, the demand for recreation facilities will only increase….
>
> Other preferences, favorites, shifts, and Interests
>
> *Adventure and high-risk activities:*
>
> There is a continuing interest in a broad range of adventure activities such as mountain biking, scuba diving, kite surfing, and wilderness backpacking. Included in this group are activities that are perceived to be high-risk, including rock climbing, bungee jumping and hang gliding. Research suggests that this demand is from a variety of age groups including the Baby Boom generation, which continues to hike, mountain bike, kayak, and engage in other physically active, resource-based recreation.
>
> Latent or Unmet Demand
>
> After applying weighting factors, the following thirteen activities scored a high latent demand in California:
>
> 1. Recreational walking
> 2. Camping in developed sites
> 3. Trail hiking
> 4. Attending outdoor cultural events
> 5. Visiting museums, historic sites
> 6. Swimming in lakes, rivers, ocean
> 7. General nature, wildlife study
> 8. Visiting zoos and arboretums
> 9. Camping in primitive areas
> 10. Beach activities

11. Use of open grass or turf areas
12. Freshwater fishing
13. Picnicking in developed sites."

Id., pp. 29-33.

D. Water Quality Control Plans

The DEA lists State Water Resources Control Board (SWRCB), *Water Quality Control Plans and Policies* (1999), as a comprehensive plan that is not inconsistent with the Staff Recommendation. DEA, p. 238 (item 11). It does not list the *Central Valley Water Quality Control Plan* (1994), a*vailable at* http://www.swrcb.ca.gov/rwqcb5/available_documents/basin_plans/SacSJR.pdf. This plan has been adopted by the SWRCB to implement the state-wide plans and policies on the Feather and other waters of the Sacramento River. Consistent with FERC's standard practice of treating such Basin Plans as comprehensive plans, and pursuant to 18 C.F.R. § 385.212, we move that FERC: deem the Water Control Plan to be filed (via this web reference) under 18 C.F.R. § 2.19, and that it approve the Basin Plan as a comprehensive plan for the purpose of further proceeding. Assuming the motion is granted, the diversion of most available inflow, resulting in frequent waterwater conditions, appears inconsistent with many applicable water quality standards (other than the designated beneficial use of Hydropower), including:

"Designated Beneficial Uses

Water Contact Recreation (REC-1): Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, or use of natural hot springs.

Non-contact Water Recreation (REC-2): Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with waste, nor any likelihood of ingestion of water. These uses may include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Cold Freshwater Habitat (COLD): Uses of water that support coldwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Wildlife Habitat (WILD): Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Spawning, Reproduction, and/or Early Development (SPWN): Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Hydropower Generation (POW): Uses of water for hydropower generation.

Municipal and Domestic Supply (MUN): Uses of water are used for community, military, municipal or individual water supply systems including, but not limited to, drinking water supply."

Id., pp. II-1.00-2.00.

"Narrative and Numeric Objectives

Oxygen: The dissolved oxygen content of surface waters shall not be depressed below 5 mg/l for waters designated WARM, or 6 mg/L for waters designated COLD, as a result of controllable water quality factors.

Temperature: The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses. The temperature of waters designated COLD shall not be increased by more than 5 degrees F as a result of controllable water quality factors."

Id., pp. 4-10 – 4-11.

VII.
REQUEST FOR FURTHER PROCEDURES

We respectfully request the following further procedures, which are within the authority of FERC and the Agriculture, Interior, and Commerce Departments, respectively.

A. FERC

We request that OEP Staff:

1. Pursuant to 40 C.F.R. § 1502.9, prepare a draft Environmental Impact Statement for further public comment. The record shows that the Project, as modified by the

Staff Recommendation, may cause significant adverse impacts to environmental quality. These impacts include: (A) exceedance of coldwater objective 17-61% of summer days, (B) loss of more than 90% of days when suitable boating flows occur in the bypass reach, (C) original authorization of the Big Bend Dam, (D) blockage of riverine fish passage by Big Bend and Poe Dams, and (E) contribution to the cumulative impacts of the several hydropower projects on passage of anadromous fish.

2. Pursuant to APA section 556(d) – 557 and 702, and in response to DEA comments, identify with specificity the evidence on which Staff relies, including citation to the relevant page(s) and explanation why the evidence is both reliable and superior to any competing evidence.

3. Pursuant to 18 CFR § 385.601 *et seq.*, convene a Technical Conference once DEA Comments and replies have been submitted, in an effort to identify, discuss, and resolve any differences in analytical data or methods that underlie such disputed conditions. We note that the DEA does not respond to this request, which the County originally made in our NREA Comments.

4. Pursuant to 18 C.F.R.§ 2.19, approve CVRWQCB*, Central Valley Water Quality Control Plan* (1994) and CDPR, *California Outdoor Recreation Plan* (1993 as updated 2002), as comprehensive plans pursuant to FPA section 10(a)(2).

5. For the reasons stated in Argument Section III, declare that Big Bend Dam is used and useful to the Project, and that PG&E acted in violation of FPA Part I by not seeking to include this work in the original license.

6. Pursuant to NEPA and FPA section 10(a)(1), coordinate the ongoing relicensing proceedings for this Project, Upper North Fork Feather Project, and Oroville Facilities, and the adaptive management of the Rock Creek-Cresta Project, as follows: (A) notice the technical conference, pursuant to (3) above, to parties in all proceedings; and (B) adopt appropriate procedures for joint hearing, briefing, or other record development to analyze and adopt appropriate alternatives for mitigation of cumulative impacts. Some issues will be limited to PG&E's system (such as warmwater conditions between Lake Almanor and Big Bend Dam, blockage of riverine fish passage, and impairment of boating use), while other issues will include the Oroville Facilities (such as blockage of anadromous fish passage).

B. Departments of Commerce and Interior

We request that the Interior and Commerce Departments respectively:

1. Submit, for the record of this proceeding, an explanation whether and how the Habitat Expansion Agreement in the Oroville Facilities Settlement will benefit riverine fish in the Project reaches, and specifically, will mitigate the Project's blockage of fish passage.

2. Agree to participate in the Technical Conference proposed in A.3 above.

3. Publish the schedule and procedures for participation in the alternatives procedure pursuant to 43 C.F.R. §§ 45.71 and §§ 50 C.F.R. §§ 221.71 *et seq*.

C. Department of Agriculture, Forest Service

We request that the Forest Service:

1. Reconsider its decision not to include a minimum flow schedule in its FPA section 4(e) conditions, in light of *City of Tacoma v. FERC* (9th Cir. No. 05-1054 (Aug. 21, 2006)). Under this case, the Forest Service plainly has authority to regulate the operation of dams on private lands, since: (A) other works are located on National Forest lands and (B) such operations affect such National Forest lands.

2. Agree to participate in the Technical Conference proposed in A.3 above.

3. Publish the schedule and procedures for the conclusion of the trial-type hearing procedure and for the alternatives procedure pursuant to 7 C.F.R. § 1.671 *et seq*.

Dated: September 19, 2006

Respectfully submitted,

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On behalf of BUTTE COUNTY

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CERTIFICATION OF SERVICE

Pacific Gas and Electric Company, Poe Hydroelectric Project (P-2107-016-CA)

I hereby certify that I have this day served the foregoing document, "**AMENDED COMMENTS OF BUTTE COUNTY AND AMERICAN WHITEWATER ON DRAFT ENVIRONMENTAL ASSESSMENT,**" upon each person designated on the official service list compiled by the Secretary in this proceeding.

The following persons have been served via email by practice or agreement in this and other proceedings.

Mike Aceituno, michael.e.aceituno@noaa.gov
Peter Allen, pva@cpuc.ca.gov
Bruce Alpert, BAlpert@ButteCounty.net
A. Barnsdale, bca@cpuc.ca.gov
R. Pete Bell, fhc@foothillconservancy.org
John Beuttler, JBeuttler@aol,com
Charlton Bonham, cbonham@tu.org
Jim Crenshaw, cspa@psln.com
Jack Gipsman, Jack.gipsman@usda.gov
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Lon House, lwhouse@innercite.com
Tom Hunter, Pcpw@psln.com
Steve Rothert, srothert@americanrivers.org
Eric Theiss, Eric.Theiss@noaa.gov
Steve Volker, svolker@volkerlaw.com

In addition, I served Nancee Murray (Legal Office, California Department of Fish and Game, Resources Agency), Nmurray@dfg.ca.gov, rather than Margaret Kim, who is no longer with the California Resources Agency. I served Kelly Catlett, Friend of the River, kelly@friendsoftheriver.org, rather than Jen Carville, who is no longer with Friends of the River.

Dated: September 19, 2006

By:

Rachel Golden

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LIST OF EXHIBITS

1. Robert W. Hughes, "PG&E Poe Project Temperature Modeling" (Sept. 5, 2006)

2. Declaration of James Lenhoff (Sept. 18, 2006)

3. Declaration of Dr. Elizabeth Soderstrom (Sept. 18, 2006)

4. California Division of Fish and Game, *Sacramento-San Joaquin Salmon Fishery of California* (Bulletin 17) (1927)

5. Declaration of David Steindorf (Sept. 18, 2006)

6. Declaration of Nate Rangel (Sept. 18, 2006)

7. Roger H. Alyworth, "Labor Day Quiet: Sacramento River Silent As Crowds Flock To The Feather," CHICO ENTERPRISE RECORD (Sept. 5, 2006)

8. F. Richard Hauer, memo reviewing Rock Creek-Cresta recreation flow studies (2004)

9. F. Richard Hauer, memo reviewing Rock Creek-Cresta recreation flow studies (2005)

10. Dr. Eric McElravy, memo reviewing Rock Creek-Cresta Recreation flow studies (2004)

11. Dave Steindorf, "Analysis of Project Flow Impacts on Foothill Yellow Legged Frogs" (2006)

12. Sarah J. Kupferburg, "Hydrologic and Geomorphic Factors Affecting Conservation of a River-Breeding Frog," Ecological applications 6(4):1332 (1996)

13. GANDA, "CEC Pulsed Flow Workshop" (2005)

14. Declaration of Kevin Colburn (Sept. 18, 2006)

15. American Whitewater, IHA analysis (2006)

16. American Whitewater, IHA analysis (2006)

17. Declaration of Shawn H. O'Brien (Sept. 18, 2006)

18. Declaration of Geoff McQuilken (Sept. 18, 2006)

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Exhibit 1

MEMORANDUM

Date: September 5, 2006

To: Sharon Stohrer, State Water Resources Control Board
MaryLisa Lynch, California Department of Fish & Game
Cheryl Mulder, USDA Forest Service
William Foster, USDI Fish and Wildlife Service

From: Robert W. Hughes, P.E., Hydraulic Engineer
California Department of Fish & Game

Elizabeth A. Lawson, Water Resource Control Engineer
California State Water Resources Control Board

REGISTERED PROFESSIONAL ENGINEER
ROBERT WILLIAM HUGHES
C [illegible]
EXP. 12/31/06
CIVIL
STATE OF CALIFORNIA

Re: PG&E Poe Project Temperature Modeling

Elizabeth A Lawson

Introduction:
The Pacific Gas and Electric Company (PG&E) operates the Poe Hydropower Project (Poe Project) on the North Fork Feather River (NFFR) under Federal Energy Regulatory Commission (FERC) license 2107. The Poe Project consists of one on-river diversion dam/impoundment and a 143 MW powerhouse located approximately 7.5 miles downstream. The Rock Creek-Cresta Project and the Upper North Fork Feather River Project are also operated by PG&E upstream of the Poe Project. FERC license 2107 expired on September 30, 2003, and PG&E is currently in the process of applying for a new license for the project.

Prior to hydropower development on the NFFR, summer water temperatures likely exceeded the thresholds preferred by coldwater fish, such as rainbow trout. However, these fish species could move upstream to cooler waters of the NFFR or access tributaries that provided coldwater refuge habitat during the hot summer months. With the development of hydropower facilities on the NFFR (including: Poe Dam, Rock Creek Dam, Cresta Dam, Belden Dam, and Canyon Dam), coldwater fish species have reduced access to their historic coldwater refuge habitat because of the barriers formed by the dams and poor passage conditions at confluences of tributaries and the mainstem NFFR due in part to lower than historic summer base flows.

The Water Quality Control Plan for the California Regional Water Quality Regional Water Quality Control Board, Central Valley Region (Basin Plan) has designated a beneficial use of cold freshwater habitat for the NFFR, including the Poe Reach from Poe Dam downstream to the Poe Powerhouse. Because the Poe Reach seasonally exceeds water temperatures necessary to protect the cold freshwater habitat use and access to historic cold water refuge habitat has been restricted, the State Water Resources Control Board, the California Department of Fish and Game, the Plumas National Forest, and the US Fish and Wildlife Service (Resource Agencies) seek to improve summer water temperatures to protect, mitigate, or enhance habitat necessary for coldwater fish species. The purpose of this study is to determine to what extent increases in bypass flow requirements at the Poe Dam may reduce summer water temperatures in the Poe Reach.

Background:
As part of their effort to evaluate flow/temperature relationships in the Poe Reach, PG&E developed two temperature models using the Stream Network Temperature Model (SNTEMP). PG&E's initial SNTEMP model was developed based on monthly averages of daily flow, water temperature, and meteorologic conditions. While a longer-term data set (33 years) was used in this model, much of the weather data was collected at meteorology stations that were a significant distance from the Poe Reach. The results from this model were presented in PG&E's December 2003 Poe Hydroelectric Project Application for New License (Application). The model demonstrated that reductions in water temperature could be achieved by increases in minimum flow, and that regardless of the temperature of the water coming into Poe Reservoir, the rate of warming could be limited to less than or equal to 1ęC through the Poe Reach at flows of 400 to 500 cfs.

PG&E also developed a SNTEMP model using average daily meteorology and stream temperature data collected at Poe Project facilities during the summers of 1999, 2000, and 2003. After reviewing the two SNTEMP models, we determined that, except for a few discrepancies, both PG&E SNTEMP models were properly constructed and calibrated. We also determined that, of the two models, the latest model that relied on three years of site-specific meteorology and water temperature data was most appropriate for our analysis.

However, due to the complexities associated with running the DOS-based SNTEMP model, we opted to create a separate model of the Poe Reach using the Windows-based Stream Segment Temperature Model (SSTEMP). SSTEMP is a simplified version of SNTEMP designed for use on single stream segments. Both SNTEMP and SSTEMP use the same algorithms to calculate the heat exchange between a river and its surrounding environment.

SSTEMP Model Development:
We constructed our SSTEMP model using the same field measured data sets and calibration parameters used by PG&E to develop their latest SNTEMP model. Flows in the reach were taken from mean-daily measurements from USGS 1140440 below Poe Dam. Meteorologic data was taken from a station located at the Poe Powerhouse. For both models, the widthôs A and B terms, which describe how the width of the channel changes with increasing flow, were estimated using stream geometry measured during the instream flow studies. The default thermal gradient of 1.650 Joules/Meter^2/Second/°C was used in both models.

Modifications were needed to convert some SNTEMP input conditions for the required data structure of the SSTEMP model. SNTEMP allows shade to be input at several locations along the reach, and the shading was not constant throughout the reach. So, the SSTEMP shading terms were calculated as weighted averages by multiplying the shade at each location by the length of the river segment represented by the shade terms from the SNTEMP input files. Two small tributaries flow into the Poe reach near the start of the reach. The SSTEMP model included inflow from these tributaries at the start of the reach by using a mass-balance approach to calculate total flow volume and combined temperature after the addition of water from these tributaries.

PG&E reported that travel time throughout the Poe Reach is about two days when the flow is 50 cfs; however, with higher flows travel time throughout the Poe Reach is less than one day. Therefore, the SSTEMP model was constructed using daily average temperature, meteorology, and flow conditions (unlike the PG&Eôs SNTEMP model which applied two-day average conditions).

The batch file option in SSTEMP was used to process all three years of existing summer data in one model run.

SNTEMP and SSTEMP Model Comparison:
To evaluate whether the SSTEMP model results matched those produced by the SNTEMP model, we compared the predicted daily water temperature at the top and bottom of the Poe Reach from each model. We also met with the PG&E staff in September of 2005 to identify differences in model results and to improve the calibration of both models. Predicted temperatures were first compared to the actual data measured during the summers of 1999, 2000, and 2003. Flow during this time in the Poe reach ranged from about 110-140 cfs. Model predictions using scenarios with inflow during wet/normal (500 cfs), and critically dry (425 cfs) were also compared.

A few small errors and input differences were discovered in the SNTEMP and SSTEMP models. One SNTEMP geometry file contained an out-of-date term used to describe the shape of the channel. The ground temperature terms were also different in several of the SNTEMP input files. The modelers agreed to use a conservative value of 100% available sunshine instead of 90% available sunshine in all simulations. After fixing a missing correction for reported air temperature values in the SSTEMP input files, the output from the two models closely matched each other with the largest differences in temperature being about 0.2 ^{o}C. Although the daily results of the two models closely matched each other, accuracy of the SNTEMP and SSTEMP models was about 0.4 ^{o}C, based on the three years of modeling data. Figure 1 below compares the results from the two models against stream temperature measurements at the Poe Dam.

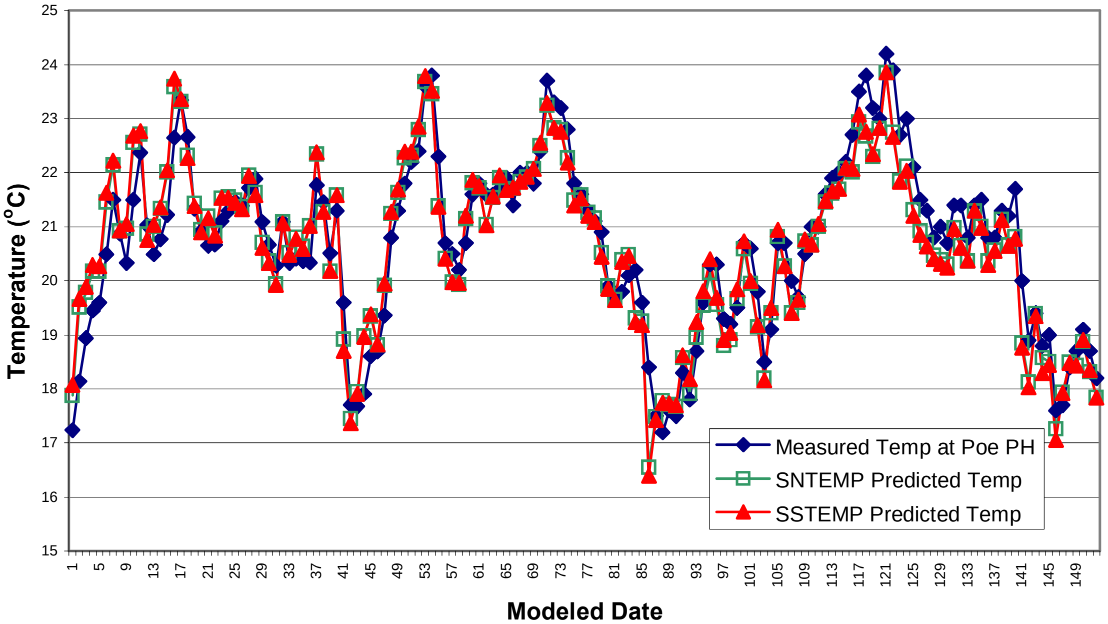


Figure 1. Actual measured temperature at Poe Powerhouse compared to SNTEMP and SSTEMP predicted values. Dates on the X-axis are compressed to show three years of summer data; numbers 1-47 are the dates 6/11/99 through 9/11/99, 48-91 are 6/17/00 through 9/11/00, and 92-152 are 6/1/03 through 9/29/03.

At this point, PG&E and Resource Agency modelers agreed that the SSTEMP model was properly calibrated and could be used to analyze the potential for temperature improvements in the Poe Reach.

SSTEMP Model Runs:
The SSTEMP model was used to predict how temperatures would change within the Poe reach based on increasing the base flows during summer months. Model runs were constructed for each day of the three-year data set at flows in the Poe reach at 110, 150, 180, 200, 250, 260, 300, 350, 400, 425, 500, 550, 600, 700, and 800 cfs. These flows were selected to incorporate the various flow proposals made in Resource Agency, Non-Governmental Organizations (NGOs), and PG&E alternatives. The inflow temperature, the temperature at the end of the Poe Reach, and the change in temperature throughout the reach were input into a spreadsheet for each day of each run to evaluate the results.

SSTEMP Model Results:
Model results were evaluated to determine the frequency that a Temperature Criteria was exceeded. The Temperature Criteria was defined as conditions when water temperature at the downstream end of the Poe Reach exceeded 20°C and temperature increase over the reach was >1°C on each day. Table 1 presents the results of this analysis.

Table 1. Predicted percent of time Poe reach Temperature Criteria would be exceeded in June, July, August, and September of 1999, 2000, and 2003.

Discharge (cfs)	Month			
	June	July	August	September
110	50.8	88.2	39.8	1.8
150	42.6	76.3	22.6	0.0
180	37.7	69.9	17.2	0.0
200	31.1	61.3	17.2	0.0
250	26.2	47.3	9.7	0.0
260	24.6	41.9	6.5	0.0
300	23.0	23.7	3.2	0.0
350	23.0	15.1	2.2	0.0
400	18.0	8.6	2.2	0.0
425	16.4	8.6	1.1	0.0
500	9.8	5.4	0.0	0.0
550	6.6	4.3	0.0	0.0
600	3.3	2.2	0.0	0.0
700	0.0	0.0	0.0	0.0
800	0.0	0.0	0.0	0.0

The percent of time that temperatures at the end of the Poe reach would exceed temperatures of 21°, 22°, and 23°C was also calculated for each summer month at each flow rate.

Table 2. Percent of days per month predicted to exceed specified temperature at a discharge of 110 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	50.8	27.9	9.8	4.9
July	90.3	52.7	16.1	3.2
August	67.7	22.6	8.6	0.0
September	7.1	0.0	0.0	0.0
Total	60.1	28.7	9.6	2.0

Table 3. Percent of days per month predicted to exceed specified temperature at a discharge of 180 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	37.7	16.4	4.9	0.0
July	77.4	29.0	8.6	2.2
August	59.1	16.1	3.2	0.0
September	7.1	0.0	0.0	0.0
Total	50.8	17.2	4.6	0.7

Table 4. Percent of days per month predicted to exceed specified temperature at a discharge of 260 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	24.6	9.8	1.6	0.0
July	65.6	24.7	4.3	0.0
August	54.8	16.1	1.1	0.0
September	8.9	0.0	0.0	0.0
Total	43.6	14.5	2.0	0.0

Table 5. Percent of days per month predicted to exceed specified temperature at a discharge of 300 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	23.0	8.2	0.0	0.0
July	64.5	22.6	4.3	0.0
August	53.8	16.1	1.1	0.0
September	8.9	0.0	0.0	0.0
Total	42.6	13.5	1.7	0.0

Table 6. Percent of days per month predicted to exceed specified temperature at a discharge of 350 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	23.0	8.2	0.0	0.0
July	61.3	21.5	4.3	0.0
August	52.7	16.1	1.1	0.0
September	10.7	0.0	0.0	0.0
Total	41.6	13.2	1.7	0.0

Table 7. Percent of days per month predicted to exceed specified temperature at a discharge of 400 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	19.7	6.6	0.0	0.0
July	57.0	18.3	4.3	0.0
August	52.7	16.1	1.1	0.0
September	10.7	0.0	0.0	0.0
Total	39.6	11.9	1.7	0.0

Table 8. Percent of days per month predicted to exceed specified temperature at a discharge of 425 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	18.0	6.6	0.0	0.0
July	57.0	17.2	3.2	0.0
August	52.7	16.1	1.1	0.0
September	10.7	0.0	0.0	0.0
Total	39.3	11.6	1.3	0.0

Table 9. Percent of days per month predicted to exceed specified temperature at a discharge of 500 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	16.4	6.6	0.0	0.0
July	50.5	14.0	3.2	0.0
August	52.7	15.1	1.1	0.0
September	10.7	0.0	0.0	0.0
Total	37.0	10.2	1.3	0.0

Table 10. Percent of days per month predicted to exceed specified temperature at a discharge of 800 cfs based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Predicted Days Where Ending Temperature Exceeds a Given Temperature			
	20 degrees C	21 degrees C	22 Degrees C	23 degrees C
June	13.1	4.9	0.0	0.0
July	40.9	8.6	3.2	0.0
August	49.5	15.1	1.1	0.0
September	10.7	0.0	0.0	0.0
Total	32.3	8.3	1.3	0.0

As the results of the SSTEMP modeling are considered, it is important to keep in mind that the temperature of the bypass flows released from Poe Dam plays an important part in the ability to achieve water temperature objectives at the end of the Poe Reach. Table 11 below demonstrates that inflow temperatures frequently exceed 20ęC.

Table 11. Percent of days per month that inflow temperatures exceeded the listed values based on 1999, 2000, and 2003 temperature monitoring.

Month	Percent of Days Where Inflow Temperatures Exceeded the Listed Value			
	19 degrees C	20 degrees C	21 Degrees C	22 degrees C
June	16.4	4.9	0.0	0.0
July	74.2	22.6	4.3	0.0
August	89.2	38.7	6.5	3.2
September	14.3	8.9	0.0	0.0

Conclusion:

Based on the results of the SSTEMP modeling, as presented above, increases in bypass flow requirements at Poe Dam are expected to significantly reduce summer water temperatures at the downstream end of the Poe Reach. However, reasonable increases in bypass flow requirements are still not sufficient to ensure that temperatures at the end of the Poe Reach will always remain below 20ęC. Tables 1-11 can be used with the results of other economic and environmental studies to determine the most appropriate streamflow recommendations for the Poe Reach. Opportunities to reduce inflow temperatures to Poe Reservoir will further contribute to improved temperatures through the Poe Reach.

Exhibit 2

DECLARATION OF JAMES LENHOFF

I, JAMES LENHOFF, declare the following:

1. I submit this declaration in support of Butte County's Comments on the Draft Environmental Assessment.

2. Many of the facts set forth in this declaration are based upon my personal knowledge. The historical facts set forth in this declaration have been acquired while reviewing historical texts and treatises and other written and pictorial information, and also by word of mouth, over the lengthy period during which I have conducted an extensive study of Butte County history. During the time I have conducted that study, I have had multiple opportunities to corroborate and have corroborated said historical facts, and as to said historical facts, I am informed and believe them to be true. If called as a witness, I would and could competently testify to all of the aforementioned facts set forth herein.

3. I received a teaching credential from California State University, Chico in 1955.

4. I was appointed by the federal government to be the first ever "historical consultant and expert" to the United States Mint in San Francisco, California in 1973, and served in that capacity for three years, through 1975.

5. I taught Social Studies at Oroville Union High School and Paradise High School for 23 years, from 1969 to 1992.

6. I am a past president of the California Heritage Council.

7. I am a past president of the Butte County Historical Society.

8. I am currently president of the Oroville Heritage Council.

9. I have been editor of the Butte County Historical Society's *Diggin's* periodical for the last 10 years.

10. I recently wrote a pictorial history of Oroville, entitled *Oroville, California*, which was published by Arcadia Publishers in 2001.

11. I am the founder and a curator of the Cherokee Museum in Cherokee, California.

12. I am currently employed by the Oroville Union High School District to teach an adult history class entitled "History of Butte County" at the Oroville Adult School, in Oroville, California and have done so for the past 41 years.

13. Passenger service on the Western Pacific Railroad through the Feather River Canyon commenced in approximately 1910. *See* http://www.wprrhs.org/wphistory.html.

14. The construction of the Feather River Highway, a highway through the Feather River Canyon, through which the North Fork Feather River passes, was completed in 1937. During the first part of the 20th century, citizens and businesses, including Newspapers, within the Oroville area proudly promoted the City of Oroville as "The Gateway to the Feather River Wonderland" (Exhibit A).

15. Local Oroville tradition holds that Herbert Hoover, who was an avid angler (*see Herbert Hoover, The Fishing President*, by Hal Elliot Wert, Stackpole Books, 2005), enjoyed fishing on the Feather River while working as a mining engineer for one of Oroville's gold

dredging firms.

16. Prolific author Erle Stanley Gardner, best known as the creator of the character Perry Mason, spent his teenage years in Oroville and was a dedicated sportsman and wildlife photographer. See http://www.kirjasto.sci.fi/gardner.htm, an Amazon.com biographic sketch of Mr. Gardner. He lived only a block from the Feather River and fished it often.

17. In the early 1900s, a number of campgrounds and other lodging facilities for tourists were erected along the Feather River Canyon, including Belden Resort, Tobin Resort, Mayaro Lodge, Rainbow's end (also known as the Paxton Hotel) and the Western Pacific Railroad's grand resort at Blairsden. Several of these lodging facilities were quite spectacular and were very popular tourist attractions, especially for anglers. Although several of these lodging facilities are still in existence, several of them have closed. Exhibit B to this declaration is a copy of an Oroville area advertising pamphlet typical of its time printed in 1937, in which several of the aforementioned lodging facilities are mentioned.

18. The tourist industry in the Feather River Canyon thrived between 1910 and 1965, but has declined considerably since that period. Western Pacific Railroad vigorously promoted tourism in the Canyon during the early 1900s. The railroad and the highway opened up scores of great fishing opportunities, and various brochures and post cards showed anglers along the scenic waterway. Exhibit C to this declaration is a copy of an early color post card, the technology for the printing of which existed only in Germany at the time, which depicts a Feather River Canyon angler with his catch, dressed in typically formal attire of that era. The

post card was mailed in 1910, as indicated by the U.S. Post Office stamp on Exhibit A.

19. A plentiful supply of sturgeon, bass, trout, and salmon were available at different times of the year. The limit of 25 trout per day lured many from various parts of California. Exhibit D to this declaration is a copy of a photograph taken in 1910 depicting a fish which posthumously became perhaps the most famous fish ever caught on the Feather River, a 271-pound Sturgeon, caught in 1910 by August Johnson, the father of former California State Senator Ray Johnson. *See Lost Beneath the Feather*, by Bill Talbitzer (1963).

20. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct, except as to historical facts acquired through study, and as to those historical facts, I am informed and believe them to be true, and that this declaration was executed this 18th day of September, 2006 at the office of the Butte County Counsel at 25 County Center Drive, Oroville, California 95965.

Respectfully submitted,

James Lenhoff

Exhibit 2.A

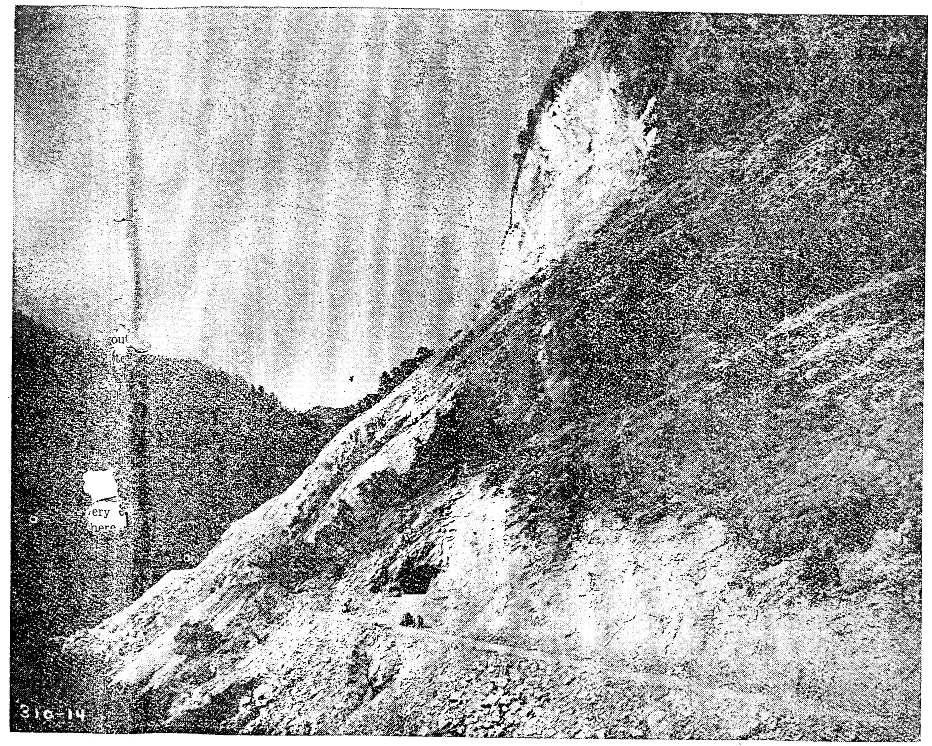
CHAPMAN'S *Magazine*

·DEDICATED TO AMERICAN IDEALS AND PROGRESS·

EASTMAN STUDIO PHOTO

HIGHWAY 24 AND THE FEATHER RIVER WONDERLAND ISSUE

Feather River Wonderland Rich In Scenery, Wild Life, Stories Of Olden Days



OLD GRIZZLY DOME before and after—left as it had stood for ages; right after its face had fallen.

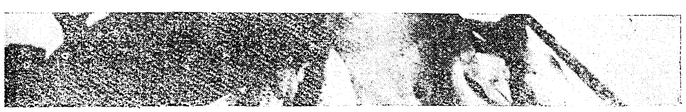
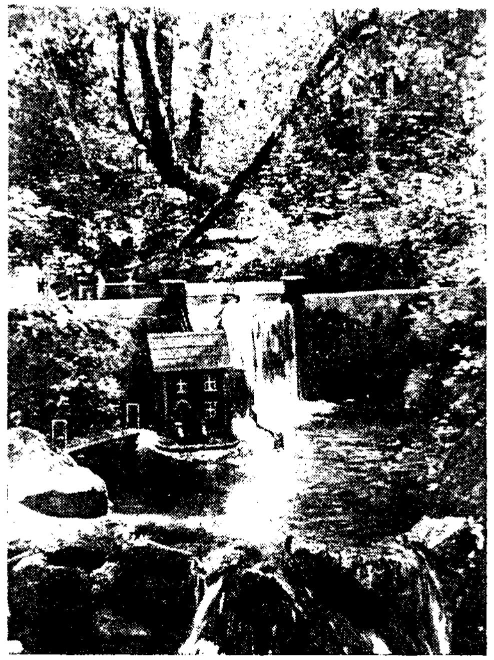


Exhibit. 2.B



Elfen Scene, Typical Of Mayaro

A Restful Spot

If there ever was a fairyland, Mayaro Lodge, in the Feather River Canyon, is the place. For natural beauty in a mountain setting, it probably has no equal.

The six-mile drive into Mayaro was taken as a sidetrip to the Mercury Featherlog. The turnoff is at the north end of the Pulga bridge. Near the summit of the drive the road crosses Dogwood creek and just before turning down to the lodge Camp Creek presents a beautiful sight with its waterfalls.

It is this creek that tumbles in one waterfall after another through the Mayaro resort. The site was discovered by E. D. Phelps back in 1913. He was so taken with it that he established a summer cabin there. In 1923, he left the bay region and went to Mayaro and started a resort. Needless to say he has been there since.

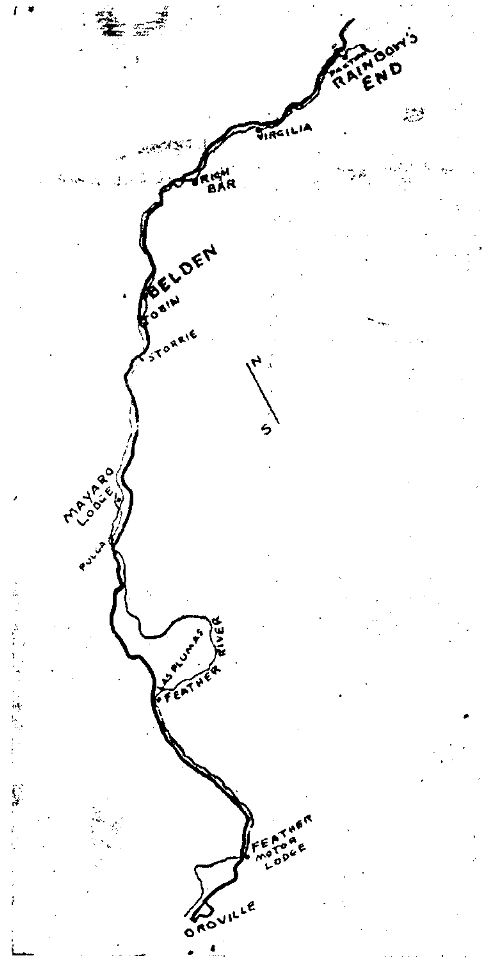
Mayaro's setting is difficult to describe. Well kept paths wind through groves of stately trees, around granite boulders and ever rushing Mayaro creek. Here and there are small, attractive cabins and in almost unbelievable places are beds of colorful flowers.

Improvement of the grounds is a hobby with Phelps. In one place there is a miniature waterwheel that actually works. In another is a miniature lake in a granite bowl with miniature power plant, boat dock, bathing beach and summer homes—a resort in miniature at a mountain retreat. It is just one of many surprises that bring exclamations to the lips of the sightseer.

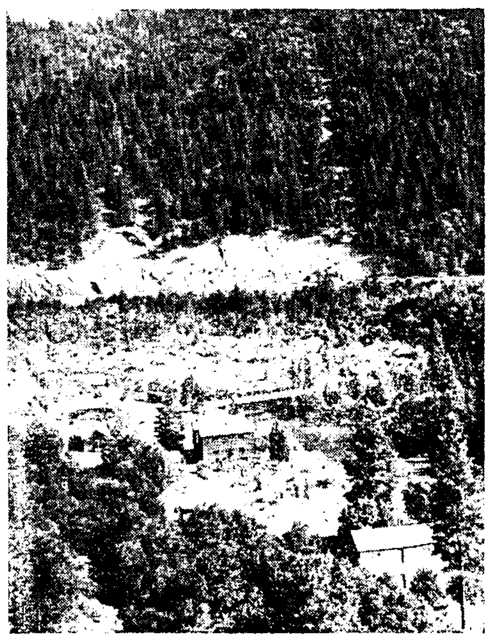
Another hobby with Phelps is trout. Twenty five thousand trout are planted in the stream every year and he has eight natural pools in which trout fry are reared until large enough to fend for themselves. This means good fishing every season.

Mayaro also has an excellent beach on the river and in the creek itself. Bordering the creek are attractive badminton courts and especially laid out courses for croquet, darts, table tennis and horseshoes.

And not the least of Mayaro's attractions are homecooked meals supplied under the personal direction of Mrs. Phelps.



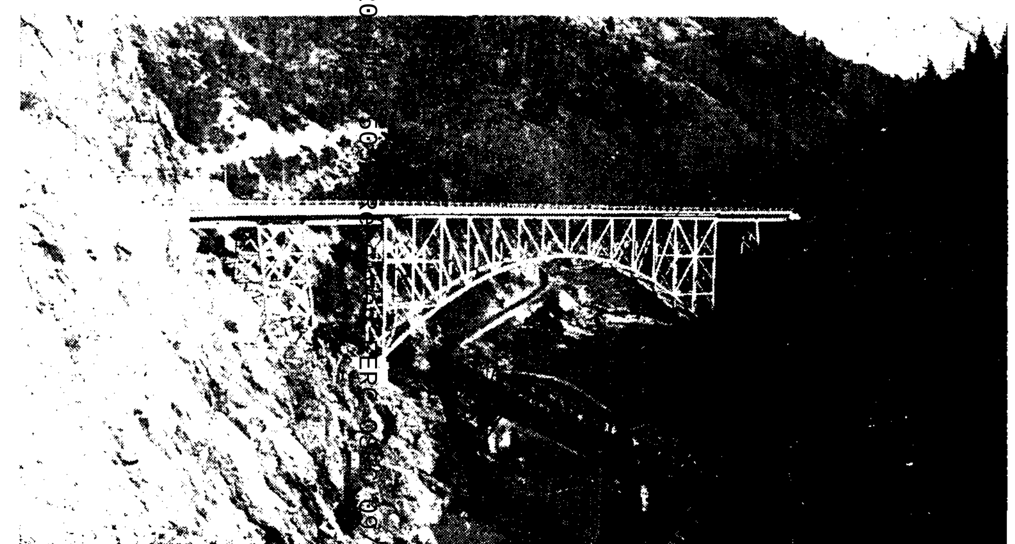
From Oroville To Rainbow's End



Rich Bar, Historic Spot

In Top Shape

When repairs now being made are completed this summer, the Feather River Highway will be in better traveling condition than ever before. Thick asphaltic base is being laid in places to give the highway a firm foundation.



Highway crosses directly over Western Pacific Railroad at Pulga in a spectacular engineering feat.

As Easy Grade

Although the Feather River Highway passes through the Sierra Nevada mountains the average grade is only .8 of 1 percent.

Construction on the Feather River Highway was started April, 1928, and completed Aug. 4, 1937.

Beautiful Falls Near Mayaro

Three Tunnels

(Continued From Page 1)

and on the way down to the river again many fine views of the canyon and mountains may be seen.

Just before crossing the Feather River for the second time, (and near Pulga) a road branches off to the left over the mountain. This is the route to Mayaro Lodge, an interesting side trip taken by the Featherlog car, the story of which will be found in another column.

Proceeding up the main highway, the Featherlog car leaves Lassen National Forest to enter Plumas National Forest (28.3) miles) but you are still in Butte county although not far from the border.

DRILLED THROUGH GRANITE

Some of the most spectacular mountain scenery on the highway is just ahead. Three tunnels were drilled through solid granite before construction of the highway could proceed up the canyon. The first tunnel goes through Arch Rock and is 265 feet in length. Passing through this tunnel, one crosses the line from Butte into Plumas county and soon two more tunnels, both through the lower reaches of Grizzly Dome, appear. One of the tunnels is 390 feet in length and the long one is 1172 feet. It has four galleries cut to allow ventilation and lighting for the traveler. Over 44,000 cubic yards of rock were removed in boring the three tunnels. They represent some of the most difficult construction on the highway and are worth a stop and closer inspection in order to appreciate the imensity of the task.

The mountains of rock through which the tunnels were drilled extend down to the bed of the river.

Arch Rock, the first tunnel, is 34.3 miles from Oroville. Grizzly Dome, second tunnel, is 35.9 miles and Elephant Butte, third tunnel, is 36.2 miles.

TROUT STREAMS FREQUENT

Two miles beyond the tunnels, Rock Creek tumbles into the river from the left and in this vicinity the highway dips down quit close to the stream affording easy inspec tion of trout possibilities.

Soon Storrie (40.2 miles) comes into view It is the second of the string of PGE canyon power plants and derives its water for powe from Bucks Creek. The mountains her seem to be highest and it is worth a sto at the side of the road to glance up an see how water is brought down the moun tainside in tubes into the canyon to th power plant. It is a breathtaking sight.

Now we are approaching what are claime to be some of the best trout waters in th canyon. Streams running into the Feathe River in the vicinity of Tobin (42.2 miles and Belden (50.4 miles) abound with th trout and many catches are being taken ou by fishermen.

FAMED BAR OF THE 50's

Famous mines and lumbering operation are located in the country ahead. One c the most noted early-day mining scenes i northern California is Rich Bar (54.8 miles.

At a turn on the highway, a modern sig points the way to the once-fabulous place ground down on the river bar half a mi away. It isn't teeming with sweating me searching for gold nuggets now but Rich Ba does carry many remembrances.

The fame of Rich Bar was spread through cut the land through letters a doctor's wi wrote to a sister in Massachusetts. The le ters, available in almost any library, we written by Mrs. Louise Clappe in 1851-5 They were first published in 1854-55 an from the beginning are considered to hav given a first-hand picture of what life w like in a California gold camp.

Today Rich Bar is little more than

(Continued on Page 4)

Completing Link

Aug. 20 is the date set for completion o the Keddie to Quincy link in the Feathe River Highway which will mean a high stan dard road between Oroville and the Plu mas county seat. The federal governmen has taken charge of realigning this shor stretch of the highway.

Rainbow's End Is Highway Show Place

One of the show places along the Feather River Highway is Rainbow's End, 68 miles from Oroville.

High on a bluff, this resort is a place where relaxation is easily attained. An altitude of 3000 feet means a cool, pleasant climate.

Rainbow's End is an attractive place without and within. Dinner and dancing are featured on Saturday nights and on Sunday it is the place to stop with the family for dinner while out on a motor trip. And for the vacationist, it is a place where life may be enjoyed to the fullest. There is a well stocked bar with an efficient and friendly "mixer" in attendance.

Sports of all kinds are available. There is a new beach on the Feather River below the resort. Other sports include badminton, croquet, archery, hunting and fishing in season and—gold mining.

The obliging hostesses, Jewell Arnest and Katherine Duhrkoop will furnish mining ground at famous Rich Bar, early day gold camp, throw in a gold pan and even a bottle in which to place the nuggets. Two girls, guests recently at Rainbow's End, went home thrilled with $1.90 each in gold panned from the river gravel.

Rich Bar apparently is still a place rich in gold. Hostess Arnest gave an illustration. An apple tree in an eleven acre orchard at Rich Bar, which is owned by the resort, was removed. In its roots was a $53 gold nugget. Dirt clinging to the roots of the tree was panned and the result was $199 in gold. No attempt has been made to take out the other trees.

At Rainbow's End there are real gold diggers. Here is Twila Cooney panning gold at the bathing pool. Guests are supplied with pans by the lodge and often make "pork and beans" that way.

Cutoff Possible

... of Tobin Resort on the Feather River Highway, reports fishing good in that vicinity. Many have been taken from Indian Creek, the North Fork and other nearby streams.

Tobin, not far from Storrie, is said to be the logical place for a road connecting the Bucks Lake country with the Feather River Highway. Bucks Creek is only three miles over the mountain and can be reached by easy grade, says Shelton.

If such a highway were built, it would make the Bucks country available for winter sports.

Rich Bar's Fame

(Continued From Page 3)

name but it will live down through California history because a cultured eastern woman wrote about life as it was lived in those days.

Virgilia (61 miles) is another Feather River Canyon community made famous for its gold production. Nearby Rich Gulch yielded over $9,000,000 in gold in the early days.

A short distance up the highway is Grey's Flat, Plumas county lumbering town, and then Paxton where Rainbow's End is located on a high bluff overlooking the east branch of the Feather River.

From Paxton the traveler has several return routes to choose from. The drive back to the valley may be made by way of Quincy and the Bucks Ranch Road, or to Greenville, Chester and the Deer Creek Highway to Chico and Oroville or by way of the Susanville-Red Bluff Highway.

Traversing the canyon almost parallel to the highway are the Western Pacific tracks. The railroad crisscrosses back and forth over the stream, sometimes above the highway and sometimes below it.

Scenic beauties of the Feather River Canyon were first opened to travelers by the Western Pacific when it was completed in 1909. When the highway finished in 1937, the scenic route was open to automobiles for the first time.

Mercury "Featherlog" No. Three

Feather Highway Is Scenic Route Over Sierras; River Draws Many

By GEORGE WANGELIN

For rugged mountain scenery and towering cliffs, plus a swell road, the Feather River Highway stands unique among mountain passes of the west.

Although it crosses the Sierra Nevada range, which at places is 10,000 feet in the air, the Feather River Highway follows the water level route along the North Fork of the Feather River. Its highest point is only 5210 feet at Beckwourth Pass and in the canyon the elevation reaches only to 3223 feet (Keddie). This is why it is never closed by winter snows—an all-year route through the mountains.

Traversing some of the best hunting and fishing country in the west, the Feather River Highway was chosen by the Mercury as the route for its third Featherlog—Oroville to Paxton, a distance of 68 miles.

Almost any kind of car can make the trip to Paxton in less than two hours but why rush through some of the finest scenery in the world? Why not make a leisurely trip? Stop the car at many points; step out and really see the beauties of nature, the trout streams and partake of the hospitality of popular resorts along the way?

AT GATEWAY BRIDGE

Checking the speedometer at the court house, the Featherlog car left Oroville at 9 o'clock on a pleasant, sunny morning. First stop was 5 miles out at the Gateway Bridge where the Feather Motor Lodge is situated.

Here one should stop to get the first real sight of the Feather River Canyon.

The Gateway Bridge (it's official name) is the first of 14 bridges on this famous highway all built at a total cost of $350,000. A short distance beyond the bridge is where the Middle and South Forks of the Feather River join the North Fork to make the main stream. A few miles farther and the canyon becomes more rugged.

Then we reach the West Branch bridge (16 miles) and start the six-mile climb over Jarboe Pass. This is where the Feather River makes a big loop to create what is called the Big Bend. Las Plumas, the first of several power communities in the canyon, is located on the lower point of the bend, off the highway to the right a few miles.

AN EASY 6 MILES

This 6-mile stretch toward the pass is the steepest on the entire highway yet it is only a six per cent grade and no accomplishment at all in high gear. Part way up is Rawson Spring to the right, so named for Ed Rawson, who was superintendent of construction on the $8,150,000 canyon road. Near the top of the grade are roads branching off to Yankee Hill and Surcease Mine. The summit of the pass is 22.2 miles from Oroville

(Continued on Page 5)

Feather Yields Big Ones

Belden Center Of Fishing Activities

Belden Resort on the Feather River Highway is a place where fishing and hunting are supreme.

It is a little city by itself, maintained principally for the benefit of sportsmen.

If you fish, you've heard of the North Fork of the Feather River, Yellow Creek, Chipps Creek, Indian Creek and the Three Lakes. It is in the heart of famous fishing country.

If you hunt, you know of Ben Lomond and its famous deer hunting.

Belden Resort is also an ideal place for a family vacation. Beautifully situated in the Feather River Canyon at an elevation of 230 feet, complete accommodations are available. The climate and water are all that could be desired and the scenery will establish memories to cherish long.

Along with the hotel there is a store where provisions and fishing tackle may be bought. Cabins may also be rented.

The resort owners, Mr. and Mrs. J. F. Mor[genthaler] and C. A. (Dad) Coykendall, are interested in fishing to the extent that they are co-operating with the Feather River Rod and Gun Club of Oroville in the rearing of trout. In a concrete pond there are 20,000 trout which will be freed in October when they become six inches in length.

The trout are also big eaters and they catch on quickly. Whenever they see Mrs. Lou Randell coming they are right on the spot for a mess of ground liver. The fish eat from 8 to 10 pounds of liver a day.

Belden is also a considerable center of mining. Approximately 25 prospectors bring their gold dust and nuggets to the store regularly where it is bought and sent to the mint. Some of the men average $2.50 a day from their mining.

Twenty four hour AAA automobile service has been established at Belden Resort. In charge of this service and a garage at Belden is Cal Bugg, former resident of Oroville.

Exhibit 2.C

POST P·N·C CARD

JUL 24 1 30PM CAL. 1910

1st Grade Hand Col.-Series

Message

I recd your postal
some time ago
but neglected
to answer it. I
got a postal from
Gladys this morn
She expects me
over Sunday I
but she won't see

Address

~~Chico~~ Jo.
Cal.
Oroff

CAL.

No. 394 Pacific Novelty Company, Publishers, San Francisco, Cal. Made in Germany.

Exhibit 2.D

200609195053 Received FERC OSEC 09/19/2006 06:25:00 PM Docket# P-2107-000

The Fish Fought Back

On a hot August Sunday in 1910, a trio of Oroville fishermen established a sort of piscatorial history on the Feather River. They didn't intend to, but once they had committed themselves, there was nothing they could do except see the thing through, and thereby make themselves heroes of sorts.

The three were August Johnson, Charley Matthews and Soapy Parker, fishermen all on the weekends, and hard working members of the bustling mining community throughout the rest of the week. They seldom missed an opportunity to go fishing, and they hardly ever failed to get a sizeable mess. But on this particular day they got more than they had anticipated even in their wildest dreams.

The Feather River is probably one of the nation's best known fishing streams. From its flat expanses in the valley where small mouth bass, salmon and steelhead abound, to its wild and roistering tributaries in the mountains that teem with trout, the river is an angler's Utopia, and has been since the first hungry prospector dipped a line into it more than 100 years ago. Thus, it was only natural that it became the source of fishing legends told and retold along the bar at J. B. Hall's saloon whenever two or more of the area's sportsmen gathered at any one time.

Thus it was on this particular blistering Sunday when a group of the town's sporting element gathered for a cold glass or two. There was a baseball game scheduled for that afternoon between the Oroville and Chico town teams and most of the men along the bar intended to take it in. Most of the conversation centered around the ball game but, as is the case in most such situations, other subjects came in for discussion. Finally, someone mentioned the whopper that was said to lurk in the deep channel of the river just upstream from town.

It seems that during several preceeding seasons, many fishermen at one time or another, had hooked onto a fish that they could not handle. Nobody knew how big the fish actually was because nobody had ever raised him high enough in the water to look. But as the conversation continued on that Sunday, the fish grew in length and girth until Jonah's whale began to look like a minnow. It turned out that practically every man in the bar had hooked the whopper at one time or another, and every angler offered an increasingly elastic estimate of its size.

As a result of all that conversation, August, Charlie and Soapy decided to pass up the ball game and instead go after the whopper. They solemnly declared to all and sundry that they would catch that fish that very day and settle the argument once and for all. With that, they left the others and set out to round up the necessary equipment for the expedition.

They went first to Johnson's blacksmith shop where they found a spool of 80 pound test line and the biggest hook available. The only pole they could find was Johnson's favorite trout rod, light and willowy, but they figured they'd make it do. Then they repaired to Abe Cohen's barber shop where they talked him into loaning them his 14-foot rowboat.

Having outfitted themselves properly — at least they were satisfied — they put Abe's boat in the water at 1:30 in the afternoon and rowed upstream to the channel. On the way, Johnson managed to catch a "shiner" about 18 inches long to be

THE WHOPPER – August Johnson stands proudly beside the monsterous sturgeon that he and two comrades, Charlie Matthews and Soapy Parker, caught in the Feather River over 50 years ago.
(Photo Courtesy Mrs. Helen Buis)

used as bait for the big one. Then they anchored the boat opposite the "Chinese Wall", that had been constructed by Major Frank McLaughlin some 15 years before. There they dropped the baited hook over the side and sat back to wait for developments.

That section of California is not the coolest spot in the nation during the summer time and on that day the temperature outdid itself in trying to burst out of the thermometer. It was an even 110 degrees in the boat and the perspiration fairly ran in revulets from the three fishermen but the trio sat stolidly waiting for action.

Just when it seemed that the heat was going to melt the caulking in the boat, Johnson got a bite. Not a very strong bite at first, but a bite nevertheless. When he cautiously gave a couple of tentative tugs, he got an answer from the other end and that was enough for August. He gave a mighty heave and got in return a yank that almost pulled him from the boat. Then the line straightened out and the next thing the fishermen knew, the boat was heading downstream.

Johnson fought the fish with all of his burly muscles while Charlie and Soapy shouted advice to him from the stern. "Reel him in!" Give him some line!" "Drop your rod!" "Hold him steady!" But actually, August was on his own. Braced in the bow of the boat, he was doing his level best to keep from being pulled overboaard while the monster below continued to move downstream and even pick up speed.

When the boat got down the river to the point where the deep channel became shallow, the fish turned around and started back upstream. About that time, a man walking across the bridge heard the shouts of Johnson's companions and looked down the river. Mouth open in wonder he saw three men in a boat that was going upstream without any effort of the oars. He turned and lit out for the baseball park.

The excited runner galloped into the ball park shouting, "The big one's been hooked. They've got him! They've got him!" With one motion the fans rose from the seats and headed for the river. The ball players joined in the race and the umpire, forgetting his dignity, followed at a dead run. It was about a mile from the ball park to the river and the crowd strung out all along the way. Excited householders erupted from their homes and joined the running throng. The charging stream of humanity soon filled Montgomery Street from hitch rail to hitch rail.

Meanwhile, out on the river, Johnson had fought a valiant draw with the fish but he was rapidly running out of strength. The monster had already taken two trips up and down the stream with Charlie and Soapy hanging on the gunwales as the boat practically scooped up minnows on the turns. Just when August was ready to fold up completely, Soapy grasped the rod and entered the fight. The first spectators who reached the river bank saw Soapy braced in the front of the boat with the rod in both hands while Charlie ministered to a worn and haggard Johnson in the stern.

In no time at all the crowd along the banks swelled to more than 2,000 persons and more were on the way. The fish continued to drag the boat up and down the stream while the men took turns handling the rod. So far the fish hadn't budged from the bottom of the river and nobody was sure what Johnson had hooked. All anybody knew was that it must be the meanest, fightingest critter that ever was and nobody wanted to leave without getting a look at him.

Hour after hour the struggle continued while the crowd along the river bank grew to include most of the citizens of the town and the surrounding area. The mayor and the city councilmen were among those present as was the minister of the church whose congregation had deserted him for the time being. Several of the menfolk left the stream briefly to return to town for picnic supplies and soon there were family picnic groups spotted up and down the stream. As the sun went down in the west, the fight between the fish and the fishermen continued with no sign of surrender by either side. A carnival air pervaded the crowd where some group singing was undertaken by the older folks while the small fry cavorted among the trees and rocks and the young adults managed to indulge in a little surreptitious sparking.

As darkness spread along the river, lanterns began to blink at each other from several spots. Out on the river, one of the trio of anglers had lighted a lantern and the progress of the battle could be followed by the bobbing light that travelled up and down the basin. When the sun crept over the eastern hills the next morning, the spectators who had remained at the scene during the night saw the situation as only slightly changed. The fish was still moving, but more slowly now, and Charlie, August and Soapy were weary but willing. The fish hadn't raised from the bottom of the stream and at every attempt to reel in the line, he found new strength to fight back.

There was hardly any business activity in Oroville that day Those members of the population who had gone home during the night returned to the river bright and early and the crowd began to swell again. Newspapers of the day estimated that more than 3,000 persons were on hand that second day to watch the struggle while in the town those merchants who had opened their stores did hardly any business. About the only activity in the town came when one or more spectators would dash from the stream to relay the news from the scene of conflict.

Finally, about noon on that Monday, a break came. August Johnson came ashore when the boat got close enough to the bank for him to leap for it, and was taken to his blacksmith shop. There he fashioned a metal ring to which he attached several stout steel hooks. To the ring he fastened a length of sturdy clothesline and returned to the river. After managing to get back into the boat, he slipped the ring over the butt end of the rod and worked it past the tip. Then the ring was lowered down the line and into the gaping mouth of the monster. That was the end of the battle. Once the hooks were set, Johnson signaled to Soapy and Charlie to grasp the oars and work the boat into the bank. Then the three disembarked and began to pull on the rope, aided by many willing hands.

The express wagon had been sent for and had been backed down to the edge of the river. As the rope was pulled in the monster began to appear from the depths. Slowly the giant head came out of the water and then foot after foot, the fish followed until there on the bank lay a gigantic sturgeon, eight feet, seven and one-half inches long. Later its weight was confirmed at 287 pounds.

The fish was hoisted into the express wagon and then the parade to the business section of the town

Exhibit 3

DECLARATION OF DR. ELIZABETH SODERSTROM

I, ELIZABETH SODERSTROM, declare the following:

1. I am the Director of Natural Heritage Institute's (NHI) Sierra and Africa River Programs with twenty years experience as a river scientist in the international and domestic arenas. Active projects in California include: (1) Restoration of the Yolo Bypass on the Sacramento River; (2) Scaling Adaptive Management to Fit a Range of Riverine Systems; (3) Overcoming the Legacy of the Gold Mine Era: Restoration of Deer Creek; and (4) Conservation and Management of Sierra Mountain Meadows. Specific elements of my restoration experience with NHI have included the design of restoration hydrographs, assessment of habitat and flow requirements for target species, and legal and institutional analysis of barriers to restoration. I am also the lead facilitator for the CALFED Independent Science Board, and active member of the Bay Delta Science Consortium, the Sierra Environmental Water Caucus, the Guadalupe River Adaptive Management Team, and the Trinity River Adaptive Management Team. I hold a M.S. in Biological Sciences from Stanford University, and a Ph.D. in Wildlands Resource Science from UC Berkeley.

2. My comments below are based on extensive professional experience combined with my review of the following documents: (1) California Department of Fish and Game's (DFG) "Notice of Intervention and Section 10(j) Recommendations" (April, 8, 2005); (2) United States Fish and Wildlife Service's (FWS) "Comments, Recommendation, Terms and Conditions, and Prescriptions for the Poe Hydroeletric Project, FERC No. 2107-016; North

Fork Feather River, Butte County, California" (Mar. 30, 2005); and Butte County's "Recommended Conditions for New License" (April 11, 2005).

3. My understanding of the northern Sierra foothills fisheries is consistent with that described in the Butte County's April 2005 comments. Historically, foothill rivers including the North Fork Feather River (NFFR) hosted nearly 40 species of native, coldwater fisheries that included runs of rainbow trout, spring-run Chinook salmon, and steelhead trout. Hydroelectric facilities, along with other impacts, reduced cold-water habitat, impaired water quality, and blocked passage such that 15% of these species are formally listed as threatened or endangered, and an additional 30% are candidates for listing.

4. The FWS, DFG, and Butte County are correct in asserting that their proposed minimum flow schedule will enhance and protect cold-water fisheries in the NFFR. Operations of the facilities in question and other projects in the basin have severely altered the natural hydrograph. The proposed minimum flow schedule will reduce warm weather thermal impacts in a manner consistent with the State Water Resource Control Board's designation of the NFFR as a coldwater river.

5. The improvement of coldwater ecosystem function in the NFFR depends not only on the quality of the water, but also on the connectivity of the system. Impassible dams in the Sierra Nevada foothills are directly responsible, in part, for the dramatic decline and eventual listing of many riverine fish species in California. Even partial barriers can increase mortality through added stress on individuals in the population. Excess energy expended

during passage can result in death before spawning. Gathering beneath upstream barriers subjects individuals to increased predation and poaching.

6. The sustainability of non-anadromous fisheries in the Feather River depends upon restoring connectivity. Non-anadromous fish in the foothill rivers are known to migrate seasonally between reaches of rivers and between the mainstem and tributaries to access a diverse assemblage of habitats, feed on seasonally available food sources, avoid predation and avoid exposure to high summer temperatures. Passage increases the total area available to non-anadromous fish populations, increases the diversity of habitats available, and provides refugia in times of stress, such as localized thermal increases or low flow events. Lack of passage or impaired passage results in under-utilization of existing habitat and over-competition in accessible habitat.

7. Fish passage will facilitate the restoration of the many cold water, migrating fish species. A fish passage feasibility study should examine all realistic options for providing upstream and downstream access to habitat for migrating fish including access around Big Bend Dam (including dam removal) and Poe Dam. Without fish passage, the benefits of restoring the cold water fishery will be valuable but local in nature. With fish passage, the benefits are ecosystem-wide.

8. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct and that this declaration was executed this 18th day of September, 2006 at 409 Spring Street, Nevada City, California 95959.

Respectfully submitted,

Dr. Elizabeth Soderstrom
Director, Sierra and Africa River Programs
NATURAL HERITAGE INSTITUTE

Exhibit 4

DIVISION OF FISH AND GAME OF CALIFORNIA
FISH BULLETIN NO. 17
Sacramento-San Joaquin Salmon (Oncorhynchus tschawytscha) Fishery of California

BY
G. H. CLARK
BUREAU OF COMMERCIAL FISHERIES

1. INTRODUCTION

1.1. Problem

This investigation under the authority of the Bureau of Commercial Fisheries, Division of Fish and Game of California, was started in the fall of 1927. The paper, while all on the general subject of Sacramento salmon, is in three parts, each of which is a separate problem.

The first part, "Historical and Statistical Review of the Sacramento-San Joaquin Salmon Fishery," takes into consideration the early investigations, history, and statistics of the fishery, artificial propagation, legislation, water supply, prices, and the causes of depletion, with suggested remedies.

The second problem, "Survey of Salmon Spawning Grounds in the Sacramento-San Joaquin River Systems," shows the available salmon spawning grounds in the systems as contrasted with the extent of the grounds in the early days. Each stream in the systems is taken up individually to show runs, spawning time and beds, obstructions to the fish, and abundance.

The last part is on the "Determination of the Age of Maturity of the Sacramento-San Joaquin Salmon (Oncorhynchus tschawytscha)," and deals with the methods of age determination, the age of maturity, and age classes in relation to sex and types.

1.2. Material

The historical and statistical data are taken from the Reports of the U. S. Commissioner of Fisheries, the Biennial Reports of the California Fish and Game Commission, Bulletins of the U. S. Bureau of Fisheries, and the California fish and game magazine. Water supply statistics are from the U. S. Geological Survey, San Francisco. The price figures are from the fish dealers and the Sacramento fishermen's union at Pittsburg.

Material for the survey of spawning grounds was gathered almost entirely from observation done in the field. Some of the data on the abundance are taken from the various publications mentioned above. Data on development of power and irrigation projects are from various technical journals devoted to that field.

The material used in the age determination is a collection of scale samples, salmon fry, and fingerlings which the Division of Fish and Game of California has on hand.

1.3. Acknowledgments

The writer wishes to acknowledge his indebtedness to Prof. J. O. Snyder of Stanford University, whose guidance and advice have been

3.2. Material

With the above problems in view, work was started in the early spring of 1928 and continued on through the summer and fall. Personal observation of each locality, as well as numerous interviews with the older inhabitants have been necessary in order to get information concerning the salmon runs and abundance. Old records and correspondence have revealed some measure of the abundance of salmon in different streams and of the conditions in the past. The numerous technical journals devoted to power and irrigation have been an aid to finding the history of these projects.

The survey of these two systems has revealed much information. A detailed account of each locality will be related later in this paper.

3.3. Presentation of Data

The Sacramento and San Joaquin valleys cover a large part of the interior of California. Two rivers, by those names, drain the valleys and the surrounding mountains. The west side of both valleys is comparatively arid, while the east side is well supplied with streams, some of which are quite large. It is into these streams on the east side that the salmon run to spawn.

It is estimated that there are (1928) 510 linear miles of stream beds suitable and available for spawning grounds. As nearly as can be estimated, previous to any obstructions in the streams, there were at least 6000 linear miles of stream bed suitable and available to spawning salmon. At least 80 per cent of the spawning grounds has been cut off by obstructions.

There are (1928) eleven dams in the San Joaquin system that are a hindrance to salmon or are a complete barrier. (See Fig. 14.) Six of these dams have fish ladders that are working; one has a ladder that is not in working order; the rest, being too high, are without ladders. At two of these dams the diversion ditches have adequate screens,[8] and at one other dam some of the canals are partly screened.

There are thirty-five dams in the Sacramento system that directly or indirectly affect the salmon migration. (See Fig. 15.) of these, sixteen have working fish ladders, and at eleven of these dams the ditches have adequate screens; four of the ladders in the system are under construction or repair. It has also been determined that the available spawning grounds do not support as large a population of spawning fish each year as they are capable of doing.

The salmon spawning migrations in these two rivers occur about the same time as in the past years. The spring run is on during April, May and June. The fall run is during August, September, and October.

The salmon have decreased tremendously in all the streams except one or two, where they are reported to be holding their own or even increasing. (These streams have very late runs and most of the fish come up after the commercial season on salmon is closed.) The abundance of salmon is taken up more fully in Part I of this paper and also under the detailed account of the streams, which will follow.

[8] The Bureau of Hydraulics of the Division of Fish and Game of California has had great difficulty in enforcing the screen and fish ladder law, and has worked under hardships with a few men to cover the large area of the state. However, under a new direction the work is being taken care of as fast as time permits.

3.4. Obstructions

A word on the history of obstructions seems to have a place in this paper. Information on the early development of power and irrigation projects is hard to obtain, but enough can be had to get a general outlook on the problem. Before power and irrigation dams were so much in evidence, the streams were obstructed with crude barriers thrown up by the early gold seekers. These barriers formed reservoirs to supply water power to the hydraulic mining operations throughout the California gold area. Besides obstructing the streams these mining operations made the rivers boil with mud and silt.[9] . It is a wonder that during this period any salmon got to the spawning beds, much less the eggs being able to hatch in such muddy waters. Some of the dams that are used today are reconstructed on the sites of these gold mining makeshifts. So, really, the days of forty-nine were the beginning of obstructions as far as fish were concerned. In the eighties, water power projects made their first appearance. In 1899 the Colgate and Nevada plants were constructed on the Yuba River. In 1895 the dam and plant at Folsom on the American River was built. The water used for irrigation came from small diversion dams built by the farmers themselves. After 1900 a number of power and irrigation projects were constructed, but the major portion of the large irrigation and power dams have been built since 1910. Such being the case, it coincides closely with the decrease of the salmon from 1910 on to the present (1928). It would seem that, as the dams have increased, the fish have decreased, although, of course, other factors have had a part in this depletion.

3.5. Details of each stream

As a source of information for future workers in the field and for the people who live in the localities discussed, a detailed account of the streams in the two river systems in which salmon run, will be given.

The San Joaquin River originates in the mountains east of Fresno. It drains the San Joaquin Valley and surrounding high country from Fresno north to San Francisco Bay, where it unites with the Sacramento River. The eastern side of the valley is drained by the Merced, Tuolumne and Stanislaus rivers. The west side of the valley is almost arid, having no streams of importance.

San Joaquin River, Fresno County (above the Merced River): The salmon of this river run in the spring[10] (the water is too low for the fall run). The spawning beds extend from the mouth of Fine Gold Creek to Kerchoff Dam and in the small streams of that area. Actual length of beds is about 36 miles. There are a few scattered beds below Friant. Four dams affect the salmon on this river. The lowermost is the Delta weir in a slough on the west side of the river, 14 miles southeast of Los Banos. The weir is about 10 feet high, 30 feet wide; a fishway on one side is in working order but there are no screens on the ditches. Stevenson's weir is on the main river directly east of the Delta weir. The

[9] Water that has a great amount of sediment in it will cause adult salmon to die or turn back because of the mud in the gills stopping respiration. When enough silt collects on eggs in the water, they die for want of oxygen.

[10] The spring run is during the months of April, May and June. The fall run is during September, October and November. The salmon spawn from September to December.

Yuba River, in Yuba County: This river has a fall run with a slight spring run occasionally, while the spawning grounds extend from the mouth of the river as far up as the town of Smartsville. Some salmon go up farther, but very few, as the greater run is in the late fall.

There is a dam known as the Government barrier, near the town of Hammond below Smartsville, which is for the purpose of catching the sediment caused by the mining and dredging operations above on the river. There are two fishways around this dam, one for low water and the other for high water. The fishways were destroyed by floods in the winter of 1927–28, but will be repaired. However, it is reported that few salmon go past this point to spawn. On the south fork of the Yuba River directly north of Nevada City is the Excelsior Dam, a power project built in 1912, and has a good fish ladder and screens. The other dams along the river were either washed out or badly damaged during the high water and flood of the winter of 1927–28.

Very little could be learned as to the amount of salmon in the river during past years, but recently the salmon have been holding their own and not decreasing. The river near its mouth is very muddy, being brick red in color and would seem to indicate that fish could not survive, but apparently they do.

Feather River, in Yuba, Butte and Plumas counties: It has a spring and fall run of salmon. The main spawning beds extend from the mouth of the river to Oroville, a distance of 30 miles. The spring run goes up into the four branches until the fish are stopped by dams.

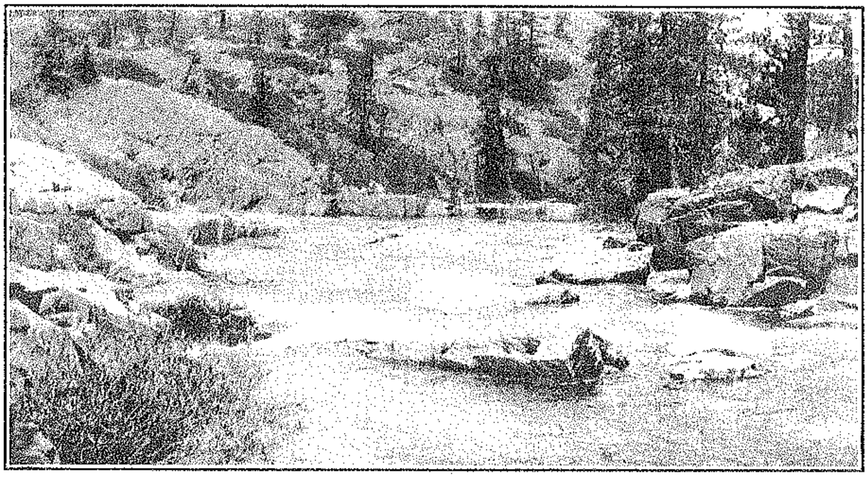


FIG. 18. Yuba River near Donner Pass. June 30, 1924. Photo by J. O. Snyder.

FIG. 18. Yuba River near Donner Pass. June 30, 1924. Photo by J. O. Snyder

Salmon spawn along these streams on the gravel bars. Almost all parts of the river which are not barricaded by dams are suitable for spawning grounds.

The Sutter-Butte Dam (see Fig. 19), the lowermost on the Feather River, is 6 miles below Oroville. It is an irrigation diversion dam about 5 feet high, having a fishway that is reported by the local people to be ineffective, but seems to do the work. There are no proper screens on the intake ditches.

The Miocene Dam is on the west fork of the river near the town of Magalia. The dam is a Pacific Gas and Electric power project 12½ feet high built about 1914, having no fishway or screens.

The Stirling City Dam is on the west fork, near the town of that name. It is an old dam about 8 feet high, that has been patched up to divert water to a power house. There is a fish ladder but it is of no use in low water. Salmon never get this far up the river. The ditch is provided with a revolving screen and sump arrangement.

Another dam of the Great Western Power Company is on the north fork of the Feather River. This dam is on the upper curve of the "Big Bend" where it diverts the water across the hill to the lower end of the bend and the power house at Island Bar. This dries up the river for a number of miles at low water periods, and of course stops the salmon before they get to the fish ladder at the dam.

As far as could be ascertained, the middle fork of the Feather River is without barriers which would hinder salmon.

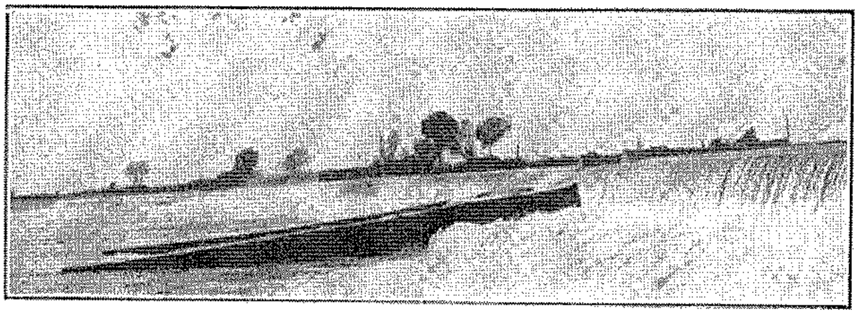


FIG. 19. Sutter-Butte Dam, Feather River, below Oroville. November, 1928. (Notice the fish ladder.)

FIG. 19. Sutter-Butte Dam, Feather River, below Oroville. November, 1928. (Notice the fish ladder.)

On the south fork of the Feather River there are two dams, owned by the Palermo-Wyandotte irrigation district. Dam No. 2 is on the main fork and has no fishway. No. 1 on Lost Creek takes nearly all the water from the south fork during the summer months.

The runs of salmon, both spring and fall, used to be very heavy in the Feather River previous to the building of obstructions. It is true that the mining operations in the early years may have reduced the amount of fish somewhat, but the building of dams has almost destroyed the spring run. The fall run is large, although not extremely abundant, and has fallen off in the last few years. It is possible from what the inhabitants say that there is a three or four year cycle for salmon in the river.

Butte Creek, in Butte County: It is a tributary to the Sacramento River, flowing through a very fertile section of the valley, and has been known as a very fine salmon stream and as a good spawning ground. There is only a fall run in the creek as the water is very low and warm in the summer. The salmon that enter the creek now, spawn in the upper reaches if they can run the gauntlet of irrigation dams and ditches.

Exhibit 5

DECLARATION OF DAVID STEINDORF

I, DAVID STEINDORF, declare the following:

1. I submit this declaration in support of Butte County and American Whitewater's Comments on the Draft Environmental Assessment.

2. The facts stated herein are known personally to me. The opinions set forth in this declaration are a result of and are offered as evidence herein pursuant to my education, training and experience, and as to said opinions, I am informed and believe them to be correct. If called as a witness, I would and could competently testify to all of the aforementioned facts and opinions set forth herein.

3. I received a Bachelors of Arts degree in Economics from California State University, Chico in 1985.

4. I received a Master of Education degree from California State University, Chico in 1998.

5. I am currently the California Stewardship director for American Whitewater (AW).

6. I formerly was employed as a recreation consultant for several hydroelectric utilities in the Western United States, including, PG&E, SMUD, Pacificorp and AVISTA, for a combined total of 5 years. During the time I was employed as a recreation consultant, I participated in 15 recreational in-stream river flow studies, as well as studies on angling, flat-water boating and aesthetics.

7. I am an avid participant in outdoor recreation. I have participated in a variety of activities, including paddling, angling, and cycling, as both a recreationist and as a

professional guide/instructor.

8. I was employed in the outdoor recreation retail industry in a number of areas, including marketing, purchasing, and analyzing retail trends; and have acted in a number of capacities, including management from 1997 to 2002. As a result of my experience in various areas of recreation and the outdoor recreation retail industry, I have become familiar with recreationists and their preferences, habits, customs, and consumer profiles within a number of outdoor sports.

9. I have had extensive experience in the area of flatwater and whitewater boating recreation, having been involved in flatwater and whitewater boating activities for 15 years. As a result of my experience in flatwater and whitewater boating activities and my experience operating an outdoor retail paddle sports facility, I have become familiar with the various forms of whitewater boating, such as kayaking and whitewater rafting, the various skill levels necessary to undertake these various forms, the equipment necessary to undertake these various forms and the expense involved in purchasing and/or renting such equipment.

10. In the last 15 years I have boated in whitewater on approximately 40 rivers in the United States, including approximately 30 rivers in California. My riverine boating experience has allowed me to become familiar with the type of in-stream river flow conditions which are optimal, or at the least necessary, for whitewater boating. Through my experience I have also become familiar with gradient, in-stream river flow levels and other river conditions which are desirable/necessary in order for such activities to be conducted. This includes familiarity with the various skill levels or "classes" of river runs, and where those various classes of runs can be found in California during different times of each year.

11. Further, as a result of my experience, I have become familiar with the annual hydrologic cycle in Northern, Central and Southern California, and also with average seasonal in-stream river flow levels in almost every river in those regions upon which whitewater boating on a regular basis. Finally, as a result of my experience, I have become familiar with the four basic categories of "water year type" generally used to compare relative annual precipitation levels – extremely dry, dry, normal and wet – and how the relative precipitation levels which occur within those four water year types seasonally affects in-stream river flows in said rivers and various reaches of those rivers.

12. As a result of my interest in flatwater and whitewater boating and my occupation as a recreation consultant for hydroelectric utilities, I have participated in 17 FERC relicensing proceedings for hydroelectric projects over the course of the last 10 years. In the course of my participation in these relicensing proceedings, I have conducted or reviewed historic in-stream river flow studies and analyses on 17 California river reaches, including the North and South Fork Feather River, the American River, the Rubicon River, the Pitt River, Silver Creek and Gerle Creek.

13. I have represented AW on the Feather River for ten years. During that time and in that capacity I have been extensively involved with the relicensing of every project which has been relicensed, or for which a relicensing proceeding has been commenced during that time on the Feather River, including FERC projects 1962, 2105, 2100 and 2107, and I have personally signed every FERC project settlement agreement that has been reached in the Feather basin during the last 10 years.

14. As a signatory of the Rock Creek/Cresta (P-1962) Settlement Agreement, I am

currently a member of the Rock Creek/Cresta Ecological Resources Committee (ERC), which is charged with the implementation and management of environmental and recreational mitigation/enhancement measures within that project. The ERC meets monthly. In the five years since that license was issued I have missed fewer than five meetings. I have conducted extensive reviews of the studies that have been done on every FERC project in the Feather basin, to evaluate the impacts of recreation flows. The ERC has not, as of this date, made any determination concerning the impacts of recreation flows.

15. My whitewater boating experience on the Feather River includes the following: (1) Rock Creek reach 50 times; (2) Cresta reach 25 times; and (3) Poe reach 7 times. Based upon my extensive whitewater boating experience on the Rock Creek, Cresta and Poe reaches, I am intimately familiar with those reaches.

Whitewater Boating Potential at the Poe Reach

16. The Poe Hydropower Project impacts a nine-mile reach of the North Fork Feather River just downstream of the Cresta Reach. Under the current license conditions the project offers almost no whitewater recreation. The current base flows of 100 cfs are far too low to provide whitewater boating. Hydrologic analysis has shown that even the infrequent spill flows that occur in the winter and spring are too erratic to provide for safe whitewater boating. These project-induced rapid flow fluctuations during spill events, combined with base flows that are less than ten percent of the natural hydrograph, create a total loss of whitewater recreation on the Poe Project. This loss is not mitigated by the limited boating opportunities on the Rock Creek-Cresta and Seneca reaches.

17. Based upon my professional and recreational whitewater boating experience and

my experience as a recreational consultant in many relicensings, it is my opinion that, unlike most of the rivers in California, if the in-stream river flows of the Poe reach of the North Fork Feather River were not impaired by PG&E's hydroelectric facilities, which divert over 90% of in-stream river flows in the Rock Creek, Cresta and Poe reaches (on an annual basis), the high summer base in-stream river flows of the Poe Reach would provide very high quality whitewater recreation throughout the summer months. Further, if winter and spring spills were regulated to lessen the flow variability which presently poses a danger sufficient to prevent safe boating, there is a possibility of year-round boating.

18. The Poe reach contains a 4.5 mile Class V section and a 4.5 mile Class III section. Based upon my experience, it is my opinion that having two such runs of different difficulty in such close proximity is highly desirable, for the reason that groups with varying ability levels can find "something for everybody" without having to travel to different locations. Further, commercial rafting potential on the lower run will give access to the general public on this unique resource.

19. Based upon my experience, it is my opinion that these reaches have a more remote wilderness feel than other runs on the North Fork Feather River because they are not immediately adjacent to highway 70. Hence, recreationists accessing these reaches are not faced with the safety issues of fast moving traffic, as they are on the Rock Creek and Cresta reaches upstream of the Poe project. Further, the close proximity to Oroville, Chico and other population centers will make these reaches two of the most accessible whitewater reaches in Northern California.

20. Finally, any notion that there is an abundance of whitewater opportunities during the summer months in Northern California, or in the west, is simply false. The popularity of the whitewater releases on the Rock Creek and Cresta Reaches is clear evidence that there is high demand for these resources. On the Rock Creek and Cresta Reaches the number of boaters exceeded the trigger numbers required to add additional boating days during virtually all of the late summer months. What has been even more astounding is the great distances boaters have traveled from, including Oregon, Washington, and Utah - nearly every corner of the western United States - and some from further east.

Indices of Hydrologic Alteration Analysis

21. In its New License Application PG&E calculated pre-project, in-stream river flows by entering "synthesized" in-stream river flow data for the period from 1974 through 2000[1] into a model developed by The Nature Conservancy (TNC) entitled "Indicators of Hydrologic Alteration NLA" (NLA IHA analysis). NLA, Appendix B2, p. 1. I conducted an in-depth review of the NLA IHA analysis.

22. Kevin Colburn, National Stewardship director for AW, and I recently conducted our own Indicators of Hydrologic Alteration (IHA) analysis for the Poe Reach (AW IHA analysis). Our methodology consisted of entering actual in-stream river flow data from the United States Geological Service (USGS) in-stream river flow gage at Pulga which is within

[1] Rather than use actual river flow data obtained from the above referenced USGS gages over a 94-year period, the licensee opted to use artificially created ("synthesized") river flows allegedly occurring over the above 27-year period. There is no justification in the NLA for utilizing this particular period. The NLA describes the "synthesization" process as using a "mass balance technique," combined with a "smoothing process ... to compensate for ... errors." NLA, Appendix B2, pp. 2-3.

Project 2107.[2] We compared data obtained from the Big Bend gage during the period from 1906 through 1910 and we entered data obtained from the Pulga gage during the period from 1911 through 2004 into the same model used by PG&E in the NLA IHA, and conducted model runs, with the following purposes:

a) Determining the character of annual pre-project historic in-stream river flows of the Poe reach;

b) Determining the character of annual post-project historic in-stream river flows of the Poe reach; and

c) Comparing our model run results (a and b above) with the results of the NLA IHA analysis.

23. Kevin Colburn entered the above in-stream river flow data from the Pulga gage into the IHA model.

24. I reviewed the above in-stream river flow data from the Big Bend gage into the IHA model.

25. The pre-project in-stream flow results of the AW IHA analysis were markedly different than the pre-project in-stream flow results of the NLA IHA analysis. The AW IHA analysis results indicate that the median monthly pre-project in-stream flows between June and October were significantly higher than those set forth in the NLA IHA analysis, as described below.

26. The AW IHA analysis shows that the median monthly in-stream flows for the period from 1911 to 1957 ranged from 1993 cfs in June to 1520 cfs in October. By contrast,

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[2] The USGS flow data is posted on the USGS website at http://www.waterdatausgs.gov/.

the NLA IHA analysis shows that the median monthly in-stream flows for the period from 1911 to 1957 ranged from 1825 cfs in June to 1143 cfs in October.

27. The AW IHA analysis shows that Project 2107-induced flow fluctuations are much larger than pre-project flow fluctuations. For example, the AW IHA analysis shows that the high in-stream flow median fall rate as regulated by the Project is 1422 cfs per day. This number is strikingly different from the pre-project high in-stream flow fall rate of 305 cfs per day. The greatly increased in-stream flow pulses appear to have substantial impacts.

28. During small flood events, the median fall rate pre-project was 409 cfs/day. By contrast, the post-project rate is 2514 cfs/day. Finally, for large flood events, the pre-project fall rate was 684 cfs as compared to 4624 cfs post-project. The NLA IHA omitted all fall rate data from flow pulse events.

29. Within the portion of the AW IHA analysis focused solely on the months of May and June, there is virtually no change to the pre-project/post-project ratios in every fall rate category set forth above.

<u>Project Impacts on Foothill Yellow-Legged Frogs</u>

30. I conducted an in-depth review of a foothill yellow-legged from (FYLF) egg mass survey conducted in both Project 1962 and 2107 reaches by GANDA in May-June 2006 (Poe-Cresta Egg Mass Survey, summary-J Drenan-7-11-06.). I compared the results of the above referenced survey with earlier surveys in the same areas. The 2006 survey indicates that during the 2006 season, a majority of the egg masses were laid at flow levels above 1000 cfs. A comparison of the 2006 survey with the earlier surveys indicates that in 2006, a comparatively large number of FYLF in the Poe reach found suitable breeding habitat at

significantly higher flow levels than those recommended in the NLA. This is consistent with both the AW IHA and the NLA IHA which indicate that the flows in the North Fork Feather in the spring of 2006 were very close to the pre-project flow conditions in which FYLF evolved for millennia.

31. I conducted an in-depth review of a FYLF tadpole survey conducted in Project 1962 Cresta reach by GANDA from 2002-2004. The table below, which shows the results of that study, shows an increase in the number of tadpoles at most locations after recreation "pulse flow" events.

Table 3.2-7. Pooled data comparisons of tadpole numbers found during VES on the Cresta Reach before and after recreational flows during 2002-2004. If two pre- or post-flow surveys were conducted around a particular recreational flow, these data were averaged.

TEST	# Surveys	Total # tadpoles before	Total # tadpoles after	Mean # tadpoles before	Mean # tadpoles after	Paired t-test t value	P
Tadpoles – all sites in July and August 2002-2004	42	88	106	2.1	2.5	-0.87	0.39
Tadpoles – all sites in July and August 2002-2003	26	74	97	2.8	3.7	-1.19	0.25
Tadpoles – all sites in July and August 2002	10	13	18	1.3	1.8	-0.91	0.39
Tadpoles – all sites in July and August 2003	16	61	79	3.8	4.9	-0.95	0.36
Tadpoles – all sites in July and August 2004	16	14	9	0.9	0.6	+0.85	0.41
Tadpoles – all sites in July 2002-2004	21	75	81	3.6	3.8	-0.33	0.75
Tadpoles – all sites in August 2002-2004	21	13	25	0.6	1.2	-1.05	0.31
Tadpoles – all sites in July 2002 only	5	7	14	1.4	2.7	-1.34	0.25
Tadpoles – all sites in July 2003 only	8	55	58.5	6.9	7.3	-0.23	0.83
Tadpoles – all sites in July 2004 only	8	13	9	1.6	1.1	+0.75	0.48

GANDA 2005, Table 3.2-7.

32. The 2002-2004 GANDA FYLF tadpole survey, results also indicated that only two tadpoles were found in isolated pools in three years of surveys on the Rock Creek and Cresta reaches. The above referenced survey categorized these tadpoles as "stranded" even though they were found in water. *See* GANDA 2005, p. 36. The survey indicated that the two "stranded" tadpoles could have been injured by predators. *See id.* I believe it would have been more accurate to characterize the tadpoles as "injured" rather than "stranded."

<u>Foregone Power Analysis for Recreational Flow Releases</u>

33. I conducted a foregone power analysis, as set forth below.

a) I obtained the following information from the NLA:

The design capacity of the Poe powerhouse is 3,700 cfs.
The maximum gross head is 493 ft.
The powerhouse capability is 120 MW.

b) Based on these numbers, I estimated the efficiency of the power plant by using the following formula: Efficiency = (120 MW*1000 kW/MW)/(3700 cfc), or .0324 MW per cfs

c) Assuming this efficiency value, I calculated the gross hourly power production by using the following formula: Power Per cfs/hr* flow =power production. The flow is equal to the release flow-base flow.

d) I obtained the following information from the NLA:

e) The cost of replacing power production foregone at the Poe Project in order to increase flow in the bypass reach is $56.20/Mw-hr.

f) I used this value to calculate power value for a range of releases on an annual basis. The average release schedule proposed by Butte County and the Boating groups was ten releases at 8 hours per day. I used the following equation: power value=power production*hours.[3]

34. Pursuant to the above foregone power analysis, I calculated the cost of forgone power for ten releases at 8 hours per day $145,297.30.

35. My assumptions are provided below.

---

[3] The power value formula does not calculate ramping rate for boating flow release or other purposes. The NLA does not propose a ramping rate. This power value formula may be adjusted to include a ramping rate, once proposed by the resource agencies.

Calculate Cost of Bypass Flows				
		Poe Powerhouse Rated Capacity (MW)	120	
		Poe Powerhouse Maximum Flow (CFS)	3700	
		Generation per 1cfs =	0.0324	MW/Hr
		Generation per 100 cfs =	3.2432	MW/Hr
		Generation per 1000 cfs =	32.4324	MW/Hr
		Release Flow	1200	cfs
		Minimum In-stream Flow	200	cfs
		Total Duration of Releases	80	Hours
		Forgone Generation =	2594.595	MWh
		Acre/Feet =	6611.6	
		Cost per Acre/Foot =	$21.98	
		Power Rate Per Mw/hr	56	
		Cost of Release =	$145,297.30	

Recreational Facilities

36. I visited the Sandy Beach area below the Poe Dam on Labor Day 2005. I took the 4 pictures in Exhibit B to this declaration, which accurately depict some of what I estimated to be about 500 college-age individuals in the Sandy Beach area below the Poe Dam, sun-bathing, swimming, as they appeared on that day. *See* Ex. 5.A. Based on my observations on Labor Day 2005, and an article I read in the Chico Enterprise Record (*See* Roger H. Alyworth, "Labor Day quiet: Sacramento River silent as crowds flock to the Feather," CHICO ENTERPRISE RECORD, (Sept. 5, 2006)); regarding similar crowds at Sandy Beach on Labor Day 2006, I believe additional facilities, including picnic tables, portable toilets, trash cans, parking, etc., are necessary to meet existing demand at Sandy Beach. I believe that lack of adequate facilities

at Sandy Beach and other project beaches is a significant limiting factor preventing families from engaging in outdoor recreation at the Project. Further as demand grows because of improvements at one location, there will be natural spillover into areas that are not as densely crowded.

37. For the reasons set forth in ¶¶ 20-21, it is my opinion that the ability for recreational users to assess Bardees Bar via Bardees Bar Road is critical to whitewater recreation on the Poe reach. Whether boaters choose to recreate on recreational release flows, base flows, or spill flows, they will need to access the reach via Bardees Bar Road. Bardees Bar is the take-out for the upper run and the put-in for the lower run. Bardees Bar is also one of only three roaded access locations for all recreational activities on the Poe reach.

38. I drove to Bardees Bar on Bardees Bar Road on June 11, 2006 and took the two pictures in Exhibit A to this declaration, which accurately depicts a culvert that has been washed out along the road, as well as the adjacent portion of the road, as they appeared on that day. In this area of the road, the road was barely passable, even by the 4-wheel drive I was driving.

39. If FERC were to order a project boundary adjustment which made Bardees Bar Road part of the Poe Project and the licensee were to upgrade and maintain Bardees Bar Road, so that it is safely and readily passable by two wheel drive vehicles, it is my opinion, based upon my above referenced experience, that these mitigations would result in the single most significant access improvement that can be made within the Poe Project.

40. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct, except as to opinions expressed

herein, and as to those opinions, I am informed and believe them to be correct, and that this declaration was executed this was executed this 18th day of September, 2006 at the office of the Butte County Counsel at 25 County Center Drive, Oroville, California 95965.

Respectfully submitted,

David Steindorf

Exhibit 5.A

200609195053 Received FERC OSEC 09/19/2006 06:25:00 PM Docket# P-2107-000

This area is known locally by Coed's as the Highway 70 Rope Swing. This is a picture of one such Coed on the rope swing.

Cars parked across from and adjacent to the Pulga Cal-Tran Station.

Cars parked across from and adjacent to the Pulga Cal-Tran Station.

200609195053 Received FERC OSEC 09/19/2006 06:25:00 PM Docket# P-2107-000

Sandy Beach, Labor Day 2005. The number of users on this one day would account for one quarter of PG&E's annual use estimate.

Exhibit 6

DECLARATION OF NATE RANGEL

I, NATE RANGEL, declare the following:

1. The facts stated herein are known personally to me. The opinions set forth in this declaration are a result of and are offered as evidence herein pursuant to my education, training and experience, and as to said opinions, I am informed and believe them to be correct. If called as a witness, I would and could competently testify to all of the aforementioned facts and opinions set forth herein.

2. I received a Bachelors of Science in Political Science from the University of California, Los Angeles in 1973. I received a Masters Degree in Business Administration from Pepperdine University in 1978.

3. I have extensive experience in the field of whitewater boating recreation, having owned and operated a commercial enterprise, as well as having been involved in the industry on a statewide level, as set forth below.

4. I have been involved in commercial river outfitting activities since 1982. Since that time I have participated in thousands of commercially permitted trips, both as a manager/owner and as a guide.

5. I have owned and operated my own river rafting business, Adventure Connection, in Coloma, California, since 1984.

6. I have represented outfitters in California on the America Outdoors board of directors since1989.

7. I have been President of an outfitters state trade association, California Outdoors, since 1990.

8. As a result of my experience in commercial whitewater boating excursions, I have become familiar with the various forms of whitewater boating, such as kayaking and whitewater rafting, the various skill levels necessary to undertake these various forms, the equipment necessary to undertake these various forms and the expense involved in purchasing and/or renting such equipment.

9. As a result of my education and experience in owning and operating my own business, as well as my experience in the industry, I have become familiar with spending patterns of whitewater businesses, and the various types of whitewater recreationist users and consumer profiles and spending patterns, as well as the overall economics involved in operation of a successful business.

10. Based upon my education and experience, it is my opinion that the majority of whitewater boaters are introduced to the sport and enjoy the sport through commercial whitewater rafting, as opposed to kayaking, for the simple reason that the majority of the public does not possess the skill or the equipment necessary to enjoy whitewater boating without a commercial outfitter.

11. Based upon my education and experience, it is my opinion that most river rafting companies require a minimum number of potential guests per whitewater season, in order to meet fixed expenses, which include permit fees, insurance, equipment costs, transportation costs and other expenses. That daily minimum is usually in the range of 18 to 24 people. Most rivers offering whitewater boating opportunities in California allow a range of group sizes per trip, with the average group size in the range of 24 people.

12. Based upon my education and experience, it is my opinion that the huge population centers in the Bay Area are located sufficiently near the North Fork Feather River, such that a new whitewater recreational opportunity such as "pulse flows" could become a sufficiently viable economic opportunity to support a commercial whitewater boating recreation enterprise.

13. Based upon my education and experience, it is my opinion that two weekends per month of releases on the Poe bypass reach would yield a sufficiently viable economic opportunity to support a commercial whitewater boating recreation enterprises operating whitewater boating excursions in the North Fork Feather River area.

14. Based upon my education and experience, it is my opinion that by introducing new whitewater recreationists who will buy goods and services, such as food and lodging, commercial whitewater boating recreation enterprises operating whitewater boating excursions in the North Fork Feather River area would provide significant benefits to the local economy.

15. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct, except as to opinions expressed herein, and as to those opinions, I am informed and believe them to be correct, and that this declaration was executed this 18th day of September, 2006 at 986 Lotus Road, Lotus, California, 95651.

Respectfully submitted,

Nate Rangel
President
CALIFORNIA OUTDOORS

Exhibit 7

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Article Launched: 9/05/2006 12:00 AM

Labor Day quiet: Sacramento River silent as crowds flock to the Feather

By ROGER H. AYLWORTH - Staff Writer
Chico Enterprise-Record

Usually the measure of success for a public event is how many people came, but for Labor Day 2006, activity on the Sacramento River was a success because functionally nobody showed up.

While in years past as many as 20,000 revelers packed the Sacramento, Monday saw less than 200 in the river by 3 p.m.

"From the years of 20,000, it's changed a lot," observed Tony Burdine, retired Butte County sheriff's lieutenant, who is liaison with the county's search and rescue team.

Near Scotty's Landing on River Road, where earlier years have seen thousands of hot tired -- often drunk -- tubers straggle ashore, Monday the beach was all but empty.

For Angela Deason of Chico and Rueben Best of Willows, who came ashore at about 1 p.m., their first float down the Sacramento was both what they had anticipated and a total surprise.

"It was exactly what I expected. It's fun, relaxing," said Best.

"I thought there'd be tons of people here, actually. We didn't see anybody tubing," said Deason.

"There's more cops out there than there was people. It's crazy," continued Deason.

Crowds on the Sacramento were so minimal, that the throngs of law enforcement and support teams that had gathered by the river, were being released by early afternoon.

However, while things were ultimately quiet on the Sacramento, the Feather River off Highway 70 at Pulga, apparently was the place to be.

By 3 p.m. as many as 1,000 people were reported at a popular spot near Pulga, called Sandy Beach.

A Butte County Sheriff's Department helicopter was keeping watch over the crowd.

While there were no reports of specific problems, teams of sheriff's deputies were moved into the Feather River area in case they were needed.

Online extras

Delve deeper into Labor Day 2006.

-- **PHOTOS** - Browse through the E-R photo gallery at the Sacramento River, Sandy Beach and more.

-- **BLOG** - Read how the Enterprise-Record covered Labor Day as it unfolded in the Labor Day Live '06 web log.

The sheriff's helicopter also made swings over Butte Creek Canyon to see if some tubers had shifted to that stream for the annual float, but like the Sacramento, crowds were thin to nonexistent.

Chico police Lt. Tim Voris said the entire Labor Day weekend was quieter than his department had anticipated.

"There were a lot of people out, but I think on arrests, we were down from even last week," Voris said on Monday.

While the final numbers had not been calculated, Voris predicted the arrests for the entire Friday though Monday period would most likely be in the range of 80, which is not significantly larger than any random weekend.

Staff writer Roger H. Aylworth can be reached at 896-7762 or by e-mail at raylworth@chicoer.com.

Exhibit 8

Flathead Lake Biological Station
The University of Montana

311 Bio Station Lane
Polson, Montana, U.S.A. 59860-9659
Phone (406) 982-3301
Fax (406) 982-3201
http://www.umt.edu/biology/flbs

Date: November 8, 2004

To: Laura Norlander
Director, California Hydropower Reform Coalition

From: Dr. Richard Hauer
Professor of Limnology

Herein is my review of the draft report titled: Rock Creek-Cresta Recreation Streamflow Monitoring: 2003 Benthic Macroinvertebrate Sampling North Fork Feather River, Plumas County, CA - Rock Creek-Cresta Hydroelectric Project (FERC No. 1962) by Garcia and Associates, Inc.

Critique of Draft Report

Positive study attributes:

1. This is an interesting study and presents some excellent data. The central question of whether increased, periodic summer flows may cause a quantifiable, deleterious effect on the benthic community is reasonable. Aquatic insects are both a vital component of riverine food webs and, in general, have many species that are sensitive to various forms of stressors (e.g., modified temperature, change in flow regime, organic pollution, chemical pollution, etc.)

2. The field sampling methods and protocols, although not standard appear to be well considered and appropriate to the field conditions.

3. Laboratory methods for handling samples and identification of taxa appear to be sound. There is no reason to suspect that identifications are incorrect.

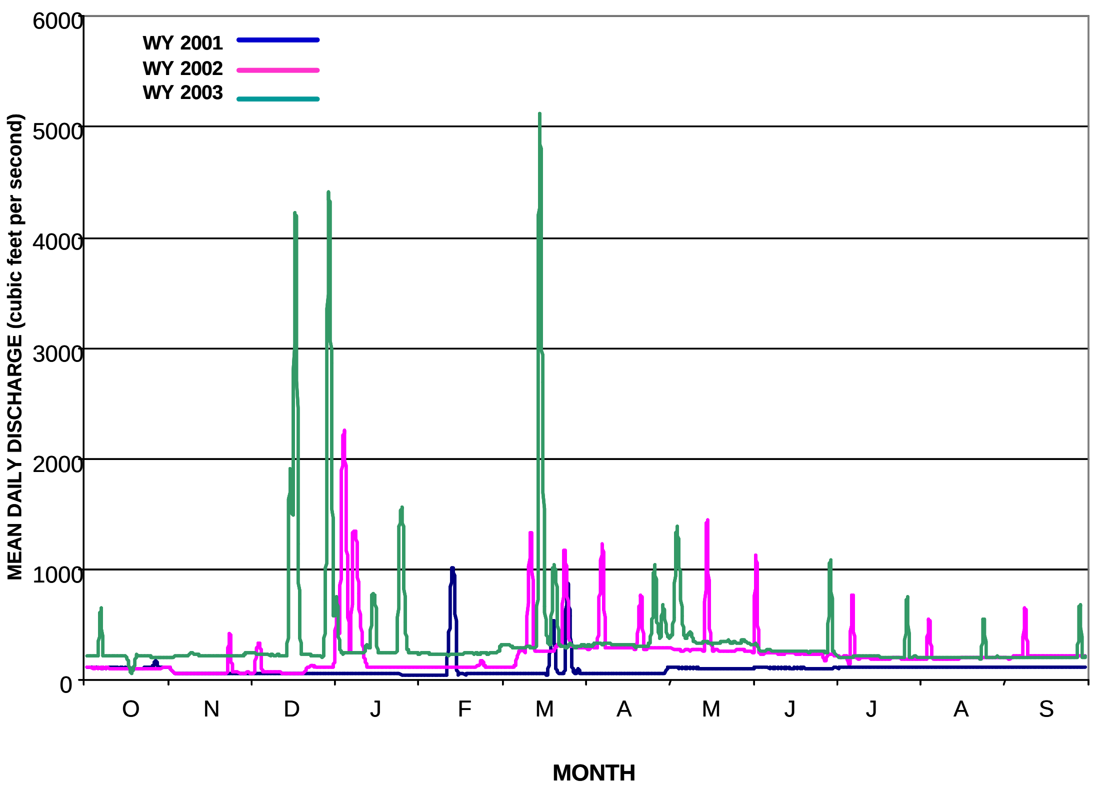
4. The statistical tools employed in the study (i.e., Chi-Square, indices of richness and similarity, Principle Components Analysis-PCA) are robust and can provide excellent insight into otherwise difficult data sets.

Study short comings:

There are several fundamental errors and study inadequacies that make this report incomplete. Without addressing the issues that are presented below, this report will be, at best, of little value or worse misleading. It is possible to address these inadequacies, but only through additional study design, data collection, analysis, and rewrite with appropriate interpretation based on the old and new data.

Here are the flaws that I think are sufficiently serious to make the report, at this juncture, inadequate in approach and over-reaching in its conclusions. This report, I believe, would not meet the criteria necessary to make it into the primary literature due to the following flaws.

1. The report refers to the previous study within the context of "catastrophic" drift. However, when I went to the USGS discharge records of the NFk Feather River for Water Years 2001 – 2003 I found the “recreational flows” to be approximately 1/2 the discharge of winter flows in WY 2002 and < 1/5 the discharge of winter flows in WY 2003. See figure below. These data indicate that the term "catastrophic" is misleading. Typically throughout the literature, catastrophic specifically refers to macroinvertebrate drift associated with flows sufficient to mobilize the streambed. The recreational flows of 2002 and 2003 do not meet these criteria. In short, the use of the term catastrophic is inappropriate and misleading.



2. Related to the above comment, the report completely ignores the hydrologic regime of the study site within critically important contexts. Without these contexts evaluation of the central question of the study are not possible. These contexts are: a) the period of record divided into pre- and post regulation, b) the recent record covering the last 5-10 years, c) the discharge record prior to the study period, d) comparison and contrasts between years and within years. The report ignores this and thus by omission implies that the recreational flows represent the major disturbance events of the year. This oversight is so egregious that makes the study in its current form of no value.

3. The report focuses on a single explanation (recreational flows) for change in the density of the benthic macroinvertebrates through the summer. It concludes that these flows result in damage to the ecological integrity of the macroinvertebrate (benthic) community. However, there are alternative hypotheses that may explain the decline in invertebrate abundance over the summer. For example, the unregulated streams/rivers throughout montane landforms in the west experience a significant decline in macroinvertebrate abundance and biomass compared to spring or late fall. This is not because of periodic increase in discharge, but rather is the consequence of the life history sequences of the dominant EPT species. There are additional alternatives that may explain the observed frequency decline. The report must address these other possible explanations for the results. (I emphasize that I do not question their un-transformed results. I just question their single focused explanation.) This study suffers from a classic case of pseudo-replication. This issue can best be addressed by having a study design that includes a river that is similarly regulated but without recreational flows and a similar river without regulation. The intensive effort on a single stream is not an appropriate study design to fully address the research question adequately. While it is impossible to find perfectly paired rivers for classic pair-wise experimental designs, it is possible to select rivers that meet the most basic criteria.

4. I found several of the statistical approaches that appeared to be either inappropriate or not fully explained so that I could make a complete evaluation of their appropriateness.

A) The first deals with the use of PCA. Ordination analysis is typically conducted on data from samples collected from spatially segregated sites that represent various gradients of physical, chemical, or biological interactions. Designs with samples collected across transects are not appropriate for this type of analysis.

B) Whenever data are collected over time from the same general locations or from placed rock-basket samplers in transects, as they are in this study, analyses should be done for ANOVA or MANOVA for repeated measures. These procedures are involved, but relatively straight-forward to conduct.

C) The report states: *"One month post-flow samples encompassed re-equilibration of the benthic community following flow-related disturbances, as the month between events was sufficient for the initial post-flow chaos to subside through redistribution and recolonization of invertebrates. As such, we believe that the one-month post flow data more accurately characterize flow-related impacts to the benthic community overall for a given event."* There is no specific logic given to this other than it is the belief of the investigators. It is completely unclear to me what the justification for this may be, unless they are arguing that some other factor (e.g., algal density, food resources, etc) are affected, which in turn has a direct or indirect delayed effect on the distribution and abundance of the macroinvertebrates. If this is true, then this is the first example that I am aware that a temporary increase in flow has such an effect. In contrast, we know for example that even short term reduction in flow often constrains the benthic community to the minimum flow channel due to high mortality in dewatered channel areas. However, this is not the case in this study.

Recommendations:

1. Review and evaluate some of the language used in the report. For example, even if the authors believe that they may be correct in their use of the term catastrophic drift, the term is inflammatory to the general public and likely unjustified.

2. The report must be placed in the context of natural hydrologic regimes of the region, as well as recent specific flows in the river under study. That this was not done is a serious flaw and without it a fatal flaw to the project. These data are available.

3. A serious oversight in the study design was to not have at a minimum at least a control (natural) river, preferably also another regulated river without the treatment flows. While this would require additional collection of data, to be definitive in interpretation and above reproach in conclusions, this step is necessary.

4. If ordination analysis is part of the study design, then the structure of the sampling protocols need to reflect this by avoiding transect type sampling.

5. While it may be justified to transform the data, it is inappropriate to transform data until you find one that gives statistically significant results. While this may not have been the case in this study/report, there is insufficient justification given for the transformations. The transformations need to be fully justified and explained.

6. Sampling designs in which data are taken from the same general location on repeated time frequencies requires MANOVA or ANOVA for repeated measures. Otherwise, the assumption of independent measures is violated.

Exhibit 9

Review of the Rock Creek-Cresta Recreation Stream Flow Studies

By

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The University of Montana

General Comments on Studies and Study Design

Taken as a whole, the series of studies conducted to evaluate the effects of recreational stream flows on selected ecological/biological resources in the Rock Creek and Cresta reaches of the North Fork of the Feather River were conducted with care and due diligence. Quality control appears to have been adhered to throughout the various studies. And, each study was conducted rigorously within the constraints established by the specific goals and objectives of each study. There is nothing fundamentally flawed with the data among any of the studies. There were some methodological weaknesses (e.g., the use of floating bongo nets in the macroinvertebrate drift study), but these were minor. In large part, I have little contention with the effort or the quality of biological work.

Nevertheless, there are substantive concerns with the overall study design and the constraints the objectives placed on the studies. These concerns fall into the following areas: A) scope, B) spatial context, C) recent temporal context, D) historic context, and E) lack of ecosystem synthesis.

A. *Scope* - These studies were highly focused to address the question, “Do whitewater recreational stream flows produced monthly from June through October have an effect on ………..?” Then insert into the research question whatever taxa (e.g., foothill yellow-legged frog, macroinvertebrates) or water quality attribute (e.g., turbidity) that is thought to be either ecologically important to the structure and function of the river reaches or is a species of special concern to the region. While this approach is extremely common in ecological studies, it has serious limitations. Unfortunately, too often these limitations only get recognized at the end of the study period as management decisions need to be made and the studies turn out to have been too narrow in scope to answer the broader questions that inevitably appear.

B. *Spatial Context* - Because the studies were all focused within the affected reaches, there is no broader context that might allow comparison reaches between recreational stream flows and reaches without these modified flows. Establishing sites outside the focal study reaches can present some complications in a study design, but these are generally overcome by locating control reaches either above the affected reaches on the same river or selected from among similar adjacent rivers. Adding both natural “control” reaches that have no regulation and reaches that are regulated similarly to the study reaches, but without recreational flows, would have added dramatically to statistical strength of the studies and to the confidence in final interpretation of impact.

C. *Recent Temporal Context* - These studies were focused on the dates surrounding each of the monthly recreational whitewater flows. Typically, flows were increased (ex: 2004) in the Rock Creek reach from a base flow of ˜ 280 cfs to a peak of ˜ 1900 cfs to ˜ 1200 cfs, depending on month. In the Cresta Reach these flows were from of ˜ 280 cfs to a peak of ˜ 1400 cfs to ˜ 1200 cfs, again depending on month. What was left out of each study and the analysis were the daily mean discharges in the study reaches during the years prior to the advent of recreational flows and discharges throughout each year of study period. I discuss the ramifications of this deficiency in greater detail below. However, it is important to realize that this colors all the research and its interpretation, from turbidity and sediment transport through the food web (macroinvertebrates) to fish and amphibians.

D. *Historic Context* – To fully appreciate the effects of recreational flows, a thorough analysis must consider the historic condition of the river reaches prior to dams and diversions in the Feather River basin. What was the likely bio-complexity and bio-productivity of the river system? Where did the highest species diversity occur? Where do the study reaches "reside" in the broad picture of environmental change in the basin?

E. *Lack of Ecosystem Synthesis* – River ecosystem structure and function and ecological integrity has been compromised in many rivers by serial discontinuities imposed on rivers by dams and diversions. Perhaps nowhere is the reality of this more acute than in the western USA, where water resources originate from mountainous headwaters, and are regulated for hydropower and diverted for irrigation and municipal water supply. Unfortunately, most studies designed to address the effects of one particular regulatory scheme or another are typically directed toward site-specific projects within small areas or with single disciplinary foci narrowly defined and confined to a few specific species that may be threatened-endangered or to species with sport or commercial interest. This leads inevitably to a species-by-species approach to regulated river schemes that have a poor record of success.

These deficiencies are perhaps most dramatically illustrated by the absence of a thorough analysis of hydrographic regimes that are typical for the river reaches being studied. While all the studies are focused on the recreational stream flows, the variation in stream flow during other times of the year were not mentioned. Such an analysis would not be (have been) difficult. Within a period of about 10 minutes I located and downloaded from the USGS website the discharge data for the period of record for the Rock Creek and Cresta reaches. I have plotted a selected portion of these data in the following 4 comparative graphs. This was done to illustrate the importance of the hydrographic context in which the studies were embedded. Without this context it is not possible to place the recreational stream flows into the array of disturbance events that play a role in controlling virtually all other variables, from channel character and turbidity to macroinvertebrate community structure or success of foothill yellow-legged frog populations.

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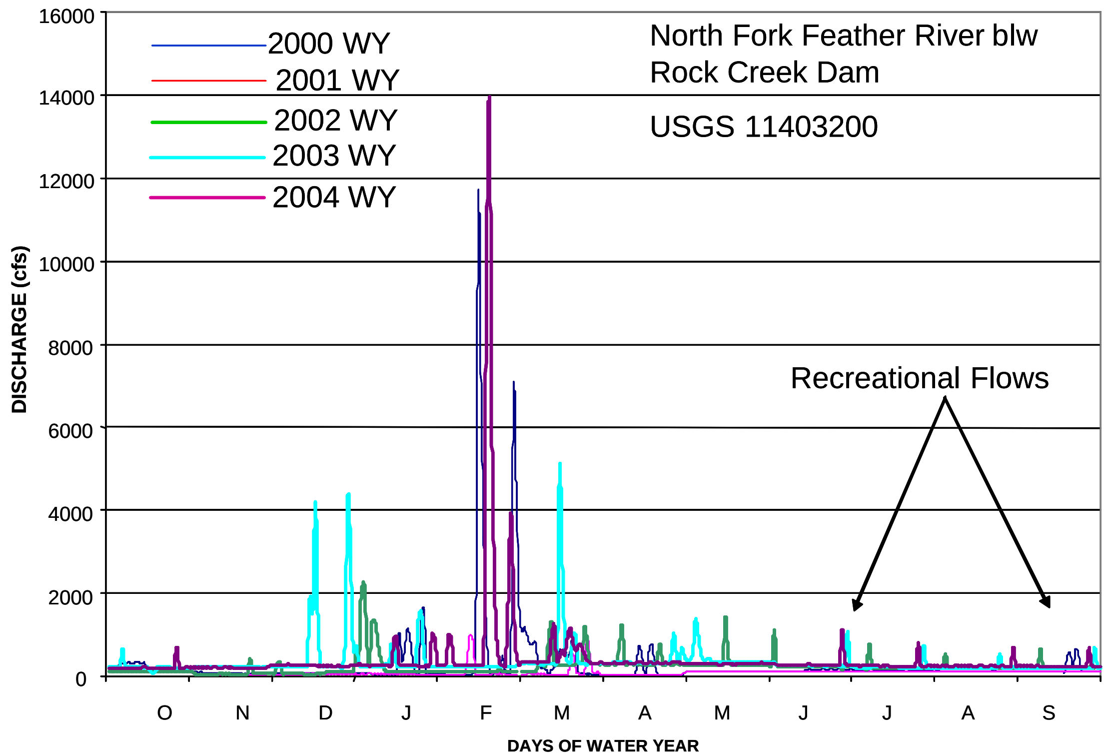
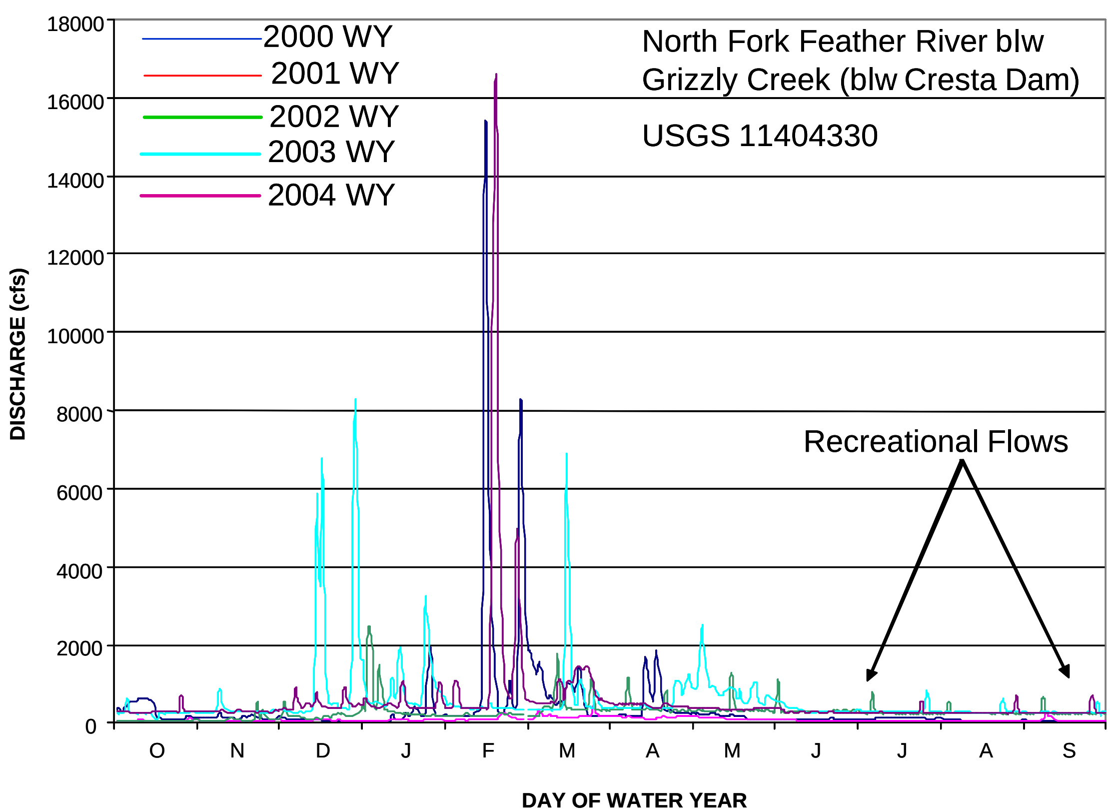
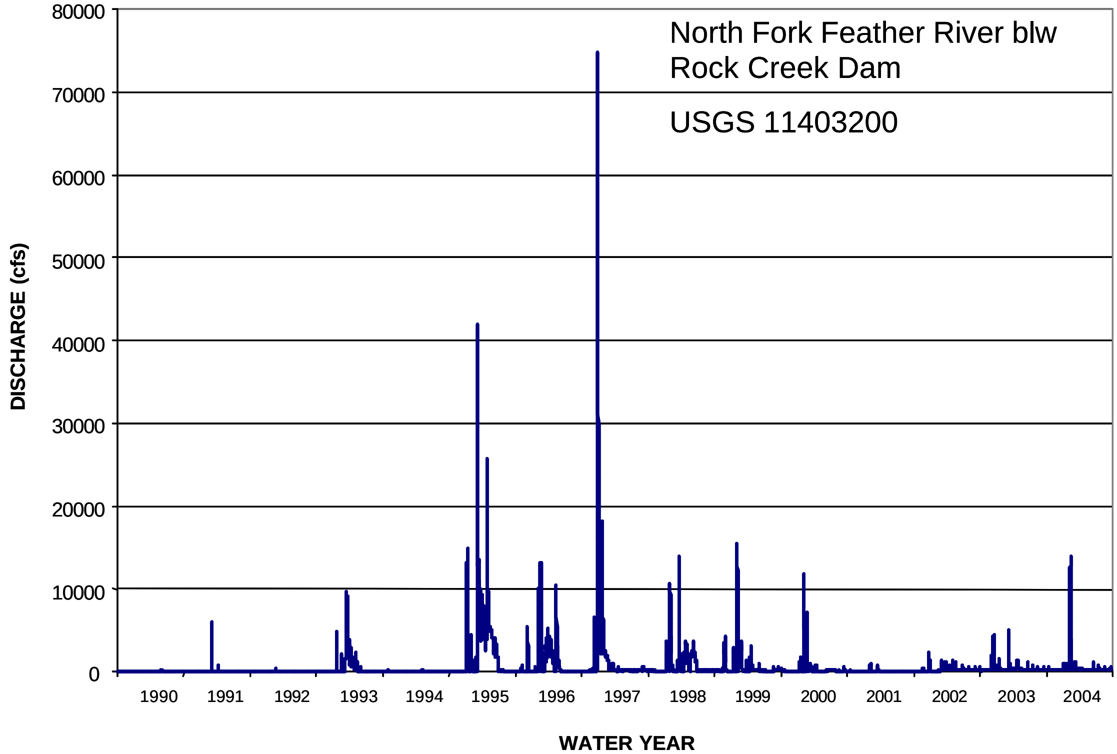
A



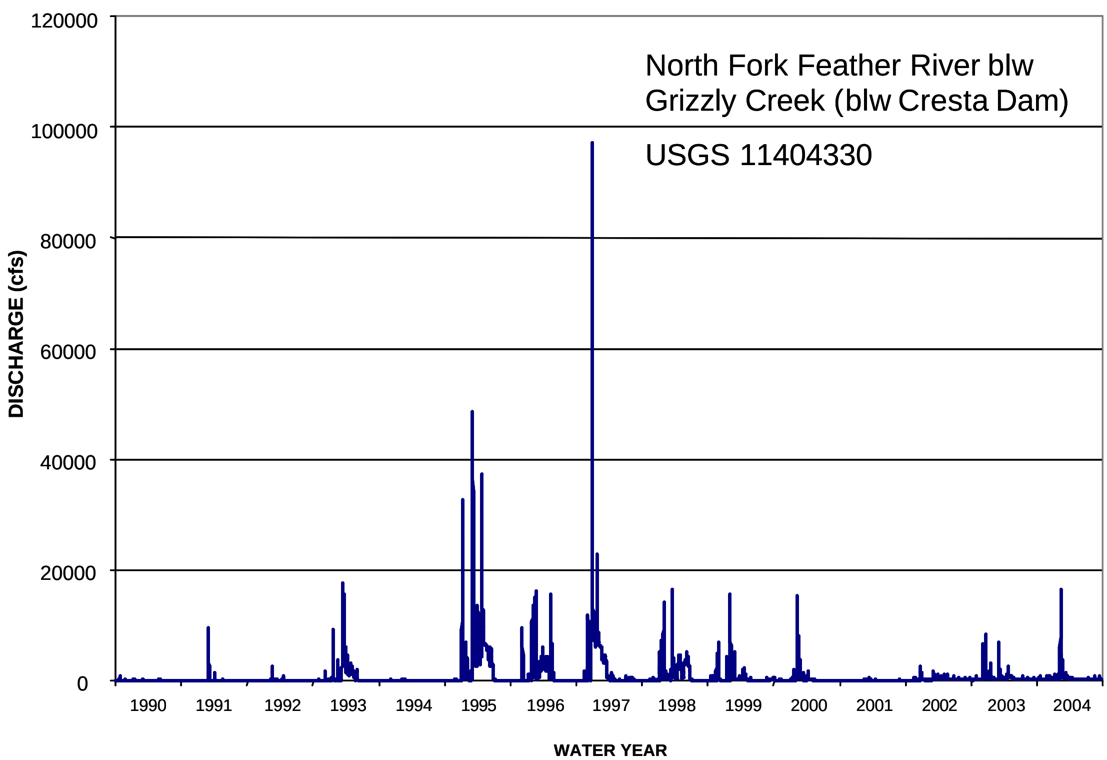
B



C


North Fork Feather River blw
Rock Creek Dam
USGS 11403200
DISCHARGE (cfs)
80000
70000
60000
50000
40000
30000
20000
10000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
WATER YEAR

D


North Fork Feather River blw
Grizzly Creek (blw Cresta Dam)
USGS 11404330
DISCHARGE (cfs)
120000
100000
80000
60000
40000
20000
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
WATER YEAR

In graphs A and B are the mean daily discharges for the Rock Creek and Cresta reaches for the 5 year period of October 1, 1999 through September 30, 2004. These are graphed as water years 2000 through 2004. During these five years the discharge at these sites exceeded the recreational stream flows by as much as 10X. In graphs C and D, the mean daily discharge is illustrated for these sites for the 15 year period, from water year 1990 through 2004. During this period the discharge in the Rock Creek reach exceeded 75,000 cfs and in the Cresta reach discharge exceeded 95,000 cfs. These graphs illustrate several fundamentally important issues that must be considered in the interpretation of the data and in the structure of river regulation and management. First, the summer recreational stream flows are minor when compared to the discharges that occur regularly in the N Fk Feather River. While these high flows did not occur each year, there is sufficient frequency of flows in excess of 4-5X the recreational flows to suggest that in no way are the summer flows that are the focus of these studies, bed-mobilizing flows.

While an examination of fall, winter and spring flow regimes cannot specifically address whether there is an effect of recreational flows in summer on macroinvertebrates, fish and selected amphibians, it does put disturbance, in general, into a more holistic context.

Review of Studies

I. Turbidity Study (Report # 026.11.05.13)

The objective of this study was to identify potential biological effects to fish species (with an emphasis on salmonids) that may result from elevated turbidity and settleable solids caused by the recreational flows. Emphasis here is that the study was on measures of turbidity and suspended solids, not on the effects of these variables specifically on fish. Rather the variables were measured at regular intervals during the recreational flows and the values compared to reviews and assessments available in the literature. This study was conducted in the summer of 2004. The study was focused on monitoring of turbidity and suspended solids in the Rock Creek reach on 6/27, 8/29 and 10/24 and in the Cresta reach 7/24, 8/28, and 10/25. Collection of data started about 12 hours prior to the ramp-up of recreational flows and continued until values were observed within 1 NTU of the background levels present prior to the recreational flow releases.

The study was conducted using standard methods, had excellent repeatability of measures and the analysis of the data were consistent with standard practices. Samples were collected at 5-minute intervals, which provides excellent resolution of change over time. Based on the study results as illustrated in Figure 3-1 of the report, there was a small increase in turbidity at sampling station RC1 below Rock Creek Dam (June 26-29, 2004) above background levels of ~ 1 NTU to ~ 5 NTUs followed by a rapid decline to near background levels prior to the maximum discharge. In contrast, turbidity at sampling station RC3 [abv Tobin Bridge] during these same dates increased from background levels of ~ 2.5 NTUs to ~ 34 NTUs. However, similarly to the RC1 turbidity values, turbidity at RC3 declined well in advance of maximum discharge [forming a positive clock-wise hysteresis]. Thus, while turbidity increases linearly with increased discharge during the rising limb of the hydrographic curve, turbidity declines rapidly as peak discharge is reached. This strongly suggests that increased turbidity is channel derived and is suspended from the river channel bottom as discharge is increased. This is further substantiated by the observation that "at least half" of the suspended solids consisted of "fluffy organic material." This is a common observation in streams that have sources of organic matter, either from autotrophy or aglutination of dissolved organic carbon that occurs while flows are low over an extended period. If there was any bank erosion or other sources of turbidity, then values would likely remain much higher longer through the increased recreational flow discharge events.

The suspended sediment values were compared with the Newcombe and Jensen (1996) impact assessment matrices to evaluate potential effect on salmonids. And, turbidity values were compared with the Newcombe (2003) impact assessment model (matrix) for Clear Water Fishes. In the study conclusions the report refers to the findings of Gregory (1992) that suggests that stress index scores are too generalized and/or conservative and that the stress index models consistently overestimate effects of suspended sediment on salmonids when the score is $\leq$6.

I conclude from the data presented, the evaluation of stress indices, and other literature on salmonids, that the turbidity values and suspended sediment associated with the duration and magnitude of the recreational flows have a minor to neutral effect on the salmonid population.

II. Benthic Macroinvertebrate Study

(with emphasis on the 2004 study as I have already commented on 2002 – 2003 studies)

The objective of this study was to determine whether increased, periodic summer flows may cause a quantifiable, deleterious effect on the benthic community. The study was conducted during 2004. The focus of the study was restricted to sampling around the summer recreational flows [not conducted throughout any other part of the year].

Macroinvertebrates are a vital component of riverine food webs. Most unpolluted rivers able to sustain salmonid populations have a robust and specious macroinvertebrate fauna. Within an array that may often exceed a couple hundred species, there are generally a suite of species that are very sensitive to various sources of disturbance or stressors. Thus, macroinvertebrates have been used extensively as indicators of stream or river ecosystem "health". One of the pioneers of using macroinvertebrates to assess impacts or as indicators of environmental quality is Dr. Vincent Resh, one of the reviewers on the Peer-review Panel. I will defer to Dr. Resh to elaborate on the potential utility of employing an Indices of Biological Integrity (IBI) to assess impact in this study.

The field sampling methods and protocols appeared to be well considered and appropriate to the field conditions. There are some inherent weaknesses to using rock-basket samplers and that is not the method I would have used, however, the work was well done and comparable data was generated. Quality control of field methods for handling samples and the laboratory sorting and identification of organisms appears to have been done competently with use of standard methods. Taxa identifications were quality controlled and voucher specimens were retained for a reference collection.

Related directly to the above discussion about annual context of the hydrographic regimes, the report completely ignores the hydrologic regime of the study sites within critically important contexts. To fully appreciate the context of the summer flows these reports should have considered: a) the period of record divided into pre- and post regulation, b) the recent record covering the last 5-10 years, c) the discharge record of the year or two just prior to the study period, d) comparison and contrasts between years and within years.

The report focuses on a single explanation (recreational flows) for change in the density of the benthic macroinvertebrates through the summer. It concludes that these flows result in damage to the ecological integrity of the macroinvertebrate (benthic) community. However, there are alternative hypotheses that may explain the decline in invertebrate abundance over the summer. For example, the unregulated streams/rivers throughout montane landforms in the west experience a significant decline in macroinvertebrate abundance and biomass compared to spring or late fall. This is not because of periodic increase in discharge, but rather is the consequence of the life history sequences of the dominant EPT species. For example [note: all examples given are common to the Rock Creek and Cresta reaches], in Montana the net-spinning caddisflies *Ceratopsyche cockerelli* emerge as adults in early to mid-July, while *Hydropsyche occidentalis* emerge in late August and early September. This has a major effect on benthic invertebrate abundance as organisms change from larval to adult forms. This is just one example of an alternative hypothesis that may explain the trend throughout the summer toward fewer benthic macroinvertebrates.

This issue could (and should) have been addressed by having a study design that included a river reach that did not have recreational flows, but similarly regulated. The exclusive effort on the affected river reaches is an inadequate study design to fully address the research question. While it is impossible to find perfectly paired rivers for classic pair-wise experimental designs, it is possible to select reaches that meet the most basic criteria.

III. Macroinvertebrate Drift Study

I have already commented on this study in a report to the ERC in November 2004. I will reiterate my main points here for the purposes of continuity.

The objective of this study was to determine the effect of recreational stream flows on the drift of benthic macroinvertebrates. This intensive macroinvertebrate drift study collected over 49,000 specimens from monthly, 5-day long sampling intervals between June and October 2002. Ecologists have known of macroinvertebrate drift as a phenomenon in running waters for nearly a half century. During the 1960's macroinvertebrate drift was one of the most intensively studied attributes of streams with several hundred papers being published on the subject. Thus, there is a rich literature available for reference, proper study design, and evaluation of the results within the context of a broad scope of ecological investigation across an array of sites and conditions.

Similarly to the benthic sampling, field and laboratory protocols were rigorously adhered. Field preservation techniques for the samples were within standard protocols. Laboratory methods for handling samples and identification of taxa appear to be sound.

As I commented on a year ago, Bongo nets, originally designed for sampling lakes for zooplankton, are not the preferred method for collecting macroinvertebrate drift (see Smock 1996). Bongo nets have several disadvantages that compromise study design and sampling. Bongo nets are not deployed independently. The study refers to this as pseudo-replication, of paired samples. However, the underlying problem with these collecting nets lies in the lack of control over the net deployment. It is well known that drifting macroinvertebrates do not drift in uniform densities either throughout the water column or across the river from bank to thalweg to bank. Rather, most macroinvertebrates drift near the bottom, particularly if this drift is more related to behavior than to unintentional drift. In this study the nets were kept at a constant depth from the surface of the stream across all discharges. Thus, as stream stage height changed with change in discharge, the nets were deployed at different elevations from the bottom. This has been shown to lead to erroneous results.

Drift density is usually best expressed as numbers of macroinvertebrates drifting per 100 m^3 of water (Smock 1996). Drift density, is calculated from samples that are taken from specific locations and are only compared to samples collected in the same way. Drift rate, which calculates density and normalizes it for change in stream discharge, is only legitimate if there is a sampling design structured to deal with the issue of different densities within different segments of the stream cross-section. This study was not so designed, thus comparisons between samples calculated for drift rate, as defined in the report, are not valid.

The term used throughout this study for drift during the higher discharges of the recreational flows is “catastrophic” drift. Catastrophic drift has a specific meaning. While the reports on macroinvertebrates argue that the recreational stream flows constitute a disturbance (based on the definition of Resh et al (1988). In my opinion, there is inadequate justification to specifically use the term “catastrophic.” Catastrophic drift does not refer to inadvertent drift caused by organisms being incorporated into the water column as they move around as part of normal feeding or foraging behavior on the substrate surface. Nor does it refer to drifting organisms that are caught in the current, but not immediately able to secure reattachment. Instead, catastrophic drift specifically refers to the drift associated with discharges that specifically mobilize the bed sediments. Clearly, this is not the case in the recreational flow regimes of 2002, when the study was done; nor for that matter in 2003 or 2004.

The vast majority of the macroinvertebrates that were collected in this study in June, and July were *Baetis tricaudatus*. This was replaced by *Simulium* spp. in August and September followed again by drift dominated by *Baetis tricaudatus*. *Baetis* nymphs are collector/gatherers and grazers feeding opportunistically on organic matter that accumulates in and around the substratum. They are a highly motile species; individuals undulate their abdomens and haired cerci rapidly in a dolphin-like swimming motion. They are strong swimmers able to move rapidly from rock to rock, often entering well into the water column as they swim. This behavior makes them increasingly vulnerable to downstream drift at higher current velocities. *Baetis* are often among the most common members of the benthic community that appear in drift samples.

Thus, elevated numbers of *Baetis tricaudatus* is should not be considered problematic or the result of catastrophic drift. In contrast, *Simulium* spp. larvae are usually extremely well fixed to their chosen substrate by a circular row of strong anal hooks. They feed on very small particles of organic matter transported by the stream flow. While they are vulnerable to predation on the upper surfaces of rocks, coarse wood, or vegetation hanging in the water, it would require a very large spate event to dislodge blackfly larvae, unless they intentionally release from their location. Such releases have generally been related to reduction in food resources or change in discharge, encouraging larvae to seek sites with increased food acquisition potential. In conclusion, it does not appear to me that the primary members of the macroinvertebrate drift are being incorporated into the drift leading to high mortality.

The phenomenon of macroinvertebrate drift has been extensively studied. Yet relatively little is known about total risk or specific predation risk. From an evolutionary perspective, all successful organisms exist because of their ability to balance risk with the bioenergetic principles of making an energy profit at the individual level. It was outside the scope of this study to determine overall risk or specific types of risk, thus it is also outside the scope of the study to over speculate on the consequences of increased drift.

IV. Foot-hill Yellow-legged Frog Study

The Foothill Yellow-legged Frog (*Rana boylii*) is a designated Federal and California "Species of Special Concern". Populations occur along the Coastal Ranges and the west slope of the Sierra Cascade crest in most of central and northern California. Because FYLF have been recorded at locations along the project area, a following study reviewed here was conducted to assess FYLF habitat and survey presence by visual encounter. FYLF Were observed in the Cresta Reach, but not the Rock Creek Reach.

The objective of the study was to assess amphibian habitat type, general river characteristics and cover associated with the water-land interface and to evaluate the effect of recreational flows on FYLF, in particular. During the surveys the study determined the onset and duration of FYLF breeding and rate of egg-tadpole-maturation development.

Habitat Assessment – The habitat assessment protocols appeared to be sensitive to major habitat variation and adequately described habitat condition at the various sites. It would have been helpful to have had some graphical or tabular summary of these data.

Visual Encounter Survey – egg masses. The frequency of egg masses in variation with river habitat and timing precluded the June 2004 recreational discharge in the Cresta Reach as egg masses were discovered in mid-May of that year. Egg masses throughout the study were typically found relatively close to shore (average of 2.4m) and in water that was relatively shallow >36cm. During snorkeling surveys in 2003 and 2004, observers found egg masses an average of 3.4 m from shore and at a maximum depth of 46cm.

Visual Encounter Survey – tadpoles. Tadpoles were first observed in the Cresta reach in 2004 in early June. Large-tads were observed in late July and again in late August during the recreational flows. Recently metamorphosed juvenile frogs were seen in late August.
Disturbance Factors – The study found that the primary source of predation and disturbance to egg masses was done by signal crayfish. Crayfish were observed feeding on egg masses with what appears to be high frequency.

Benthic Detritus – Tadpoles of FYLF feed primarily on algae and attached diatoms. However, they also apparently use detritus for cover along shallow river habitats. Detritus was apparently transported from these shallow water habitats by the recreational flows. This observation, as part of the FYLF study is corroborated by the results of the Turbidity Study. Apparently, the recreational flows mobilize detritus forming the observed “fluffy” organic matter that composed a significant portion of the suspended solids. It is likely that a significant percentage of this material is transported out of the study reaches rather than simply mobilized and redeposited, since turbidity values declined precipitously prior to the declining limb of the recreational flow hydrographs.

Stranding – This study showed no strong evidence that large tadpoles were affected by the recreational flow events. Only a “search-and-rescue” draw-down as part of a recreational flow resulted in recorded stranding.

V. Stranding and Displacement Study

The objectives of this study were to 1) evaluate displacement of fish (primarily juvenile) resulting from recreational stream flows and 2) determine the frequency of stranding of fish, tadpoles, and macroinvertebrates during and following recreational flows.

The displacement surveys were conducted visually by two snorkel divers counting the frequency of fish observed within 24 hrs before and after recreational stream flows. Divers conducted replicate counts by repeating censuses counts of fish along specified river lengths with divers switching areas counted. While there are several factors that affect the repeatability of visual survey of this type, the results using unbiased “blind” recording of counts (i.e., the divers are do not know what the other diver recorded until after the replicated survey) had remarkably consistent replication between divers.

Results of the displacement surveys (Figures 7, 10, 13, 16 and 19) showed no consistent pattern of change in fish abundance that could be associated with the change in stream flows. Neither fry nor juvenile rainbow trout appeared to be adversely affected by the recreational flows. Counts were as often as not to be higher after the flows as before. The conclusion of the study was that the results “failed to show any consistent or appreciable changes in the number of resident fishes from the monthly recreation flows.”

The standing surveys were similarly rigorous. During the five monthly evaluations in 2004, the surveyors moved over 27,000 rocks and found only 204 stranded macroinvertebrates 137 fish and no FYLF tadpoles. Most of the stranded macroinvertebrates were very mobile crayfish and pond snails. Interestingly, neither of these taxa were recorded as part of the drift in the macroinvertebrate drift study.

Most of the fish that were stranded were cyprinid and catostomid fry. It was noted that by summer flows, the trout fry were of sufficient size that they were capable of avoiding stranding during the ramp-down following the recreational flows. The summary of the report stated that impacts due to stranding appeared to be minimal.

Summary

1) The Turbidity and Suspended Solids study showed that there is a measurable decrease in water clarity and that material that is primarily made up of flocculent organic matter, loosely attached algae and fine silt and clay particles are easily transported by the recreational stream flows. The loss of water clarity is for short duration with a likely minimal effect on fish.

2) The benthic invertebrate studies of 2002, 2003 and 2004 show little to no difference in before and immediately after recreational flows. One may conclude that macroinvertebrates tend not to be physically displaced from the benthos as a result of the higher flows, and there is no measurable direct effect on the benthic community.

3) The long term trend each summer toward a decrease in the benthic community may or may not be due to the recreational flows. The studies, as designed, are not capable of resolving this. There are many other alternative hypotheses that may explain the declining trend. To firmly get at this answer will require direct between-stream comparisons of the Rock Creek and Cresta Reaches with a natural unregulated stream and a regulated stream without recreational flows.

4) The 2002 drift study shows an increase in drift associated with the recreational flows. However, there is no evidence that this is deleterious to the benthic community or that it has any affect on fish or riparian populations. Referring to this a “catastrophic drift,” I believe, is unwarranted.

5) The foothill yellow-legged frog survey revealed the primary piece of evidence suggesting that there may be some substantive effect to the recreational flows. This comes about primarily as a result of mobilization and flushing of very fine detritus from nearshore shallow waters that appear to be the primary habitat for frog tadpoles. The detritus may serve as cover for tadpoles that are easily caught by visual-search predators.

6) The displacement and stranding study indicated that these variables appear to have minimal effect on fish, tadpole or macroinvertebrates. Fish fry and juvenile numbers appear to be similar along specified study segments before and after the recreational flows. Likewise, very few organisms appear to be stranded following ramp-down of the flows.

6) Given these data, it does not appear that the recreational flows, as they were conducted in 2002, 2003, and 2004 had a significant negative effect on the benthic macroinvertebrate community. I found this surprising, as it is not what I would have anticipated. This makes sense, however, as you examine to long term hydrographic regimes. Stream ecosystems evolved over millennia to be able to respond to short-term relatively minor stressors. And, in fact may respond positively to intermediate levels of disturbance that help maintain biodiversity and complexity. The relatively small increases in discharge for short duration that does not mobilize the large bed-sediments, are not unlike naturally occurring short-duration rain storms that result in short-duration increases in discharge.

Addendum – answers to specific ERC questions

From Dave Steindorf
1. *What is linkage between juvenile recruitment of FYLF in 2004 to search and rescue events?*
Only that the search and rescue events lowered the discharge <u>below</u> the extended baseflow before the recreational flow event. Search and rescue, as I understand it, was for someone that had been in the river using the whitewater event; thus, the temporal proximity. The discharge being drawn below the baseflow may have resulted in greater stranding mortality because of the rate of the drawdown and the extent of the drawdown by drafting long-term habitat.

2. *If the concern over more rapid flow fluctuations is the potential for stranding, would you expect this to be reflected in the stranding studies?*
I would have expected they would. However, that does not appear to be the case. Thus, there may be alternative explanations that may relate to a complex array of factors.

3. *What type of algae do tadpole eat?*
Tadpoles eat various forms of algae, including diatoms as well as dead material as organic detritus.

From Jerryman
1. *How do you resolve the differences in the graphs illustrated on Page 47 and 49 of the 2004 macroinvertebrate study?*
The strong differences are primarily related to the June pre-flow and what is essentially the July pre-flow abundances. I believe these may be as much attributable to natural changes in abundance as affected by life history events as they are attributable to the consequences of flow.

2. *An analysis and description of interstitial space is needed.*
I agree.

3. *Section 5.8 of the macroinvertebrate study provides comparison for "pre" data and should also provide comparison for "post" data.*
I agree.

One of the things I found missing from the macroinvertebrate reports was a good synthesis and discussion of their findings.

From Unknown
1. *Please review, analyze and comment on the methodologies and studies used for determination of impacts of whitewater flows on fish.*
See details above; however, the effects appear to be minor.

2. *Please review the methodologies and conclusion in the Angler Caused Mortality report and provide comments as to adequacy and scientific basis for methodologies.*
While I did not get a copy of any such report, I found this to be a very interesting sideline discussion. I have no way of evaluating the veracity of this; however, the implications are clear. Angling may have a significantly more profound effect on trout populations than the recreational flow. I think one at least could argue that anglers fishing along the banks and wading through near shore habitats may also have a greater effect on disturbance of Foothill Yellow-legged Frog egg masses and early tadpoles, as well.

3. *Please review and provide comments on substrate movement impacts on macroinvertebrate and fish habitat and populations.*
The recreational stream flows are not sufficient to obtain any appreciable transport or rearrangement of bed-material. Thus, it is unlikely that there is a significant change in the habitat of fish or macroinvertebrates.

4. *Please analyze and comment on impacts of turbidity and sediment on macroinvertebrate habitat and populations and the relationship to fish health with particular emphasis on fish disease.*
The turbidity and sediment transport associated with the recreational stream flows has a large effect on the accumulation of detritus in shallow nearshore areas. While the transport of this material may have an effect on the macroinvertebrate populations, this appears to be minor. I am unaware of the presence of whirling disease in California and in particular the NFFR; however, the accumulation of organic floc is an excellent habitat and food source for tubificids, the intermediate host of whirling disease. It is at least interesting to contemplate that possibility that periodic small changes in flow may be beneficial in the prevention of disease in salmonids.

5. *Please analyze and provide comments on the impacts to macroinvertebrate habitat and populations resulting from the deposition of sand size particles following whitewater flows.*
While the discharges are not sufficient to obtain any appreciable bedload, there is apparently some movement of sand grain size material along the bed. It is difficult to ascertain from the macroinvertebrate study whether the sand particles that appeared in the rock-basket samplers would have also appeared in undisturbed (by introduction of the samplers) substratum. Generally, high quantity of interstitial space results in increased habitat availability for macroinvertebrates.

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From Jerrymen1941

1. *Please review, analyze and comment on the methodologies and studies used for determination of impacts of whitewater flows on fish displacement.(* Other questions, I believe, are found in the answers above.)
I comment on this above, but in summary, the study appears to have been well executed. The finding were that there was little quantifiable displacement due to the whitewater flows. This makes sense. Fish are highly adapted to change in flow and use refugia very effectively. Thus, if the flows would be sufficient so that fish would be unable to maintain their position in the stream, fish tend to move to lateral habitats for the duration of an event.

Final Comment:
River ecologists have shown that significant changes in river flow to fit the special interests of any one group, whether that be irrigators, hydropower interests, anglers or whitewater enthusiasts, is generally done at the expense of the overall ecological health of the river. While these studies were clearly focused on the effects of whitewater flows artificially induced in the summer, the ecological problems with the NFk of the Feather River are far more pervasive than the issues related to increasing flows for this one interest group. What the NFkFR needs is an ecological based systems management (EBSM) that is comprehensive and brings some level of normality to the hydrographic regime.

With the clear probability of goring someone's ox, I cannot help but suggest that there appears to be considerable concern over the speck in the left eye while there is a plank in the right eye.

Submission Contents

PartA.pdf.. 1-86

Exhibit 10

Comments by Eric McElravy
May 18, 2004

Draft

Rock Creek-Cresta Recreation Streamflow Monitoring:
2003 Benthic Macroinvertebrate Sampling

North Fork Feather River, Plumas County, CA
Rock Creek-Cresta Hydroelectric Project (FERC No. 1962)

GANDA and Associates
San Anselmo, CA 94960

I. Introduction

This report presents the results of more than 200 samples of benthic macroinvertebrates taken in the Rock Creek Reach of the North Fork Feather River (NFFR) during the benthic monitoring program in 2003, This resulted in a large data set. The current draft report has among its objectives to summarize and present the data that was obtained from the samples and other measurements and observations taken during the study, and to attempt to interpret and synthesize the data relative to effects of the recreational flows. The first objective has been met; extensive raw and summary data are presented throughout the report and in the appendices. The second objective is more difficult to achieve in part because of the limited objectives of the study design, and there is a tendency in some portions of the report to speculate beyond the available or presented data. Following are some general and somewhat more specific comments that are proposed for the authors' consideration during preparation of any revisions of this report.

II. General Comments

1. Present a graphical overview of the data as part of the "Benthic Macroinvertebrate Summary" .

This report is not an easy read because of the amount of data presented, and the necessity to present the data by month (to follow the study design). I believe that an expanded “Benthic Macroinvertebrate Summary” would help orient the reader to overall trends in the data. As a suggestion, select key measures (metrics) that define the structure of the macroinvertebrate community and present each as a bar chart across months pre-post event. The bar chart should be 2-D for readability (better than the 3-D Charts often used in this report and include error bars for all mean values presented (± 2 Standard Errors would probably be most informative). In this way much key information over the period of the study could be presented in very few pages to end this section.

2. Reiterate the original study design.

Remind readers that the original study design focused on the immediate pre-post effects and that each month was essentially a “separate study” (with potential seasonal changes in pre-post response.) This will help explain the need for speculation when across-season (declining) trends are discussed. This seasonal aspect of the data was not considered during the design of the 2003 study. The authors might provide specific suggestions at the end of the report regarding establishment of controls and methods to address the questions raised by the 2003 data.

3. Related to No. 2 above, reduce the amount of speculation regarding expected seasonal trends.

If increases in densities and species richness are expected to occur in the fall in the NFFR, then, lacking a control, this assumption needs to be supported with appropriate literature citations, for stream systems similar to NFFR in terms of, for example, primary energy source summer -fall (autocthonous/allochthonous), climate, ecoregion, etc.).

4. Move the section on colonization time from Appendix C to the very beginning of the results section and simplify the analysis (e.g., omit the PCA analysis). The entire study depends on the assumption that the colonization time used was adequate to allow the baskets to be a representative sample of the surrounding substrate. The 20 Pre-October samples could be segregated by recolonization time in the analysis to look at effects of re-sampling when compared with the “control” samplers. The important response variables would be taxa richness, similarity, density and relative abundance of taxa, for comparison between the two sets of samples. As the samplers provide only a snapshot of the benthos at the time of sampler removal, seasonal changes in the composition and abundances of the included

taxa would confound any analysis comparing October control samples with prior months' samples

III. Specific comments, questions and suggestions.

1. Methods: Samplers were placed only along the left side of the stream channel (facing downstream, Fig. 4.2.1). Was there no pocket water habitat on the right side of the channel?

2. Data Analysis: On page 10, 2nd paragraph, report should note that there is potential for seasonal confounding effects in the 1-month post flow, and if possible to comment on any importance of this factor in data interpretation.

3. Data Analysis: Please provide references for the "Morista-Horn" and Jaccard indices. Morista -Horn is spelled differently in various places in the report. I am familiar with a "Morisita" index. Please check and correct all usage if necessary.

4. Data Analysis: The statistical analyses, especially the MANOVAs, provide the primary basis for drawing conclusions about the data. As such, selection of appropriate response variables to enter into the MANOVA is critical. The variables selected should describe the structure and function of the benthic community and be appropriate for the study. Density (from abundance per sample)and species (or higher taxa) richness are commonly used measures. However, in a short term study (pre-post) focusing on physical disturbance, pollution indicators such as tolerance values do not seem appropriate. These measures respond to, primarily, changes in pollution that result in lower dissolved oxygen levels. Should omit tolerance as a response variable if there are no known water chemistry problems during the recreational flow events that would have a short term impact on macrobenthos. Diversity indices are redundant with richness and percent dominance. The authors of the Rock Creek-Cresta report need to justify the selection of response metrics in light of the questions asked by the study and then re-run the MANOVA's.

5. Data Analysis: The authors need to provide the kind of detailed description regarding the statistical procedures used similar to what they do for describing the collection, sorting and subsampling of samples. When were transformations used and did they succeed? In the MANOVAs, what "Test Statistic" was used to evaluate the significance of the MANOVA? Why (for monthly analyses) is

abundance LN transformed (commonly done for counts) for pre-post whereas taxa richness is transformed for pre-1 Month post? Why are there numerous MANOVAs rather than one with all factors of interest? What is the difference between "Velocity Class" and Velocity" in MANOVAs? Did the software remove factors that did not contribute significantly to explaining variability in the MANOVAs? When describing The Chi-Square procedure, note (as was seen in Appendix C) the effect of proportion change on small populations to the overall Chi Square.

6. Data Analysis: PCA's: If 3 principal components are required to show patterns in samples, it might be easier to visualize with a 3-D plot.

7. Interstitial Space: Explain in methods how the percent interstitial space filled was determined.

8. Table Legends: Tables often include bold numbers. The legend for the table should explain what the bold numbers are/mean.

9. Percent Change (as in the monthly major taxonomic grouping graphs): Low sample sizes can make percentage change hard to interpret since a small change in number of individuals affects percentages for taxa with a low N. Report sample size (mean N-values/sample) wherever percentages are used.

10. Monthly Comparisons: Bar graphs in the monthly sections especially need error bars. Please include.

11. Although overall mean densities show little change and sometimes increase in the immediate post-flow samples the variability in the data does increase all months except September. This is most likely due to increased spatial aggregation. Avoid the term "chaos" to refer to this result.

12. Between Month Comparisons: It is not surprising that the MANOVAs show differences due to month (seasonality). All graphs in this section should be bar graphs (with error bars for means). There is no data between points in figures such as Fig. 5.7.1.3.

13. Between Month Comparisons: Not all figures show a "decline" across months. For example, Fig. 5.7.1.4 shows a sharp drop in pre-flow data from June-July and relatively little change after that. Here error bars would be helpful in evaluating significance.

Exhibit 11

Analysis of Project Flow Impacts on Foothill Yellow Legged Frogs

The data on the Foothill Yellow Legged Frog (fylf) surveys for May and June show some very disturbing results for the fate of the fylf on the North Fork Feather. This year has been unique in the volume of water that has flowed through the Feather Basin. For the first time in recent history the North Feather has been flowing at what would be the natural unimpaired flow all winter and spring. This was a result of the large storm during New Years that filled Lake Almanor and necessitated releases from Prattville in what would normally be the refill season. This year offered us the opportunity to see how fylf and the other aquatic species on the Feather would respond to a more natural flow regime representing the environmental conditions they have evolved with in an unregulated system.

In April I sent an email to Bill Zemke and the rest of the ERC raising concerns that the proposed fylf monitoring plan would potentially miss much of the frog breeding season by waiting until the flows in the reach were within 50% of base flows. This would be 500 cfs on the Cresta reach and 200 cfs on the Poe reach. The data summaries for Poe show that the first egg masses were found in the tributaries when flows in the main stem were at 5000 cfs. Egg masses were first located in the main stem at flows of 2000 cfs. It is unclear from the data however at what flow egg laying began to occur in the main stem. What we do know is that egg masses were found at the highest flows that were surveyed on the Poe reach, 2000 cfs. We can also see from the survey data that the bulk of the egg masses were found when the flows were between 2000 and 1700 cfs. This is strikingly different from the past prediction that breeding would predominately occur at lower flows. Given the number of egg masses found on the Poe reach it clearly should have been a banner for fylf on the North Feather. Unfortunately the frogs that were expecting a gradual decrease in flows associated with a natural hydrograph had their egg masses stranded when the project flows dropped precipitously from 1700 cfs on the 8th of June to 600 cfs by the 9th and finally down to 170 cfs on the 14th. For comparison the Middle Fork Feather at Milsap Bar and the North Feather at Poe had essentially the same flow, 4000 cfs, on the 25th of May. However, by the 15th of June the Poe Reach was at 170 cfs while the Middle Feather was still at 2000 cfs (see figure 1).

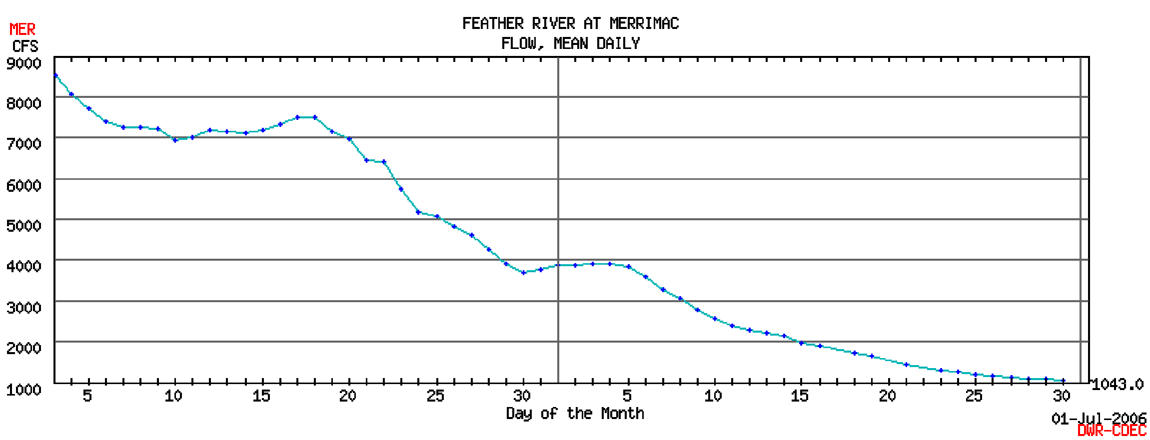


Figure 1. Middle Fork Feather at Milsap Bar spring 2006.

The overall impact of the rapid drop in flows, associated with project operations on the North Fork Feather, was stranding of over 50% of the known egg masses on the Poe reach. There can be little doubt that this will have a devastating impact on the fylf populations in the Poe Reach in the future. Given the level of concern that PG&E and other parties have expressed about this sensitive species on the Feather, I am astounded that there appears to have been no dialogue about what impact these project operations would have on the egg masses that had been laid in the Poe Reach and potentially in the Cresta Reach. We have discussed at length changing recreations flows, spring pulse flows, flows down Bucks and Grizzly Creeks, all with the intent of protecting frogs. Note that our previous decision to cancel June recreational releases was based on data that was far more inconclusive (i.e. lower level of statistical confidence) with regard to impacts on fylf. PG&E had the information to act and avoid stranding potentially all of the eggs that were laid before they began to reduce flows on the 9th of June, however they did not choose to alert the rest of the ERC to this issue. This is inconsistent at best. At worst this action has rendered all of our other restoration efforts pointless.

This type of flow manipulation and potential impact to the fylf populations is not limited to the high flows from this year. The graphs below show the high flow event of May 2005 on both the Middle Fork Feather and the Cresta Reach. Again we see roughly the same high flow, 13,000 cfs, on both graphs. The difference is the flows before and after this event. While the unregulated Middle Fork Feather was at 2000 cfs before this event, the Cresta reach was at 200 cfs. After the peak flow event on the 19th of May the Cresta Reach was reduced to 400 cfs within ten days.

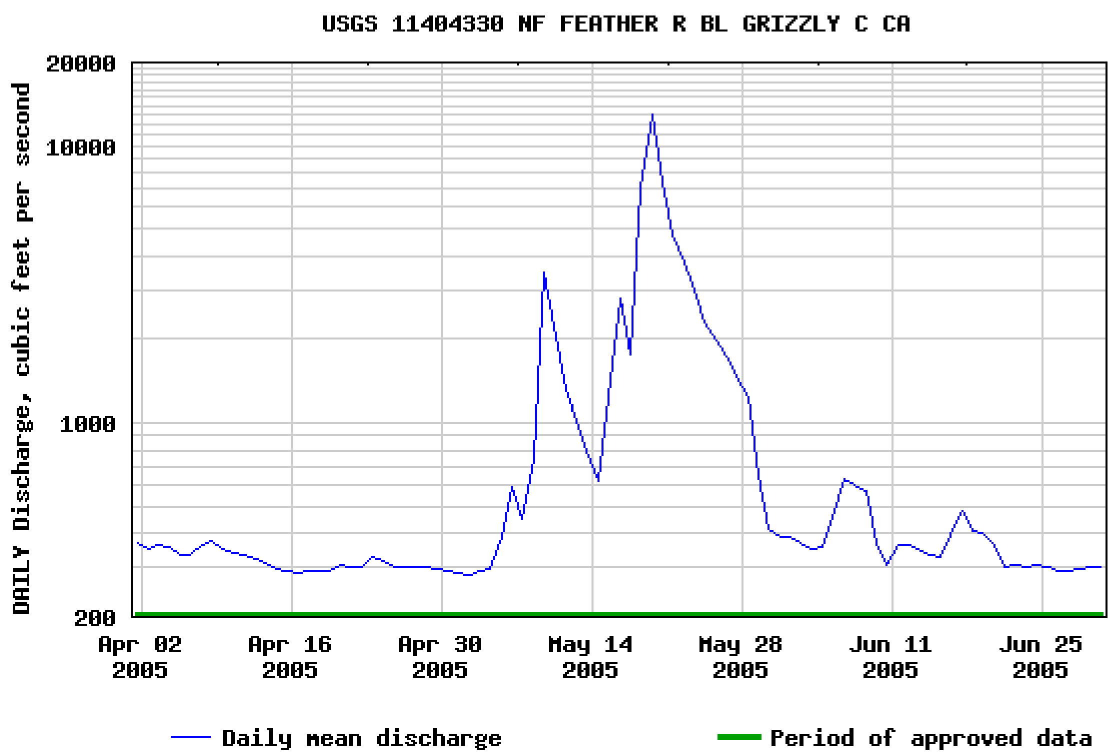


Figure 2. Cresta Reach Spring 2005.

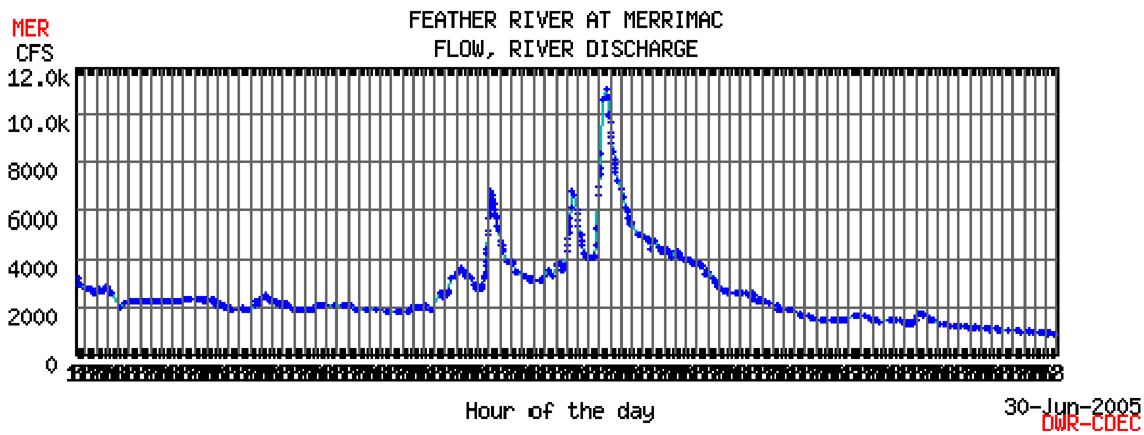
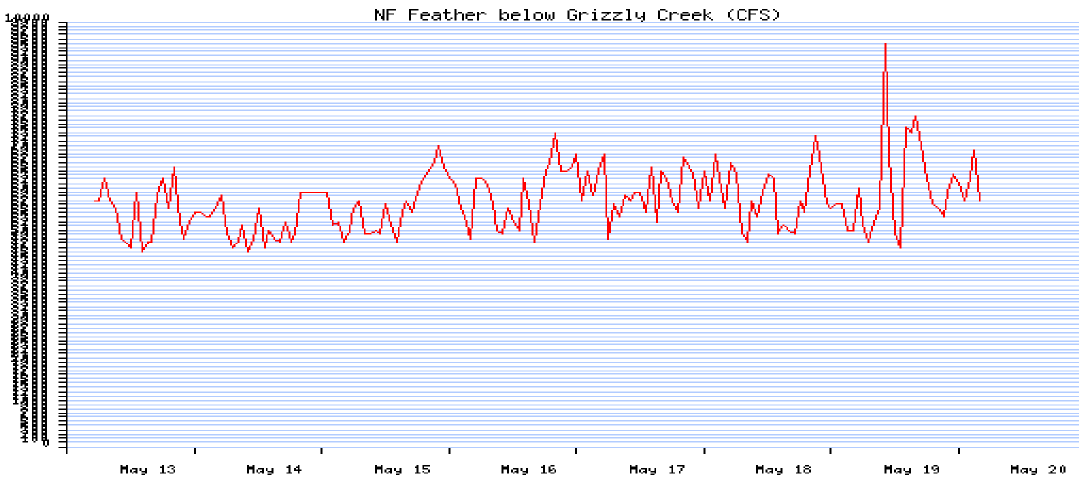


Figure 3. Middle Fork Feather at Milsap Bar Spring 2005.

In contrast the Middle Fork Feather was at 3500 cfs ten days after the peak flow, and thirty days later the flow was still at 1000 cfs. Of primary concern is the rapid reduction in flows on the regulated Cresta reach on the 29th of May. After several days of relatively gradual flow reductions, 200 to 300 cfs per day, the flows dropped 50% from 1250 to 650 cfs. This would have occurred right at the start of the egg-laying season for fylf. Unfortunately the first egg mass surveys were not completed until June 2nd so we have no data to document the potential impacts. The other concern is the two flow spikes that occurred on the 6th and the 17th of June. While these flows of 600 and 500 cfs may not seem extreme, note that these are average daily values and the fifteen-minute flow data will show much higher peak flows. All of the egg masses that were found in the Cresta reach during the June 2nd survey were present during these two flow events, however no mention was made of these events or their potential impact on egg masses or tadpoles in the monitoring report. Meanwhile the report devoted significant attention to the disparity between the number of egg masses on the Cresta and Poe reaches.

It is disconcerting that the team of consultants and other experts continue to leap to unsubstantiated conclusions on the effect of recreation flows on the fylf population on the Cresta Reach, while totally ignoring the documented impacts of the project. It is my understanding that at the June ERC meeting the small number of egg masses found on the Cresta reach was attributed solely to the impacts of recreation flows. This finding is preposterous given that no surveys were completed on the Cresta reach until after most of the egg laying, and stranding, had already occurred on the Poe reach. No surveys occurred on the Cresta reach until the 10th of June and not all sites were surveyed on that date. If surveys were delayed until the 10th of June on the Poe reach only 14 egg masses would have been found. If an equivalent study effort were done on both reaches we would have a very different picture than the one that was painted for the ERC at the June meeting.

It would be reasonable to wonder why more stranded egg masses were not located on the Cresta reach when surveys were finally done in June. A look at the flow record for late May gives us a clue to some of the missing egg masses. During the same time period when the first egg masses were being laid on the Poe reach the Cresta reach was fluctuating wildly. Hourly changes of 800 cfs or more were common and one of 4000 cfs in one hour occurred on the 19th of May. It is unlikely that any egg masses would have survived these fluctuations and it would seem possible that flow changes of this magnitude, far greater than those observed during recreational releases, could even displace adult frogs.



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North Fork Feather Home Long-Range Forecast

NF Feather below Grizzly Creek

Disclaimer

Gauge History (Graph)

Flow (cfs)	Updated
6600	2006-05-20 05:00:00
5800	2006-05-20 04:00:00
7000	2006-05-20 03:00:00
6300	2006-05-20 02:00:00
5800	2006-05-20 01:00:00
6200	2006-05-20 00:00:00
6400	2006-05-19 23:00:00
6000	2006-05-19 22:00:00
5400	2006-05-19 21:00:00
5600	2006-05-19 20:00:00
5700	2006-05-19 19:00:00
6300	2006-05-19 18:00:00
7100	2006-05-19 17:00:00
7800	2006-05-19 16:00:00
7400	2006-05-19 15:00:00
7500	2006-05-19 14:00:00
4700	2006-05-19 13:00:00
5000	2006-05-19 12:00:00
6900	2006-05-19 11:00:00
9500	2006-05-19 10:00:00
5600	2006-05-19 09:00:00
5300	2006-05-19 08:00:00
4800	2006-05-19 07:00:00
5200	2006-05-19 06:00:00
6100	2006-05-19 05:00:00
5100	2006-05-19 04:00:00
5100	2006-05-19 03:00:00
5700	2006-05-19 02:00:00
5700	2006-05-19 01:00:00
5600	2006-05-19 00:00:00
5700	2006-05-18 23:00:00
6600	2006-05-18 22:00:00
7300	2006-05-18 21:00:00

Figure 4. Cresta Reach May 2006.

I believe that the 15-minute data that I have asked PG&E to provide will show even more rapid fluctuations on the Cresta reach than on the Poe Reach. This increased fluctuation is due to the different gate structure on the Poe Dam, the radial type, as compared to the drum type on the Cresta Dam. I will not draw the conclusion that these flow fluctuations are the only reason for the low egg mass numbers on the Cresta; I will leave that type of unsubstantiated conclusion to others. I will simply present it here as a plausible argument. However, it would be a fully reasonable hypothesis that egg masses would have been stranded and desiccated in the same percentages on the Cresta reach as documented on the Poe reach.

It is also my understanding that the impacts to fylf that are being attributed to recreational flows, and the decision to cancel the July release, are based on the potential impacts to tadpoles. . This potential impact is based solely on the behavioral experiments and not field surveys. None of these experiments examine the full range of habitat available to frogs in the river. They were thus not appropriately designed to test the behavioral response to flow changes that occurred during recreational releases. Furthermore, conclusions from the behavioral studies run contrary to the data from our displacement studies that were conducted during the recreational releases. Consistently we found no appreciable change in the number of tadpoles before and after releases. It is unclear why we would discount the information that we have gathered on the river, during the releases, in favor of the experimental data that was not designed to quantify impacts from recreational releases.

At this point I see no justification for the canceling of the July release for the following reasons.

1. We have documented evidence of project operations and the regulated flow regime having significant impacts to fylf this year.
2. We have evidence that project operations likely to impacted fylf in previous years.
3. Recreation flows have had no impact on egg masses over the past 4 years.
4. We have no evidence from displacement studies done during recreation releases that any displacement of tadpoles has occurred.
5. We have no plan on how to reduce the known impacts to fylf from project operations.

In short I do not believe that the interest of the Whitewater Boating community or the Foothill Yellow Legged Frogs are being served well by this decision.

I look forward to discussing this with all of you,

Dave Steindorf
California Stewardship Director
American Whitewater

Exhibit 12

Hydrologic and Geomorphic Factors Affecting Conservation of a River-Breeding Frog (Rana Boylii)

Sarah J. Kupferberg

Ecological Applications, Vol. 6, No. 4 (Nov., 1996), 1332-1344.

Stable URL:
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Ecological Applications, 6(4), 1996, pp. 1332–1344

HYDROLOGIC AND GEOMORPHIC FACTORS AFFECTING CONSERVATION OF A RIVER-BREEDING FROG (*RANA BOYLII*)[1]

SARAH J. KUPFERBERG
Department of Integrative Biology, University of California at Berkeley, Berkeley, California 94720 USA

Abstract. Organisms that live in highly variable environments, such as rivers, rely on adaptations to withstand and recover from disturbance. These adaptations include behavioral traits, such as habitat preference and plasticity of reproductive timing, that minimize the effects of discharge fluctuation. Studies linking hydrologic regime, habitat preference, and population processes, however, are predominantly limited to fish. Information on other sensitive taxa is necessary to facilitate conservation of multispecies assemblages and restoration of biodiversity in degraded river channels.

I studied the functional relationship between physical habitat and reproduction of the foothills yellow-legged frog (*Rana boylii*), a California State Species of Special Concern. From 1992 to 1994, I mapped breeding sites along 5.3 km of the South Fork Eel River in northern California and monitored egg survival to hatching. Frogs selected sites over a range of spatial scales and timed their egg-laying to avoid fluctuations in river stage and current velocity associated with changes in discharge. The main sources of mortality were desiccation and subsequent predation of eggs in a dry year and scour from substrate in wet years, both caused by changes in stage and velocity. At the finest spatial scale, frogs attached eggs to cobbles and boulders at lower than ambient flow velocities. At larger scales, breeding sites were near confluences of tributary drainages and were located in wide, shallow reaches. Clutches laid in relatively narrower and deeper channels had poor survival in rainy as well as dry springs. Most breeding sites were used repeatedly, despite between- and within-year variation in spring stage of the river. This pattern of site selection suggests that conservation of *Rana boylii* may be enhanced by maintaining or restoring channels with shapes that provide stable habitat over a range of river stages.

Key words: amphibians; Anura; frogs; geomorphology; hydrology; oviposition; physical habitat; Rana boylii; *reproductive success; river; spatial scale.*

INTRODUCTION

The loss of aquatic biodiversity in rivers and streams is a global conservation problem (Master 1990, Allan and Flecker 1993, Sparks 1995). In these habitats, species declines are often associated with water diversion, impoundment, flow regulation, channelization, and other habitat modifications (Williams et al. 1989, Bianco 1990, Moyle and Williams 1990, Elvira 1995). Such perturbations alter sediment and water flow regime, which, in turn, cause geomorphic change. Impacts include incising of channels downstream from dams, broadening and deepening of channels after in-stream gravel mining, and filling of interstices with fine sediments (Kondolf and Matthews 1993, Ligon et al. 1995). Thus, channel restoration to mitigate for biodiversity loss has become a priority (NRC 1992), underscoring the need for design recommendations based on balancing the requirements of many species. Studies of biotic response to physical channel properties, however, have focused primarily on fish habitat use and classification (Wesche 1985, Sullivan 1986, Orth 1987, Nestler et al. 1989, Kershner and Snider 1992). We need data linking birth and death rates of many species to geomorphic and hydraulic parameters if rivers are to be managed as whole ecosystems. This has been done theoretically in models of river food chains (Power et al. 1995).

In the Pacific Northwest, most studies linking hydrology and geomorphology to population processes emphasize salmonid spawning and rearing habitat (Lister and Genoe 1970, Bisson et al. 1982, Laufle et al. 1986, McMahon and Hartmann 1989), rather than habitats of a variety of aquatic organisms (but see Power 1992*a*) that may include other sensitive taxa. One such species is the foothills yellow-legged frog, *Rana boylii,* which lives in rivers and streams of California and Oregon (Zweifel 1955, Stebbins 1985). This frog is a California State Species of Special Concern (Jennings and Hayes 1994). It has experienced significant population declines, especially in the southern and inland parts of its range relative to northern coastal areas (G. Fellers, National Biological Service, *personal communication*). Decline has occurred with the modification of river habitats, introduction of bullfrogs (*Rana catesbeiana*) that are predators and competitors of *R.*

[1] Manuscript received 15 May 1995; revised 30 October 1995; accepted 2 December 1995.

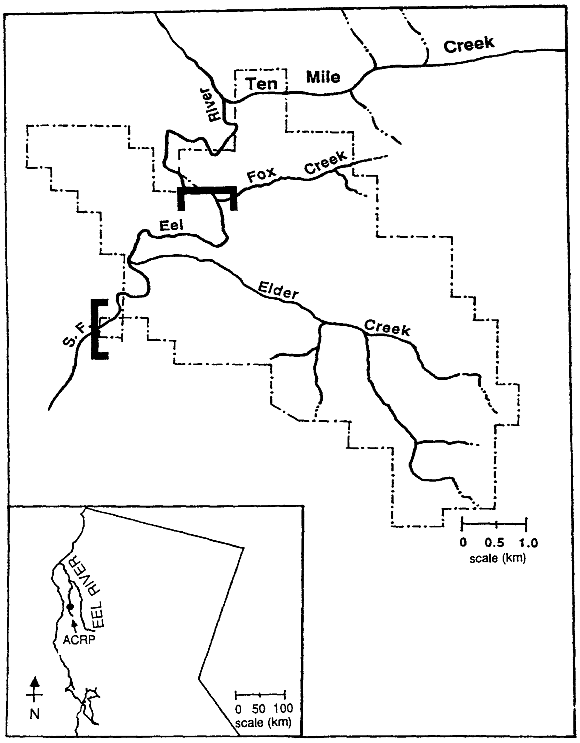


FIG. 1. Location of the Angelo Coast Range Preserve (ACRP, dotted outline) in northern California. Study reach is enclosed by large brackets.

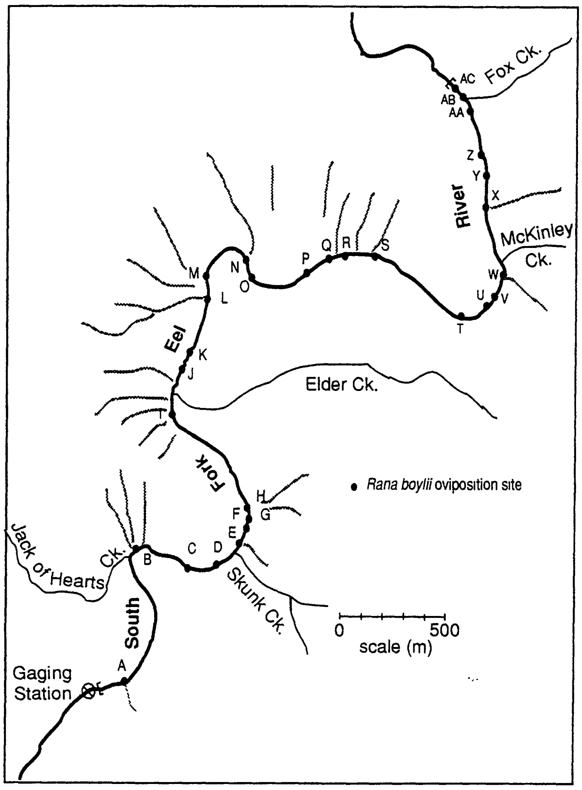


FIG. 2. Study reach and *Rana boylii* breeding sites (points on heavy solid line enclosed by small brackets). The frogs occur, but do not breed, in tributaries (thin solid lines). Shaded thick lines indicate drainage patterns of rivulets that flow in early spring. Letter placement indicates breeding site location on the left or right bank. Site use ranged from regular to sporadic. Site name (no. clutches in 1992, 1993, and 1994; . . . indicates sites not censused in 1992): A (. . ., 37, 44); B (23, 23, 43); C (. . ., 0, 4); D (. . ., 0, 12); E (0, 3, 9), F (48, 26, 37); G (22, 23, 26); H (7, 0, 12); I (22, 27, 33); J (47, 41, 38); K (0, 0, 8); L (18, 0, 1); M (11, 23, 22); N (20, 29, 26); O (. . ., 0, 1); P (. . ., 0, 6); Q (. . ., 0, 3); R (. . ., 7, 10); S (. . ., 43, 55); T (. . ., 0, 2); U (10, 19, 10); V (6, 13, 60); W (26, 11, 32); X (32, 27, 40); Y (. . ., 4, 2); Z (. . ., 8, 19); AA (. . ., 43, 29), AB (. . ., 0, 4), AC (. . ., 0, 5).

boylii (Moyle 1973, Hayes and Jennings 1986, Kupferberg 1996), and invasion by fish either nonindigenous to the drainage basin (Sacramento squawfish, *Ptychocheilus grandis*) or the region (bass, *Micropterus* sp., and green sunfish, *Lepomis cyanellus*) (M.E. Power and S.J. Kupferberg, *unpublished data* from Ten Mile Creek and South Fork Eel River below confluence with Ten Mile Creek). These simultaneous stresses make the causes of ranid decline difficult to untangle (Hayes and Jennings 1986). This study focuses on the links between habitat quality and reproduction of *R. boylii* by quantifying the physical conditions necessary for eggs to survive to hatching.

To maintain viable populations, organisms that live in highly variable environments, such as rivers, must be able to withstand or recover from disturbance. Here, I present observations that yellow-legged frogs lessen the effects of hydrologic disturbance during breeding by using sites with geomorphic and hydraulic conditions that minimize adverse effects of discharge fluctuation. Specifically, I address the following questions: (1) Is the distribution of breeding sites random, in proportion to availability, with respect to tributary confluences and geomorphic units (pools, riffles, and bars)? (2) Within breeding sites, do frogs oviposit according to depth, distance to shore, flow velocity, and substrate? (3) What are the major causes of egg mortality, and how frequently do they occur? (4) Is survival of eggs related to the shape of the channel and date of oviposition? (5) Do frogs initiate oviposition in relation to discharge and temperature? I address these questions for a stable population of *R. boylii* in a relatively pristine river reach, and discuss implications for engineered channel design and flow regime.

NATURAL HISTORY AND STUDY SITE

This research was conducted at the South Fork Eel River, within the Angelo Coast Range Reserve (formerly the Northern California Coast Range Preserve), Mendocino County, California (39°44′ N, 123°39′ W) (Fig. 1). I chose the 5.3-km study reach (marked by brackets in Fig. 2) because of accessibility and the absence of nonindigenous bullfrogs and fish relative to downstream reaches near Ten Mile Creek, where they are present. The study reach is typical of streams and rivers inhabited by *R. boylii,* being characterized by partial shade, shallow riffles, and substrates cobble-sized or greater (Hayes and Jennings 1988). The watershed is sparsely settled and dominated by old-growth mixed coniferous forest. Within the study area, the channel is fourth order and the gradient is 0.44%. The river has cut a narrow canyon lacking a floodplain, and active channel width is ≈30 m.

Although *R. boylii* are common along tributaries, they congregate at the same sites in the main stem each spring to breed. In 1992, I located 15 discrete sites along 2.6 km of noncontiguous river channel. In 1993 and 1994, I expanded the survey to 5.3 contiguous kilometres and located 14 additional sites (Fig. 2). I define these discrete sites as breeding sites, and the location of a given egg mass as an oviposition site. Breeding sites range in size from 2 × 10 m to 5 × 70 m, and are separated from other breeding sites by up to several hundred metres. For ≈1 mo beginning in mid-April to early May, mating and egg-laying occur. Egg incubation lasts ≈2 wk, depending on water temperature and position in a clutch, with eggs at the perimeter hatching first and those at the center and close to the rock hatching last (S. J. Kupferberg, *personal observation*). The number of egg masses indicates reproductive female population size, because one female lays one clutch of 1000–2000 eggs (Zweifel 1955). During the three study years the mean (±1 SE) reproductive output was 92.8 ± 10.2 clutches/km, or 18.8 ± 1.9 clutches per breeding site. For the 15 breeding sites sampled in all three years, among-year differences in this estimate of population size were not significant (multivariate repeated-measures ANOVA: Wilks' $\lambda = 0.68$; $F_{2,13} = 3.02$; $P = 0.08$).

METHODS

Breeding site distribution

I mapped the distribution of breeding sites during spring 1992–1994 and measured the distance from each breeding site to the nearest tributary (temporary and permanent), using a hip chain in the field and topographic maps. At mid-April 1994 discharge (flow volume per unit time) levels, I characterized each breeding site by noting whether or not it was at a bar, and by classifying the adjacent channel according to depth and turbulence: riffle (water surface turbulent, depth <1 m); shallow pool (smooth water surface, depth <1 m); medium pool (1 m ≤ depth < 2 m); or deep pool (depth ≥2 m). I measured the length of each channel type with a hip chain and calculated the proportion of the study reach in each channel type. To determine whether or not distribution of breeding sites indicated selectivity, I compared observed to expected frequencies with chi-square tests. Expected frequencies were calculated under the null hypothesis that the proportion of breeding sites in each channel type would equal the proportion of the study reach in each channel type.

Egg survival

Over the survey period, April–June 1992–1994, I monitored survival to hatching by marking individual egg masses with numbered flags or popsicle sticks placed nearby. I visually estimated the percent of clutch remaining from week to week, and finally the percent hatching. I gave each clutch a rank with respect to desiccation and scour. For stranding: 1, egg mass completely exposed to air; 2, egg mass partially exposed; and 3, egg mass completely submerged. For scouring: 1, egg mass completely gone from substrate; 2, egg mass partially removed; and 3, egg mass intact. If markers were not relocated, clutches were not included in analyses. I also noted the presence or sign of predators and fungal disease. Effects of scour were visually distinctive from predation. A portion missing indicated a large predator, whereas frayed jelly and loose connections among eggs indicated partial scour. I attributed empty egg cases to small predators, such as limnephilid caddisflies, which can penetrate jelly to consume embryos (Stein 1985). I did not observe empty jelly cases in recently oviposited egg masses. I used log-linear analysis to assess associations among the mortality sources, Kruskal-Wallis tests to compare survival among breeding sites, and Spearman's rank correlations to assess the correspondence among oviposition date, stranding/scouring index, and hatching success.

Historical analysis of stranding and scouring event frequency

To determine how representative the three study years were in terms of rainfall and discharge, I consulted USGS records of daily and peak discharge measured at the study site from 1946 to 1970 (EarthInfo 1994). Recording of river stage (elevation of water surface in relation to an arbitrary datum) was resumed in 1990 by M. E. Power at the same staff gage. The gaging station is near the most upstream breeding site (Fig. 2). In spring 1993, base flow (discharge in between storm events) was estimated from discharge monitored on Elder Creek (EarthInfo 1994), because sediment clogged the stilling well at the South Fork Eel gaging station. At base flow, the float measuring stage was resting on sediment, but measurements at peak flows were accurate. In 1994, gaps in the record due to technical problems with the data logger were filled in by extrapolation from data gathered at a temporary gage at breeding site X (Fig. 2) (A. Lind, U.S. Forest Service, *unpublished data*). I estimated discharge from stage height using a low-flow rating curve (M. E. Power, *unpublished data*) in conjunction with a rating curve provided by the U.S. Geological Survey (K. Markham, USGS, Ukiah, California, *unpublished data*). A rating curve is an empirical relationship developed by measuring the cross-sectional area of flowing water and the velocity at several stages; the product of area and velocity is discharge.

The frequencies of large spring spates and dewatering rates were assessed by calculating the recurrence intervals of such events during the oviposition period, 15 April–15 June, 1946–1970. Recurrence interval = $(N + 1)/(M)$, where N is the number of years of record and M is the rank order of the discharge, with the largest discharge ranked first (Leopold 1974). Dewatering rate of the channel was calculated as the percent decrease in discharge over the oviposition period.

Physical conditions at clutches

I measured water depth, distance to shore, and substrate (bedrock, boulder ≥ 256 mm, cobble ≥ 64 mm, pebble ≥ 2 mm, or vegetation) at recently (within 0–3 d) laid clutches throughout the 1992 and 1994 breeding seasons. Between-year differences in depth and distance to shore were compared using t tests. At seven breeding sites on 7 May 1992 (discharge: $Q = 0.44$ m^3/s at gaging station), I measured velocity with a current meter, holding the rotor adjacent to the center of recently laid clutches. Velocity was then measured several centimetres horizontally away from eggs at depths equivalent to the centers of the egg masses. These ambient velocities therefore reflect flow conditions of the near-bank breeding area, not the entire channel. A two-way ANOVA tested for differences between velocity at the egg mass and ambient velocity, as well as for differences among breeding sites. Location of velocity measurement, at egg mass vs. ambient, was treated as a fixed factor and was crossed with breeding site, which was also treated as a fixed factor because sites are often historical.

Channel geometry in relation to breeding site selection and egg survival

During April 1994, I established staff gages (metre sticks wired to steel rebar pounded into the river bed) and measured channel cross sections with a surveyor's rod and level at the approximate center of 15 breeding sites and at 11 nonbreeding sites. I chose nonbreeding sites by dividing the study reach into 15 equal-length segments; within each segment, I used 10-sided dice (Kotanen 1992) to generate the digits of longitudinal distances for the origin of each cross section. Four cross sections were eliminated because they fell within or only a few metres away from breeding sites. Between breeding and nonbreeding sites, I compared hydraulic radius (the ratio of cross-sectional area to wetted perimeter, about equal to the mean depth) and wetted cross-sectional area at discharge $Q = 0.20$ m^3/s at the gaging station. To test the hypothesis that good breeding sites have geometries in which stage and velocity are relatively insensitive to changes in discharge, I compared four descriptors of channel shape: (1) cross-sectional area; (2) wetted width to depth ratio; (3) wetted perimeter, which is the distance along the varying topography of the channel bottom rather than width of the water surface; and (4) hydraulic radius. For each variable, I used Mann-Whitney U tests to compare breeding to nonbreeding sites, and to compare sites with above-average survival to sites with below-average survival. To illustrate how channel shape interacts with changes in discharge, I used HEC-2 computer simulations of water surface profiles (U.S. Army Corps of Engineers 1991) in a typical low-survival channel (site W) and a high-survival channel (site X). To determine if the survival consequences of channel shape were consistent under conditions of decreasing and increasing discharge, I used Pearson's r to test for survival correlation in a dry and a wet year. All statistics were calculated with SYSTAT (Wilkinson 1992).

Timing and duration of breeding

To evaluate whether or not frogs began oviposition at the same discharge each year and whether or not the length of breeding activity was influenced by discharge fluctuations, I superimposed a cumulative frequency distribution of clutches over time onto the April–May hydrographs.

To evaluate whether or not frogs began oviposition at the same temperature each year, I compared daily mean water and air temperature during the week preceding and the week following the appearance of the first egg mass. Means were calculated from hourly data logged from thermistors at the gaging station. Air temperature at a given hour may vary among breeding sites according to canyon wall slope and aspect, but I assume that differences in daily means are minimal. Water temperatures are likely to be uniform across sites and to mirror values of the thermistor, located ≈10 cm above the river bed. Most clutches were laid ≤10 cm above the bed, at depths of ≈20 cm, where the effects of surface warming would be minimal. In the early spring, variation in water temperature due to ground water seeps, regions of upwelling, and tributary confluences are also minimal (S. J. Kupferberg, *personal observation*).

RESULTS

Geomorphic distribution of breeding sites and physical characteristics of egg attachment sites

Breeding sites tended to be located near tributary confluences (Fig. 2, Table 1) in shallow reaches (Table 2). Typically, breeding site channels were asymmetrical and eggs were deposited on the less steeply sloping side, indicating that these sites provide shallow, low-velocity habitats close to shore, over a range of river stages. Of the surveyed channels, those with eggs were wider and shallower than non-egg channels chosen at random (Fig. 3). Twenty of 29 breeding sites were at cobble/small boulder bars. At the April 1994 stage,

TABLE 1. Landscape patterns of *Rana boylii* oviposition at the South Fork Eel River, California. Most clutches are in closer proximity to confluences with side drainages than would be expected by chance.

Year	Distance to nearest tributary (m)	Proportion of study reach	Observed no. clutches	Expected no. clutches	χ^2†	P
1992	<100	0.57	292	166	224	≪0.001
	≥100	0.43	0	126		
1993	<100	0.57	399	233	274	≪0.001
	≥100	0.43	12	178		
1994	<100	0.57	553	337	320	≪0.001
	≥100	0.43	42	258		

† df = 1.

TABLE 2. Nonrandom distribution of *Rana boylii* breeding sites (n = 29) with respect to geomorphic features of the South Fork Eel River, based on a 3.6-km longitudinal survey (χ^2 = 8.1, df = 3, P < 0.05).

Feature	Proportion of reach	Observed no. sites	Expected no. sites
Riffle	0.16	3	4.6
Shallow pool (depth < 1 m)	0.46	21	13.4
Medium pool (1 m ≤ depth < 2 m)	0.13	1	3.8
Deep pool (depth ≥ 2 m)†	0.25	4	7.3

† Breeding sites were at bars near the outlets of these pools, not at the deepest part of the profile.

emergent rocks were a common feature at breeding sites (15 out of 15 surveyed channels) but not at random sites (3 out of 11 channels).

Individual egg attachment sites occurred within a narrow depth range and a more variable range of distances from shore. Depth ranged from 4 to 43 cm, with consistent yearly means (±1 SD) and coefficients of variation ($\bar{X}_{1992}$ = 19.7 ± 5.4, CV_{1992} = 27.4%, n = 225; $\bar{X}_{1994}$ = 19.7 ± 7.3, CV_{1994} = 36.5%, n = 293; t = 0.05, P = 0.96). To achieve consistent egg depth, frogs oviposited at highly variable distances from shore, ranging from 0 to 1250 cm. In 1994 when base flow discharge was low, frogs oviposited farther from shore than they did in 1992 ($\bar{X}_{1992}$ = 220.3 ± 184.3, CV_{1992} = 83.6%, n = 216; $\bar{X}_{1994}$ = 280.5 ± 260.1, CV_{1994} = 92.72%, n = 290; t = 3.0, P = 0.003). The most commonly used substrates were cobbles (53.6%) and boulders (34.4%). Bedrock and vegetation were used much less frequently (9.6% and 1.2%, respectively).

Frogs selected attachment sites on lee sides of rocks and beneath overhangs within a narrow velocity range (3.2 ± 0.19 cm/s, mean ± 1 SE; range = 1.1–13.5 cm/s). Flow velocities at egg masses were significantly lower than mean ambient velocities within the breeding site (Fig. 4).

Hatching success in relation to hydrology and channel geometry

The main causes of mortality were hydrologic: desiccation (in 1992) or scour (in 1993 and 1994) (Figs. 5A, 6). In 1992, a drought year, survival was relatively high (89.7 ± 10.2%, mean ±1 SE) and stranding was the major cause of mortality. During the oviposition period, 3 cm of rain fell and discharge decreased 53% (from 0.60 to 0.28 m^3/s) in the 5 wk between appearance of the first clutches and hatching of most of the eggs. In 1993, survival could not be estimated accurately because of late-season rainstorms (24.7 cm total rainfall) when most larvae were emerging, constituting a >300% increase in discharge (from 4.8 to 20.8 m^3/s). After the water receded and visibility improved, most egg masses had been swept off their substrates and markers were also gone, making an accurate census impossible. Subsequent tadpole censusing later in the summer indicated that survival was indeed very low (S. J. Kupferberg, *unpublished data*). In 1994, survival was 79.8 ± 12.4% and the major cause of mortality

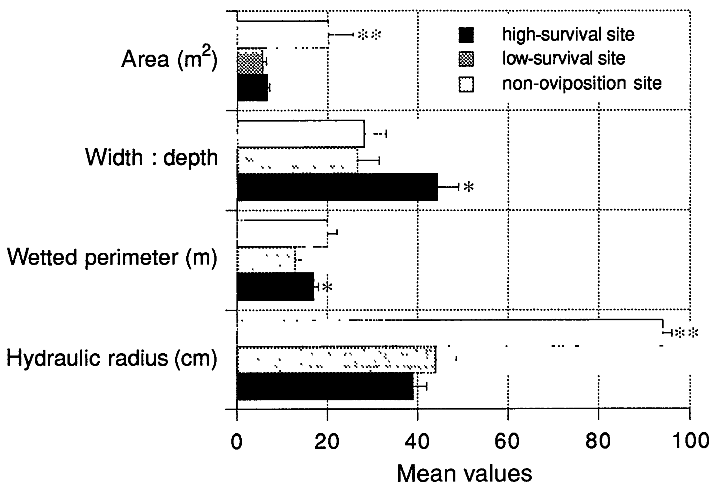


FIG. 3. Mean values (+1 SE) of cross-sectional geometry variables for nonbreeding (non-oviposition) sites, breeding sites (n = 11) with high survival (n = 10), and low-survival sites (n = 5). Measurements refer to the wetted channel in mid-April 1994, when oviposition began. * indicates significant (P < 0.05) differences between high- and low-survival breeding sites ($U_{\text{width depth}}$ = 46.5, $U_{\text{wetted perimeter}}$ = 46.5); ** indicates significant ($P \le 0.01$) differences between nonbreeding and breeding sites (Mann-Whitney $U_{\text{hydraulic radius}}$ = 140, U_{area} = 141).

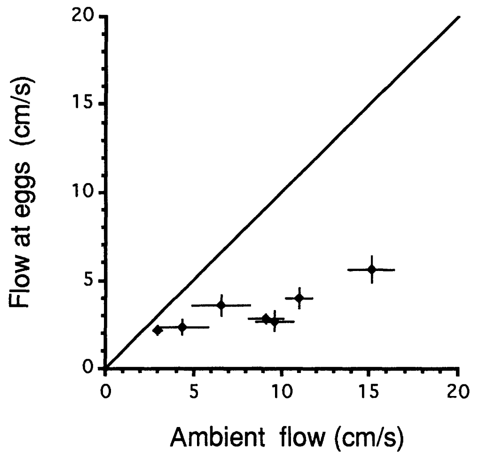


FIG. 4. *Rana boylii* prefer low-velocity egg attachment microsites ($F_{\text{location, egg vs. ambient}} = 140$; df = 1,170; $P \ll 0.001$). Each point is the mean (± 1 SE) flow velocity measured at clutches (y) and 5–10 cm away from eggs (x), for seven breeding sites. Line $x = y$ indicates expected flow at eggs if frogs were not microsite selective. Some sites had significantly higher velocities than others ($F_{\text{site}} = 27.6$; df = 6, 170; $P \ll 0.001$). A significant interaction between location of flow measurement (near or away from egg mass) and breeding site ($F_{\text{location} \times \text{site}} = 11.2$; df = 6, 170; $P \ll 0.001$) indicates the increasing difference between egg and ambient velocity as ambient velocity increases.

was scour, associated with 14.3 cm total rainfall over the breeding season. Debris marks on staff gages indicated that river stage rose an average of 40 cm during peak flows, and stage height was, within an average of 1 cm, the same at hatching as at initial egg-laying. Stranding was, therefore, minimal. In both 1992 and 1994, eggs laid later experienced less variation in discharge and had less chance of being scoured or stranded than eggs laid earlier (Figs. 5B and 6).

Mortality was also specific to breeding site (Fig. 5A). The correlation between survival in years with and without spring rain (Fig. 7) suggests that, for some channel shapes, stage and velocity are relatively insensitive to discharge changes and, thus, allow higher survival to hatching (Fig. 8). There were significant differences between the above-average, and below-average survival sites, with respect to wetted perimeter and width to depth ratio (Fig. 3), but no significant differences in cross-sectional area or depth.

Stranding, a consequence of discharge fluctuation and channel geometry, interacted with predation but not with fungal-associated mortality (Table 3). In 1992, stranding increased predation by exposing eggs to surface-dwelling hemipterans and terrestrial predators such as ants, in addition to fully aquatic predators such as limnephilid caddis fly larvae (41% of exposed clutches had predators present, whereas 14% of submerged clutches had predators present). Stranding did not alter risk of fungal attack (23% of exposed clutches had fungus vs. 25% of submerged clutches). Moreover, risks of predation and fungal attack were independent.

Historically, eggs face scouring conditions more often than stranding. The proportion of one stranding to two scouring years resembles the longer term record, in which there were eight years with no rain during the oviposition period and 16 years with rain. The 1992–1994 study period was representative of historical breeding season conditions with respect to peak discharge (Fig. 9A), but the late May–early June 1993 storms were anomalous with respect to dewatering of the channel (Fig. 9B). Although the 1993 flood has a recurrence interval of $\approx$10 yr, or a 10% chance of occurring in any given year's breeding season, it represents a much rarer event in terms of dewatering (Fig. 9B).

Seasonality of breeding

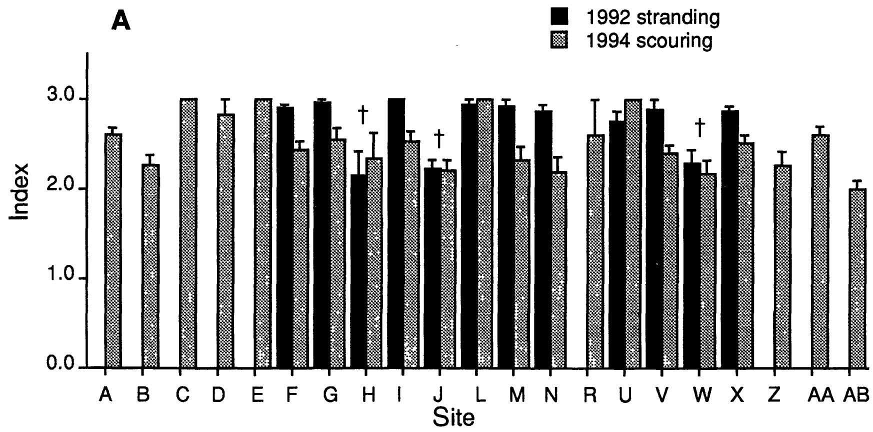
In low base-flow discharge years, oviposition occurred earlier than in high discharge years (Fig. 5). The duration of breeding activity corresponded to rain during the oviposition period. In the absence of appreciable spring rain during 1992, 75% of clutches were laid in 11 d. In the presence of rain in 1994, 75% of clutches were laid in 39 d. Peaks on the 1994 hydrograph correspond to flat regions of the cumulative percentage of clutches curve, whereas the receding limbs after peaks correspond to regions of steep increase in oviposition.

Initiation of oviposition was also associated with warming (Fig. 10). Daily mean air and water temperatures were significantly warmer during the first week of oviposition than during the preceding week, in all three years. There were significant among-year differences in pre-oviposition water temperature, but no differences in postoviposition temperature, as indicated by the significant interaction term in the ANOVA.

DISCUSSION

The reproductive strategy of *R. boylii* appears well-suited to rivers with predictable winter–flood, summer–drought hydrographs. Breeding was completed in a shorter period of time and earlier in a drought year compared to two years with rainy oviposition periods. Successful *R. boylii* selected historically used breeding sites associated with tributary confluences, with distinctive channel morphologies, and with boulders that created microhabitats with below-ambient flow velocity. In combination, these behaviors enhanced egg and early larval survival by decreasing the risk of desiccation and concomitant exposure to predators, and by mitigating the likelihood of scour off rocks.

When rivers are modified by channelization, gravel mining, damming, or diversion, the characteristics of channel morphology and hydrology important to *R. boylii* recruitment become decoupled from the climatic patterns that regulate breeding. Latitudinal variation in *R. boylii* breeding season, in which southern populations breed earlier than northern populations (Zweifel 1955), suggests that these frogs wait for warm temperatures and the cessation of winter rains to initiate



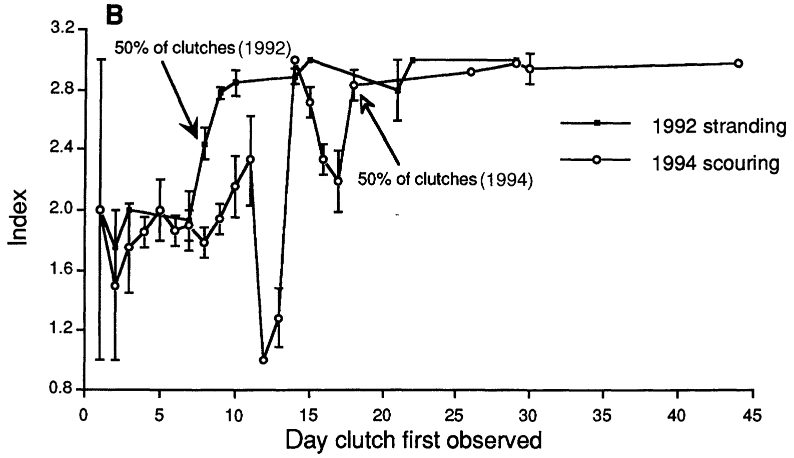


FIG. 5. Mean (+1 SE) scouring and stranding indices of *R. boylii* egg masses were significantly different among breeding sites (A), and were significantly correlated with oviposition date (B) and survival. For 1992: $r_{\text{stranding index} \times \text{survival}} = 0.62$, $P < 0.001$; between-site differences, Kruskall–Wallis $\chi^2 = 87.3$, df = 11, $P < 0.001$; $r_{\text{stranding index} \times \text{date}} = 0.28$, $P < 0.01$; $n = 280$ clutches at 12 sites. For 1994: $r_{\text{scour index} \times \text{survival}} = 0.89$, $P < 0.001$; between-site differences, Kruskal–Wallis $\chi^2 = 60.8$, df = 22, $P < 0.001$; $r_{\text{scour index} \times \text{date}} = 0.70$, $P < 0.001$; $n = 476$ clutches at 23 sites. Daggers indicate sites that had significantly more losses in both years. Index of stranding fate: 1, egg mass completely exposed to the air; 2, partially exposed; and 3, completely submerged. Index for scouring: 1, egg mass completely gone from substrate; 2, partially removed; and 3, intact. Breeding sites A–E, R, and Z–AB were not monitored for survival in 1992.

breeding. The specific proximal cues that *R. boylii* use to initiate breeding, such as air and water temperature, insolation, and discharge, are currently being compared in regulated and unregulated rivers across a latitudinal gradient in six northern California watersheds (A. Lind, U.S. Forest Service, *personal communication*). This forthcoming information plus an understanding of breeding site selection and mortality sources within a single, relatively pristine system (from this study of the South Fork Eel River watershed) may allow us to manage rivers in ways that do not continue to threaten *Rana boylii.*

Spatial scales of habitat preference

The choice of appropriate boundaries for a conservation project is particularly important for riverine organisms, because rivers are highly heterogeneous environments (Ward 1989) in which habitats are nested hierarchically (Frissel et al. 1986, Hawkins et al. 1993). Factors controlling the distribution and abundance of river organisms span many orders of magnitude in space and time (Minshall 1988, Crowl and Schnell 1990, Biggs and Gerbaux 1993), from climate, geology, land use, and hydrologic regime (Benda et al. 1992, Poff and Allan 1995), to water velocity (Rabeni and Minshall 1977, Biggs and Gerbaux 1993), substrate (Minshall 1984, Power 1992*b*), food abundance, and predation (Peckarsky 1984, Power 1987, Crowl and Schnell 1990). To determine what habitats must necessarily be included in a project focused on maintaining *R. boylii* populations, I consider both the largest and smallest scales (extent and grain, sensu Wiens 1989) of spatial heterogeneity to which these frogs respond, in terms of reproductive behavior.

The largest scale of *R. boylii* selectivity was at the sub-basin level (1000s of square metres). Breeding

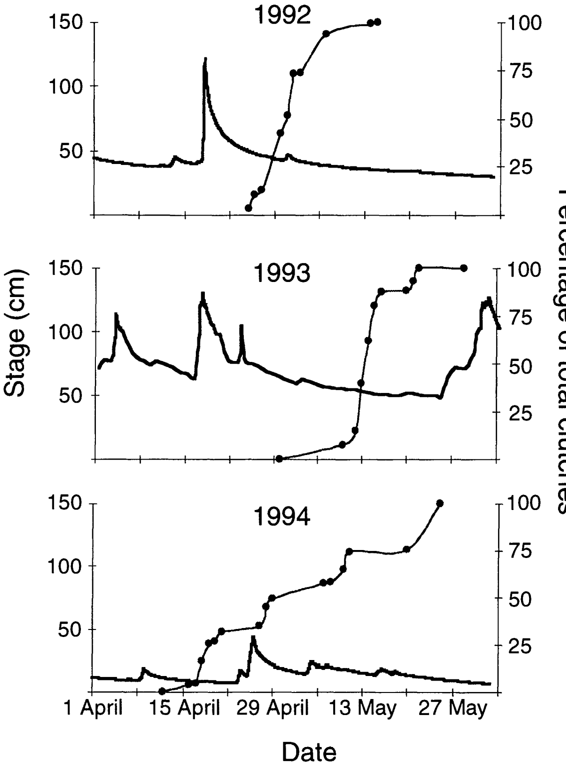


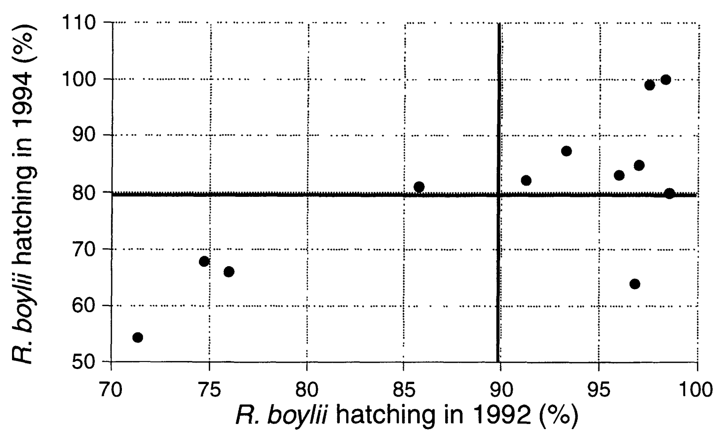
FIG. 6. Spring hydrographs 1992–1994 (bold line) and cumulative frequency distribution of *R. boylii* clutches (thin line).

sites were associated with drainage patterns of the sub-basins and were close to confluences with tributaries. This result may be explained by the disadvantages of tributaries for breeding, but relative advantages for adult overwintering. Tributaries are dark and cool with low algal food production, conditions not conducive to tadpole growth. Although *R. boylii* overwintering behavior is not known, adults are commonly found in the tributaries in the early spring before they are abundant in the mainstem (S. J. Kupferberg, *personal observation*). It is also not known whether or not *R. boylii* leave water channels for the forest margins, but they are rarely seen more than a few metres away from water (S. J. Kupferberg, *personal observation*). It is thus likely that they leave the active channel of the mainstem to avoid scour, and move to low-order tributaries, some of which may only flow during the rainy season. Adults may then migrate downstream to the main stem to breed, congregating at the gravel/boulder bars closest to the tributary confluences. An alternative explanation for this result is that sediment from tributaries may contribute to local maintenance of the coarse sediment patches that cover the main stem's bedrock channel. The availability of coarse sediment enables frogs to find rocks that can shield egg masses from high flow velocities. An analogous sediment supply link between tributaries and main stems is exemplified in the Pacific Northwest, where the supply of salmonid spawning gravels in larger streams is affected by logging practices (Hartman et al. 1987) as well as by natural erosion processes in low-order tributaries (Benda et al. 1992).

At the scale of reaches (e.g., pools and riffles, 10–100 m^2), frogs selected broad, shallow channels. Breeding sites with greater than average width to depth ratios had above-average survival. One explanation for this result is that the two variables critical to eggs being swept off rocks or desiccated, current velocity and stage, are less sensitive to discharge fluctuation in broad, shallow channels than in deep, narrow channels. Velocity increases more slowly with increasing discharge in wide channels than in narrow channels because of greater channel roughness (Dunne and Leopold 1978). Under conditions of declining discharge, stage decreases less in a broad channel than in a narrower channel. Alternatively, frogs may have avoided deep pools because substrates there were too small for egg attachment, there was predation risk from fish (Holomuzki 1995), or algal food resources needed by tadpoles were absent. Chemicals released by algae, which stimulate spawning in another ranid (Savage 1961), may be at low concentration in deep pools.

At the finest scale (e.g., individual cobbles and boulders, 0.1–1 m^2), frogs attached eggs to microsites with lower than ambient flow velocities. High velocities can

FIG. 7. Correlation between *R. boylii* hatching success in a drought year, 1992, and a flood year, 1994 (Pearson $r = 0.73$, $P = 0.007$). Vertical and horizontal lines represent mean survival in 1992 and 1994, respectively.



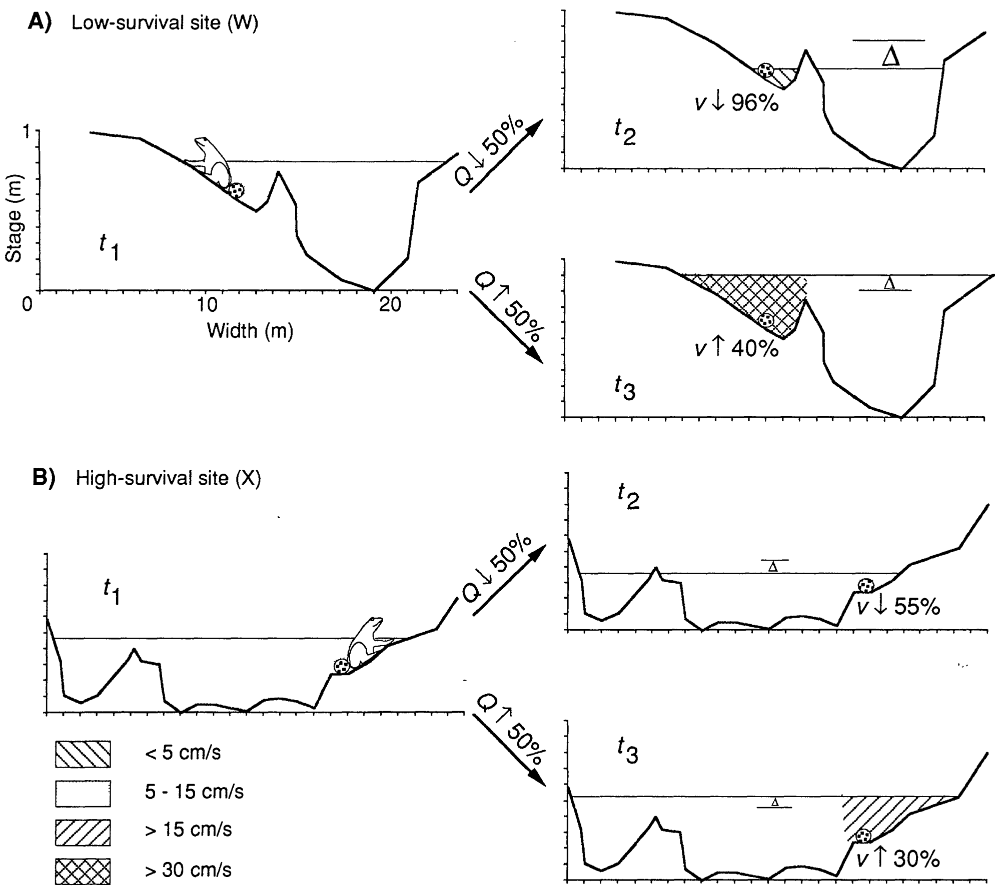


FIG. 8. Sensitivity of stage and velocity to discharge fluctuation at *R. boylii* breeding sites with different channel shapes. Frogs (not drawn to scale) are ovipositing at equal depths in (A) a low-survival channel cross section (1:10 vertical exaggeration), and (B) a high-survival channel, at discharge $Q_1 = 3$ m³/s. At subsequent times (t), discharge can decrease ($Q_2 = 1.5$ m³/s) or increase ($Q_3 = 4.5$ m³/s). Changes in stage (indicated by Δ) and velocity (v, indicated by fill pattern; percentage change in velocity is also shown) are relatively smaller in the wider, shallower channel. Eggs become exposed to air in the narrower channel when Q decreases by 50%.

limit fertilization (Pennington 1985, Denny and Shibata 1989, Levitan 1991). Although sperm density and viscosity can counteract diffusion caused by velocity and turbulence, as has been shown for marine invertebrates (Thomas 1994), current velocity must be slow enough to allow external fertilization. Interestingly, the tailed frog (*Ascaphus truii*), one of the few frogs with internal fertilization and the only frog with an intromittant organ, breeds in the steep gradient, and high velocity, tributary creeks at the site.

High velocities also sweep away clutches. I have observed clutches that were oviposited at low velocity remaining attached as velocities rose >20 cm/s, but not for sustained periods. When returning to a site that had experienced 20 cm/s flow for a few days, I usually found that all but a few of the eggs in the clutch had washed away. Thus, it appears that there is a threshold velocity and duration of exposure beyond which the egg jelly loses adhesion. If velocities were high at the time of oviposition, however, frogs concealed their clutches in low flow microsites underneath overhanging portions of large boulders.

Oviposition timing and historic site use in relation to discharge and temperature

R. boylii breed early during the transition between the wet and dry seasons, despite the likelihood of highly variable discharge that can cause egg mortality. Discharges equaling those of late May 1993 (20.8 m³/s), which swept most clutches away, recur at an interval of ≈9 yr during the breeding season, based on 25 years of records. Although longer term data are not available, it is reasonable to assume that breeding later would minimize exposure to variable conditions. Accordingly, frogs commence ovipositing later when base flow is high, and earlier in low-flow years, but this plasticity may be driven by temperature cues as well as by precipitation. At the South Fork Eel, oviposition appeared to begin once mean water temperatures reached ≈12°C,

TABLE 3. Multidimensional contingency analysis examining associations among three sources of mortality for *Rana boylii* egg masses: stranding (S), fungal attack (F), and predation (P) in 1992.

Null hypothesis	df	Y^2 (likelihood ratio χ^2)
P independent of F at all levels of S	2	0.39
P independent of S at both levels of F	2	22.2***
F independent of S at both levels of P	2	0.16
P independent of F and S	3	22.5***
F independent of P and S	3	0.41
S independent of P and F	3	22.4***

*** $P < 0.001$.

although *R. boylii* eggs have been found in water ranging from 9° to 21.5°C at other sites (Zweifel 1955). Unlike hylid pond frogs, in which breeding is positively correlated with both warm temperatures and rain (Ritke et al. 1992), breeding of rhacophorid and ranid frogs in first and second order Japanese mountain streams is positively correlated with water temperature but negatively correlated with rain (Kusano and Fukuyama 1989, Fukuyama and Kusano 1992). These behaviors may explain why, during 1994, *R. boylii* breeding started earlier and continued >2 wk longer than in previous years.

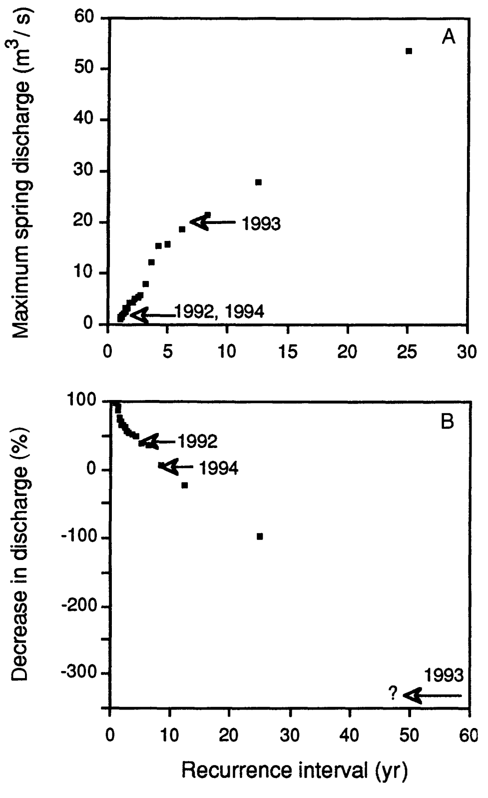


FIG. 9. Frequency of spring discharge (1946–1970) recorded at the South Fork Eel River near Branscomb, California, by the USGS. (A) Maximum mean daily discharge during the approximate oviposition period of *R. boylii,* 15 April–1 June. (B) Channel dewatering rate during the same period. Arrows indicate magnitude of discharge and dewatering during 1992–1994. The extrapolated recurrence interval for the 1993 increase in discharge is indicated by a question mark.

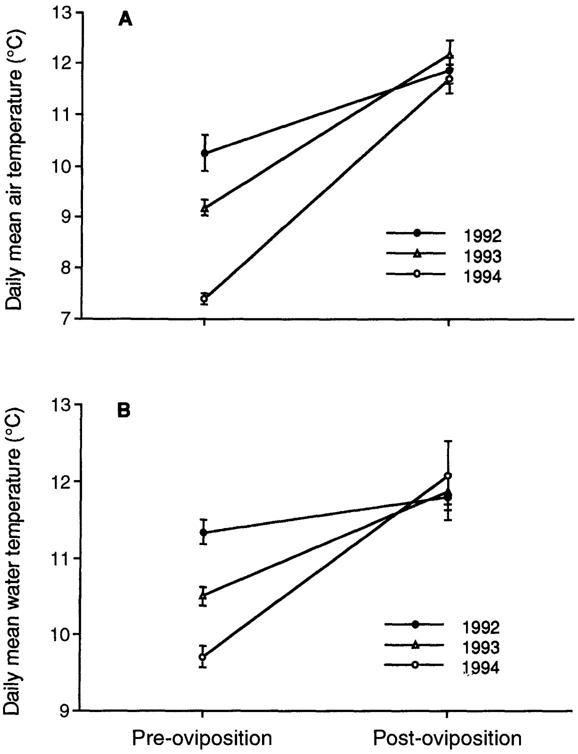


FIG. 10. Daily mean (±1 SE) temperature in the week preceding and following the appearance of the first *R. boylii* egg mass. Two-way ANOVA results for (A) air: $F_{\text{year}} = 3.3$; df = 2, 36; $P = 0.05$; $F_{\text{pre- vs post-oviposition}} = 34$; df = 1, 36; $P \ll 0.001$; $F_{\text{year} \times \text{pre- vs post-oviposition}} = 2.5$; df = 2, 36; $P = 0.1$; (B) water: $F_{\text{year}} = 3.6$; df = 2, 36; $P = 0.04$; $F_{\text{pre- vs post-oviposition}} = 42$; df = 1, 36; $P \ll 0.001$; $F_{\text{year} \times \text{pre- vs post-oviposition}} = 6.7$; df = 2, 36; $P = 0.003$.

Despite the results in 1992 and 1994 that the first 50% of clutches had greater losses to stranding and scouring than the second 50%, early breeding may be maintained because of priority advantages accrued by early breeders. For example, late-arriving males risk finding that all gravid females have already mated and laid their eggs (Wells 1977). Offspring of early-mating frogs also have priority advantages with respect to size and, hence, competitive ability as tadpoles (Wilbur and Alford 1985, Morin et al. 1990). Moreover, the phenology of algal blooms in spring and summer (Power 1992*a*) may create a situation in which food resources are less abundant for tadpoles not yet metamorphosed in the fall. There also may be insufficient time for late-metamorphosing juveniles to forage and grow in the fall before winter dormancy must begin. These conflicts among selection pressures, when superimposed on years of varying rainfall and temperature, may serve to maintain variation in oviposition timing.

Historic site use appears to be maintained, despite annual variation in river stage and breeding season. The heavily used sites in this study have been used for ≥25 yr (P. Steel, Angelo Coast Range Reserve manager, *personal communication*), suggesting that these sites have appropriate habitat at a range of river stages. It is also likely that these sites have been morphologically stable during this period. The large boulders dominating these sites do not move at bank-full discharge, i.e., at 1–2 yr recurrence intervals. The force, or critical shear stress, necessary to move the large rocks probably occurred last during storm events of 1964 (W. E. Dietrich, *unpublished data*).

Conservation and restoration implications

Amphibians and fish are important components of biodiversity. Amphibians constitute 28% of all U.S. animal species that are ranked as extinct, possibly extinct, critically imperiled, imperiled, or rare; fish constitute 34% (Master 1990). In rivers, this diversity is maintained, in part, by variation in hydrologic regime, as has been shown for fish assemblages (Grossman et al. 1982, Moyle and Vondracek 1985, Poff and Allan 1995). Under natural flow regimes, conditions favoring recruitment of one species, or set of species, fluctuate with states favoring recruitment of other species (Starrett 1951, Seegrist and Gard 1972, McElravy et al. 1989). Management strategies should therefore be dynamic to respond to species differences in links between the physical structure and flow regime of a river, and the population processes of the target organisms. Most efforts to manage physical conditions in the rivers of California and Oregon for wildlife benefit have focused on optimizing habitat and discharge for salmonids (Shirvell 1990, Flosi and Reynolds 1991, Nickelson et al. 1992). Additions of spawning gravels and high-volume releases in the spring (to trigger spring spawning runs or to get smolts out to the ocean) may be at cross-purposes to conservation of other species vulnerable to late-season floods, as is shown here for *R. boylii.*

If rivers are to be restored, enhancement plans should contain a heterogeneity of habitats and flow regimes that can sustain diverse populations. To achieve this goal, we need data that relate hydrology and channel morphology to population processes for a broad array of taxa (algae, insects, turtles, snakes, salamanders, etc.). Just as the availability of spawning gravels is recognized as essential for conservation of river-breeding salmonids, availability of frog breeding sites, i.e., broad, shallow channels with stable, large-boulder substrates that do not move under bank-full conditions, are necessary for *R. boylii* conservation. Censuses of adult frogs conducted in midsummer (Moyle 1973, Hayes and Jennings 1988) may yield a partial picture of the necessary physical conditions if the availability of breeding habitat is overlooked.

Specific recommendations for *R. boylii* conservation follow from observations of this study. Plans regarding the scale of any project should incorporate the fact that breeding habitats are embedded within the drainage network of the watershed, with heavily populated breeding sites located near tributaries that may be important adult habitats. Channel restoration plans should include the appropriate heterogeneity of elevations, grain size, and flow velocities present at repeatedly used, high-survival breeding sites. Specifically, these channels should mimic the asymmetrical cross-sectional profiles of egg sites, and should have large boulders that are stable under bank-full conditions. To provide protection from discharge fluctuation and to create oviposition sites at a range of stages, relatively low-slope benches elevated above the thalweg (main conveyance channel) should be included. In addition to sloping toward the thalweg, benches should be graded to elevate the surface of the water higher at the upstream end of the benches, so that tadpoles will follow the receding water line and end up in the low-flow channel. Instream aggregate (gravel) mining, which typically removes bars and creates a wide, flat channel, might be particularly harmful to *R. boylii* recruitment. To minimize loss of breeding habitat, mining should occur in parts of rivers not used for oviposition, such as deeper pools or reaches with few tributaries, and at times of year when frogs are more common in tributaries, i.e., fall and winter. At least in some years, releases of water from dams during the breeding season (April–June) should be timed to minimize stranding and scouring mortality, because extreme fluctuation in discharge can lead to the loss of a cohort of tadpoles, as occurred naturally during the late May flood of 1993. The absolute magnitude of peak discharge is also important, because the lowest peak discharge year, 1992, had the highest survival.

As amphibians decline (Wake 1991), we rarely know whether or not sensitive species, such as *R. boylii,* are strong interactors possessing unique traits with ramifications for other trophic levels. *R. boylii* tadpoles can enhance macroalgal standing stock on cobbles by removing diatom epiphytes, have negative competitive effects on benthic invertebrate grazers (Kupferberg 1996), and are important prey for juvenile aquatic garter snakes (*Thamnophis atratus*) (Lind and Welsh 1994; S. J. Kupferberg, *personal observation*). Because of these interactions, as well as this frog's susceptibility to displacement by non-native bullfrogs (Kupferberg 1996), conservation of *R. boylii* has implications for other components of river food webs.

Acknowledgments

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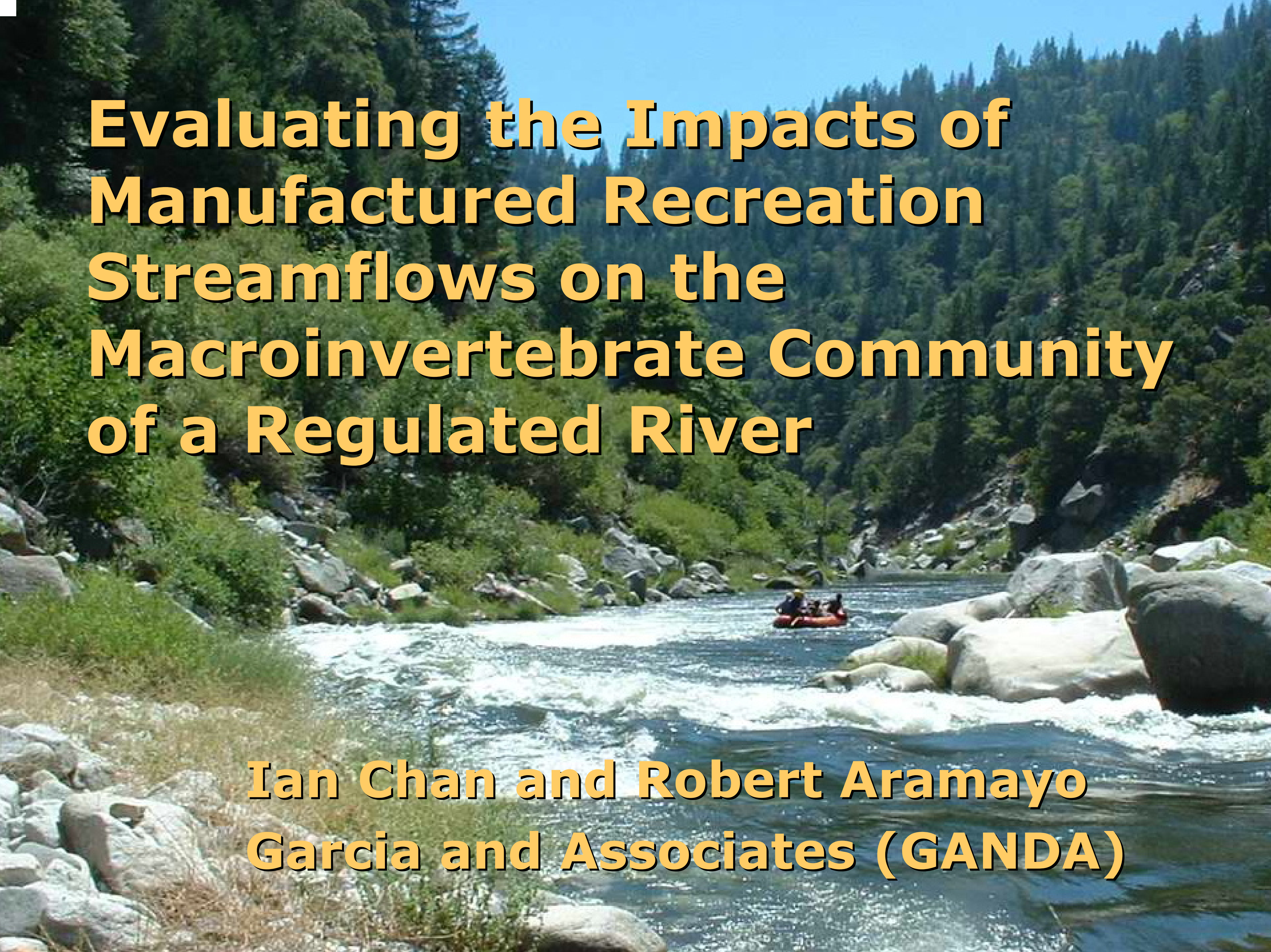
Exhibit 13

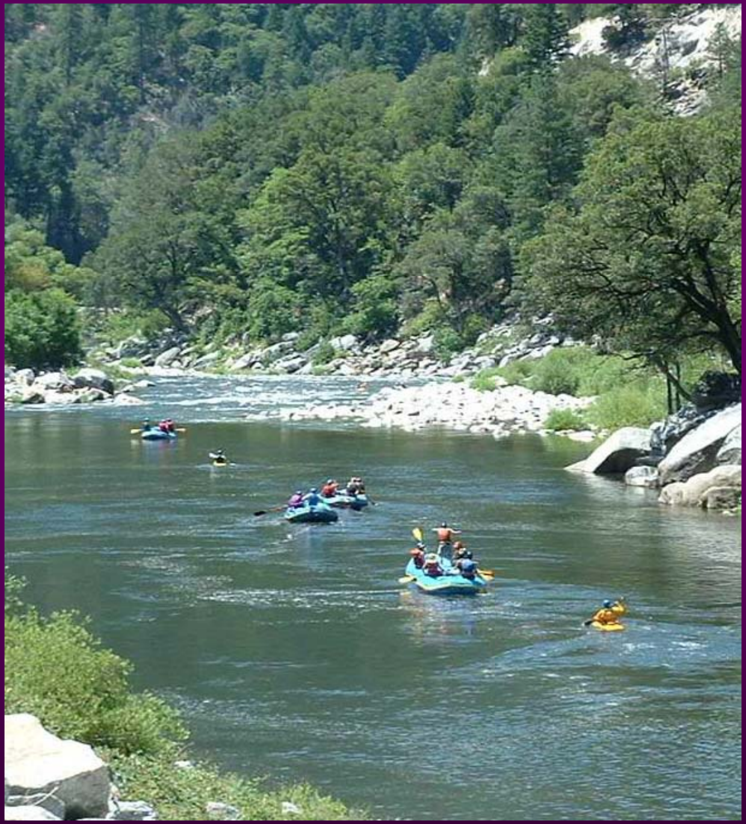


Evaluating the Impacts of Manufactured Recreation Streamflows on the Macroinvertebrate Community of a Regulated River

Ian Chan and Robert Aramayo
Garcia and Associates (GANDA)

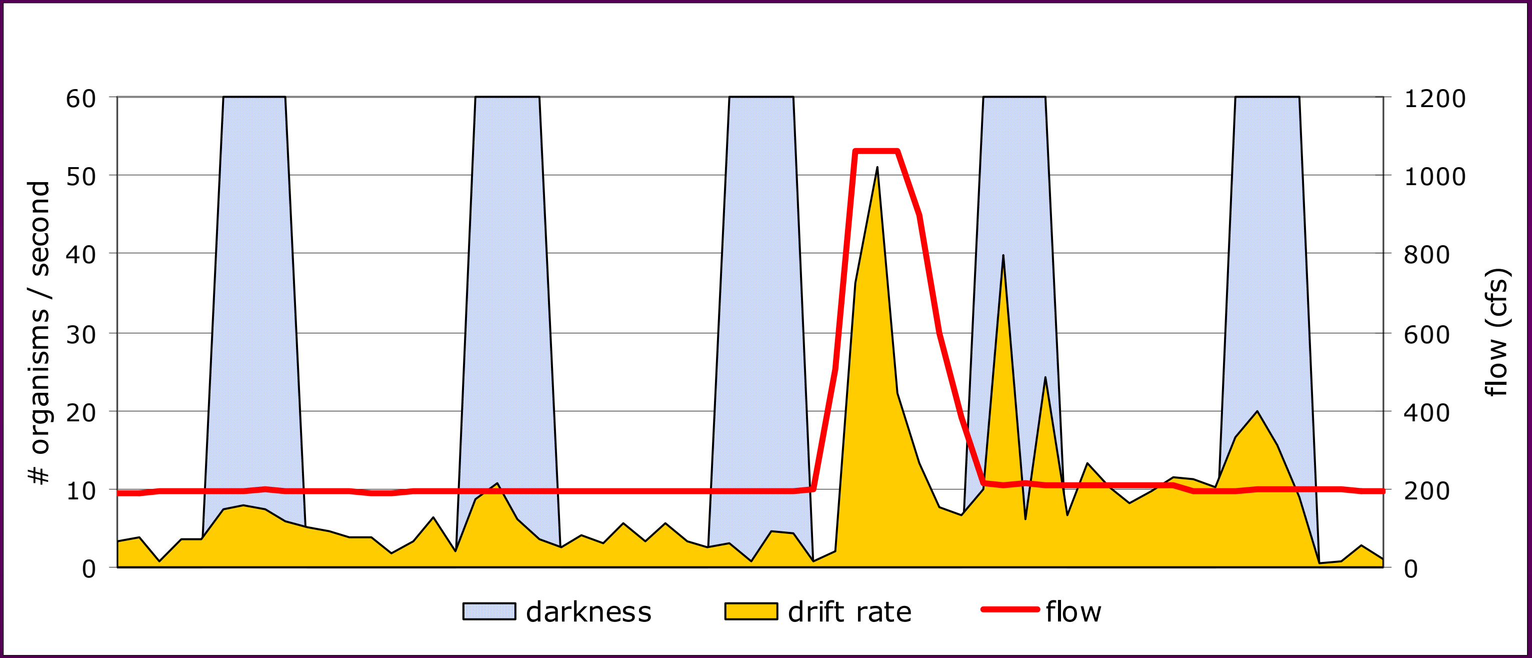
INTRODUCTION

North Fork Feather River (NFFR) Pulsed Recreation Streamflows



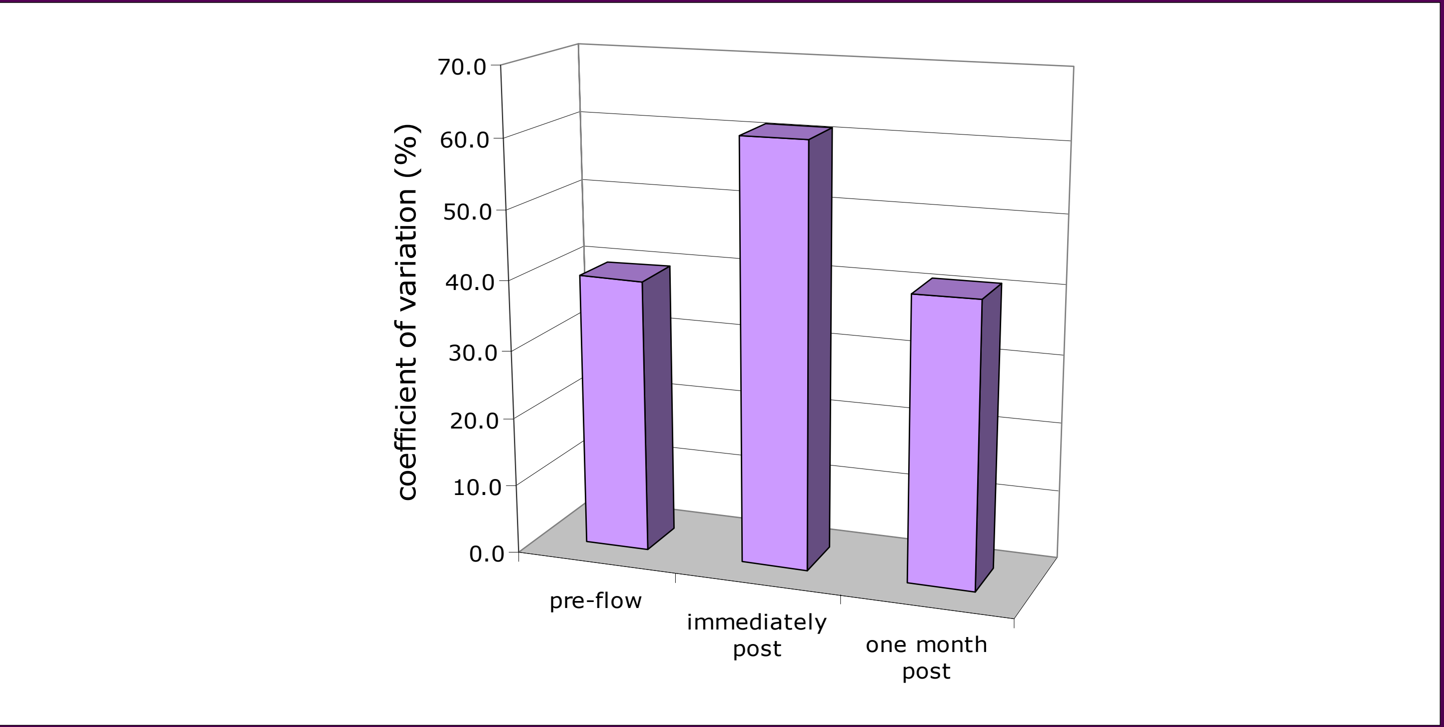
- **MAGNITUDE**: 4-7x baseflow levels
- **DURATION**: 1-day events (<24hrs)
- **FREQUENCY**: once per month
- **TIMING**: late June-October (during typical low-flow/baseflow season)

Previous studies of NFFR pulsed flows (2002-2003) demonstrated:



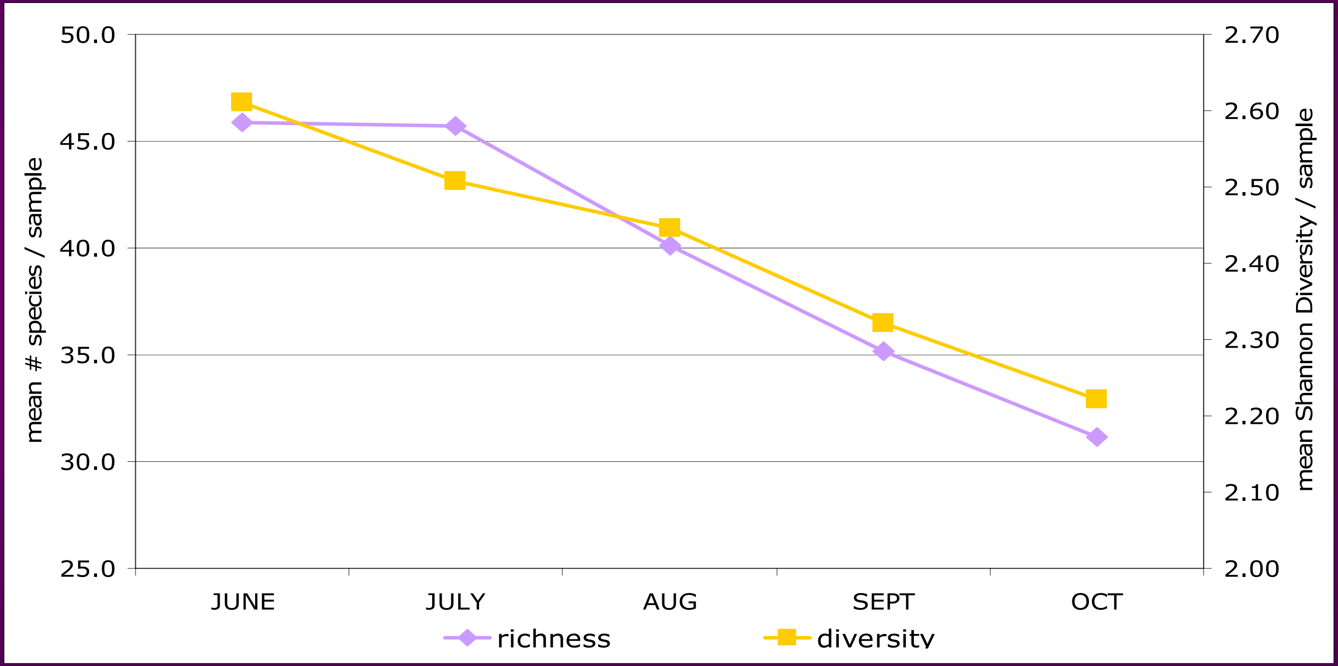
1. Increased invertebrate drift during & after recreation flow events (i.e., "catastrophic drift")

Previous studies of NFFR pulsed flows (2002-2003) demonstrated:



2. Higher post-flow variability in metrics, although not necessarily declines (e.g., benthic density)

Previous studies of NFFR pulsed flows (2002-2003) demonstrated:



3. Apparent “decline” in summary metrics through sampling season (*cumulative impact or natural seasonal pattern??)*

Previous studies of NFFR pulsed flows (2002-2003) focused on:

- Before-after comparisons only
- Affected reach only (no "control")

THEREFORE:

- Difficult to understand baseline seasonal changes, and…
- Isolate effects of natural vs. manufactured sources of variation

CURRENT STUDY DESIGN

- Before-after-control-impact (BACI) design built upon design of larger concurrent study (focusing on before-after comparisons in treated reach only) by also sampling an unaffected upstream “control” reach
- Representative artificial substrate sampling (as in previous studies) plus limited kick sampling before and after flow events in both reaches

STUDY OBJECTIVES

1) compare short-term differences between benthic communities of “treated” and “control” reaches immediately before and after pulsed-flow events

2) determine if longer-term seasonal trends differ between reaches following repeated pulsed-flow events

3) compare the efficacy of representative artificial substrate sampling vs. standard kick sampling methods

“control” defined:

- Best “control” or “reference” condition = as similar as possible to the treated reach with the exception of pulsed flow events

- Terms “control” and “reference” do <u>not</u> refer to unregulated or pristine conditions

STUDY AREA

TREATED REACH

- Rock Creek Reach: regulated reach below Rock Creek Dam and Reservoir
  - *monthly pulsed flows*

CONTROL REACH

- Belden Reach: partially regulated reach below confluence of unregulated E. Branch & regulated UNFFR
  - *no pulsed flows*

METHODS: Representative Artificial Substrate Sampling

Modified Coleman-Hynes Rock Baskets

- Outer basket anchored and left *in situ*
- Inner basket filled with native substrate
- 500 micron bag retains all of inner basket and contents during sample retrieval

METHODS: Standard Kick Sampling

- 18″x9″ kick net with 500 micron mesh bag
- three 1x2 ft collections composited per replicate sample
- 3 replicate samples per site

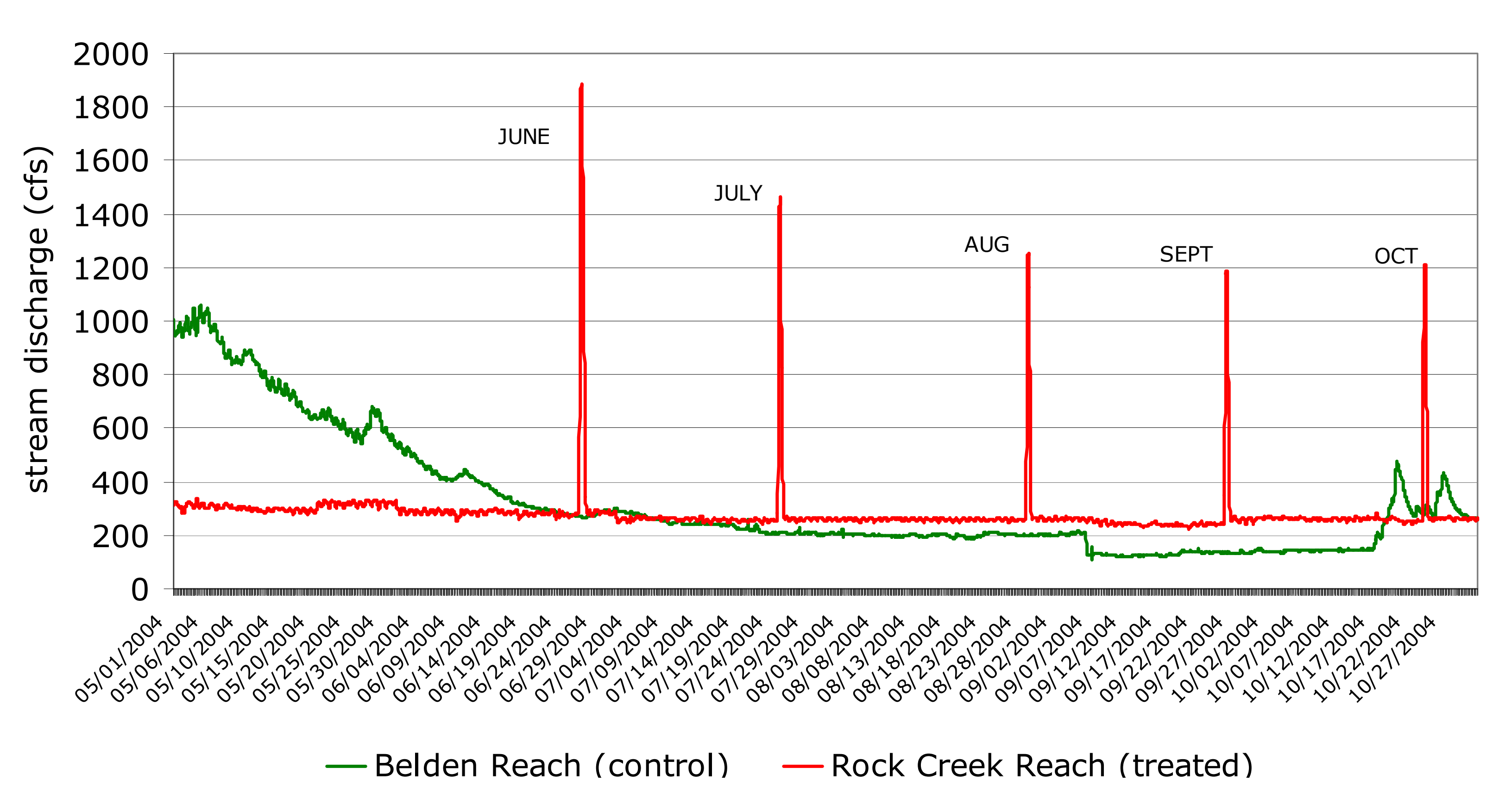
METHODS:
Laboratory Procedure

- Not a fixed-count method
- Systematic separation of coarse and fine portions using "double-sieving" technique
- Entire coarse portion processed
- Subsampled only fine portion
- Estimated whole-sample taxa lists

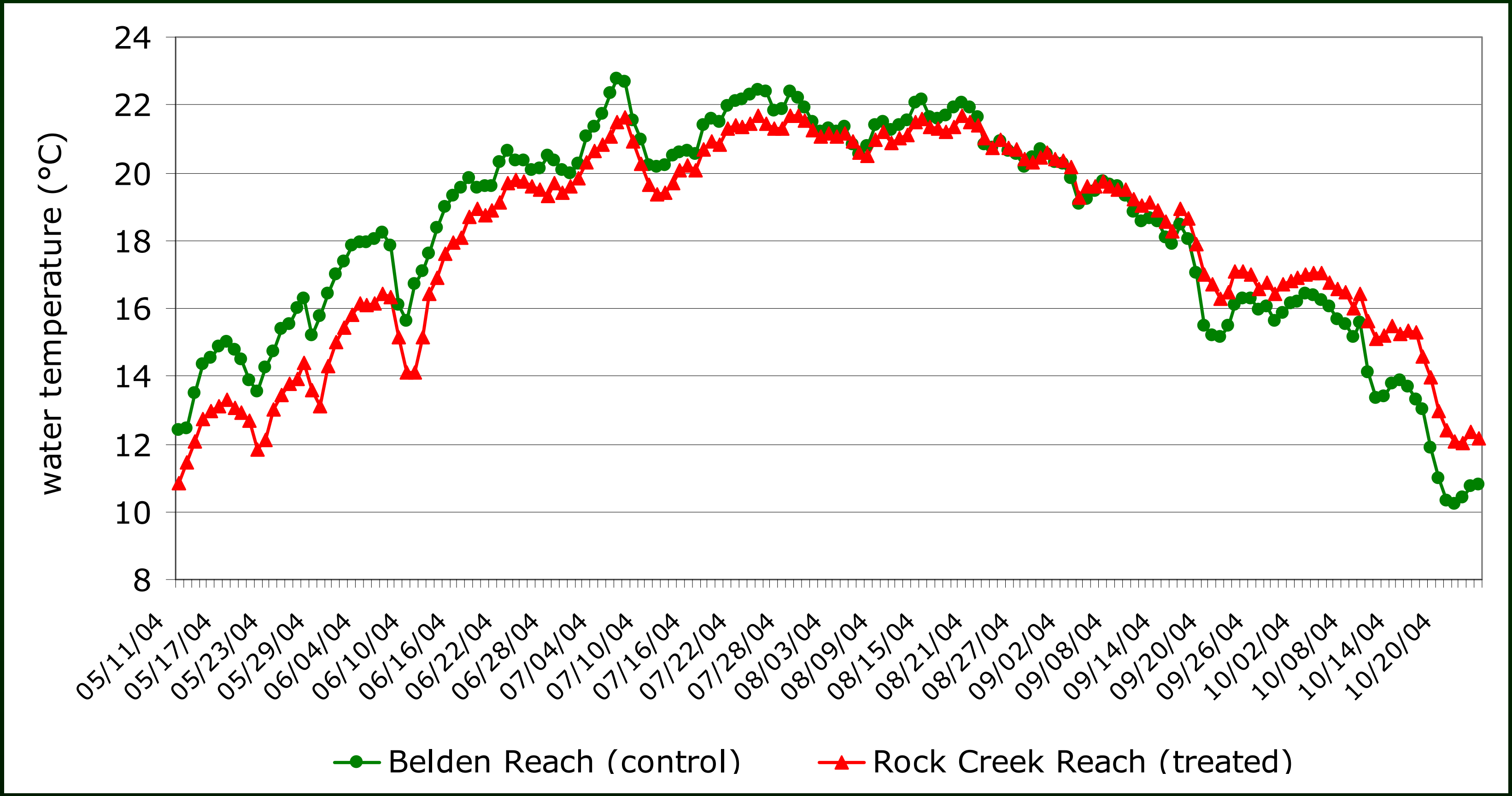
METHODS: Data Analysis

- Calculated standard invertebrate metrics (richness, composition, tolerance, FFG measures, etc.)
- Multimetric/IBI approach:
  - compiled metric data into Hydropower Multimetric Index (Hydro-MMI)
- Analysis of variance (ANOVA) with Hydro-MMI as the response variable

RESULTS: NFFR Hydrograph (2004)



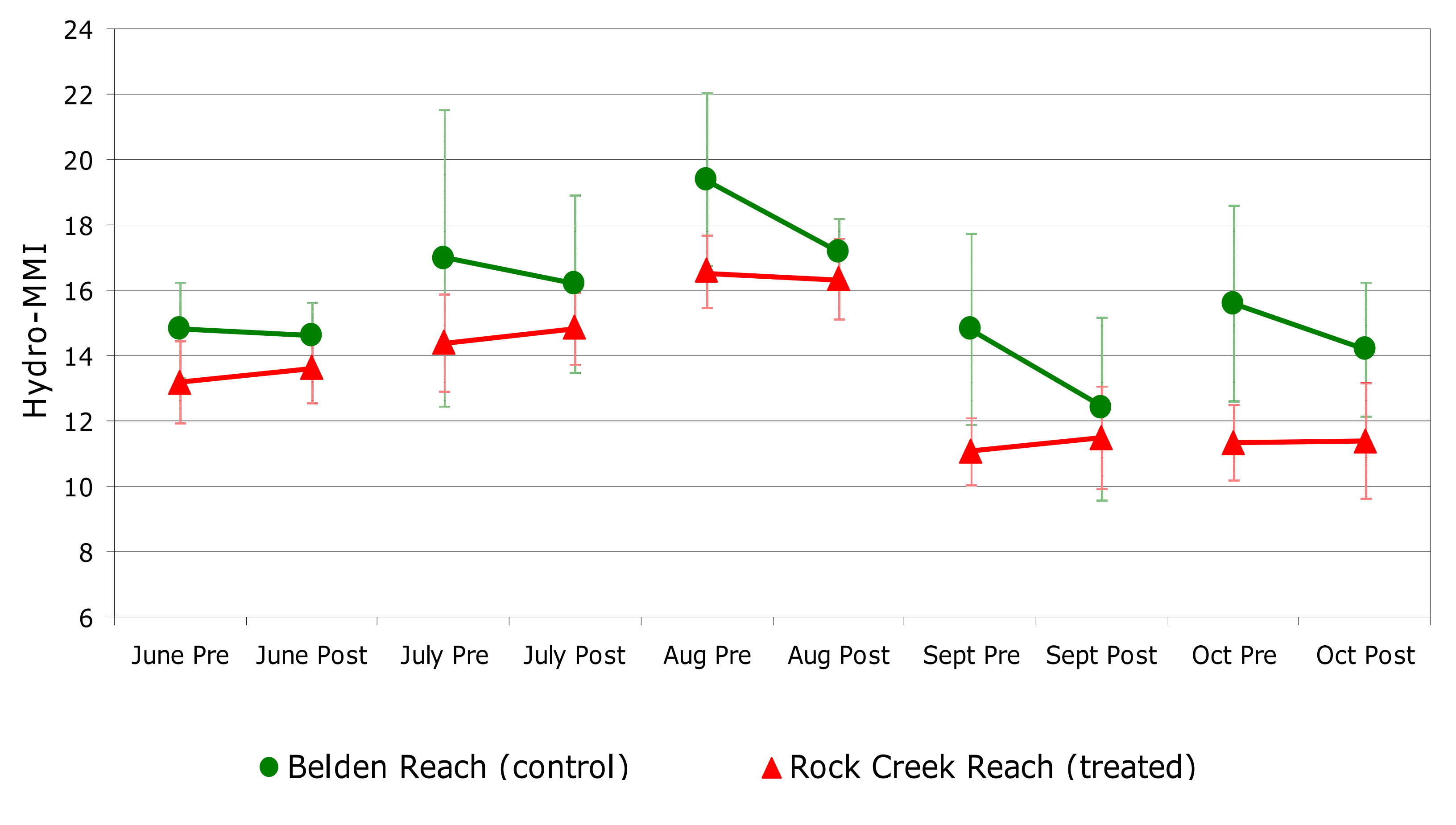
RESULTS:
NFFR Thermograph (2004)



RESULTS
Short-Term Pulsed-Flow Effects

- <u>Basket samples</u>: difference in Hydro-MMI between the treated and control reaches was statistically significant before and after pulsed-flow treatments (ANOVA, p=0.011)
- <u>Kick samples</u>: no significant difference in Hydro-MMI (p=0.410)

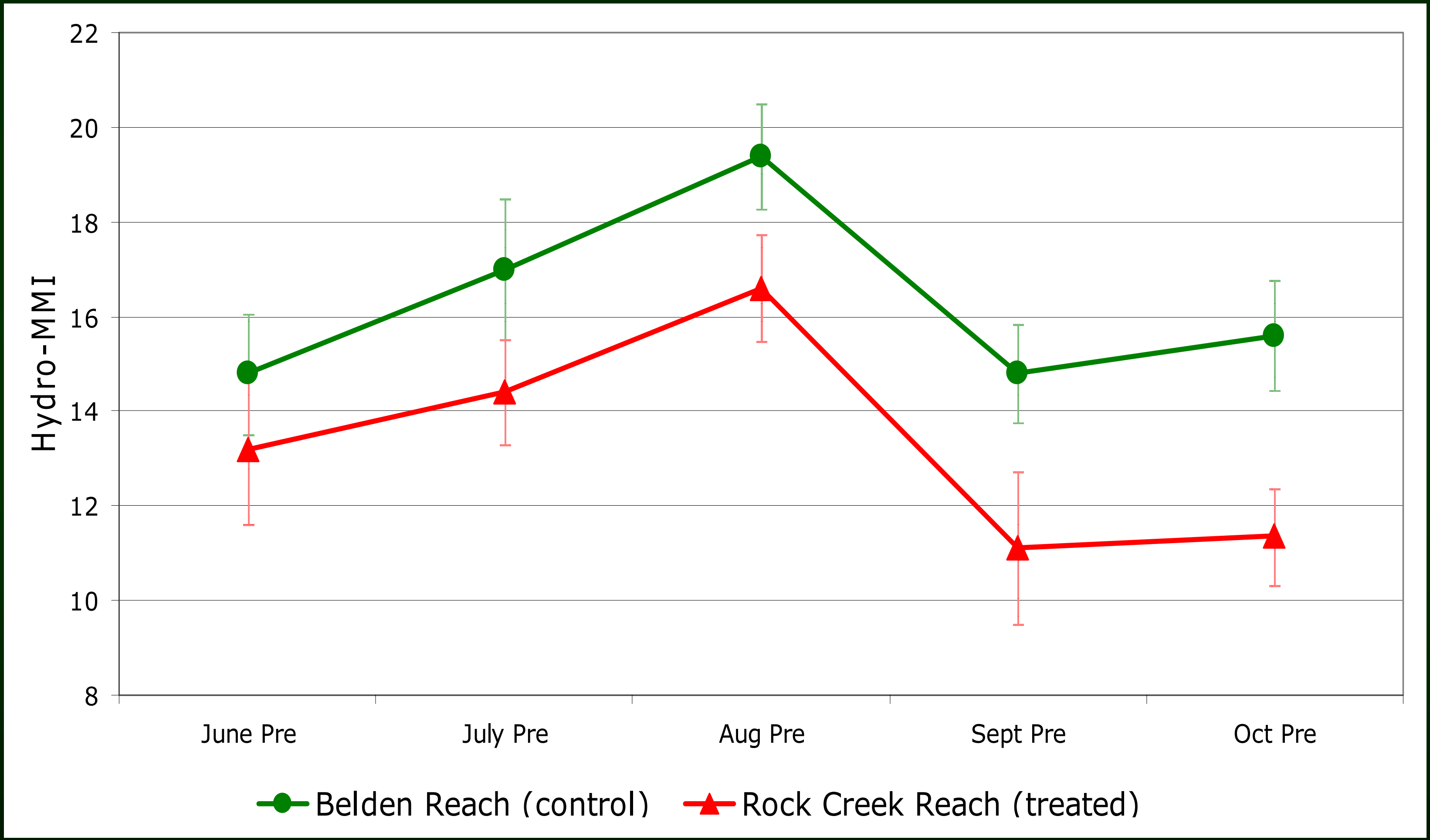
Pre vs. Post-Flow Hydro-MMI (basket sample data)



RESULTS
Longer-Term Seasonal Trends

- Basket samples:
  - seasonal trends in Hydro-MMI not significantly different between reaches (p = 0.229)
  - seasonal trends in richness and abundance also similar between reaches

Monthly Pre-flow Hydro-MMI (basket sample data)

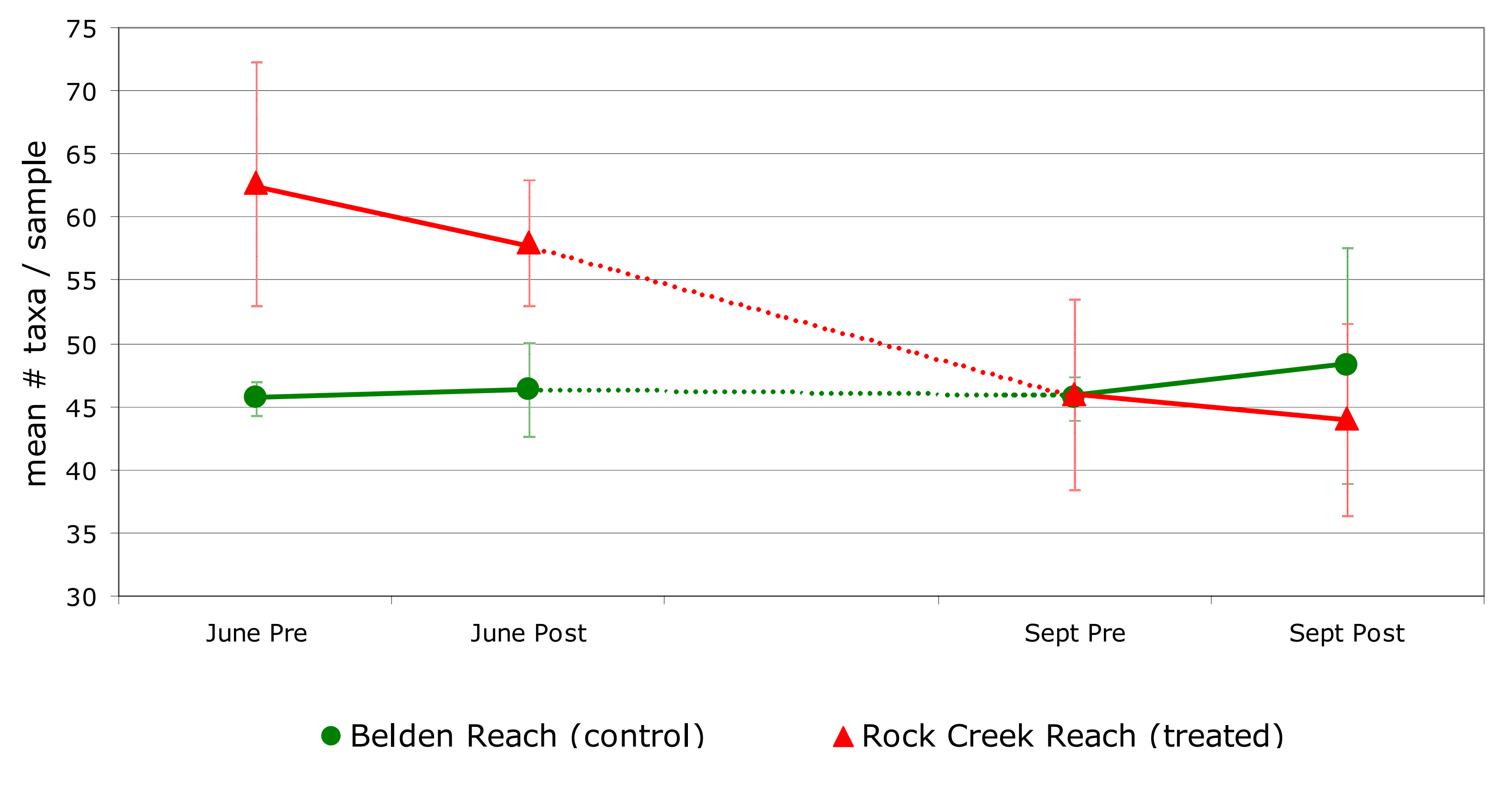


RESULTS
Longer-Term Seasonal Trends

- <u>Kick samples:</u>
  - Seasonal* trends <u>not</u> similar between reaches
    - Some declines (or lack of increases) in the treated reach were not observed in control

**CAVEAT:* kick sample data limited to June and September sampling events only (i.e., do not necessarily illustrate the trend for the whole season)*

June vs. September Taxa Richness (kick sample data)



RESULTS
Basket vs. Kick Sampling

- Difference in Hydro-MMI between sample types was statistically significant in treated and control reaches ($p = 0.067$)
- Basket samplers selected for subset of benthos dominated by filterers
  - 58% more filterers than kick samples
    - 64% more net-spinning caddisflies (e.g., Hydropsychidae)

Basket vs. Kick Samples

BASKET SAMPLES **OVERESTIMATED**:

- Caddisflies (Trichoptera)
- True flies (Diptera)
- Aquatic worms (Oligochaeta)

BASKET SAMPLES **UNDERESTIMATED**:

- Mayflies (Ephemeroptera)
- Beetles (Coleoptera)
- Freshwater mites (Arachnida)
- Several abundant “drift taxa”
  (e.g., *Baetis*, *Leucotrichia*, *Acentrella*)

CONCLUSIONS
Short-Term Pulsed-Flow Effects

- Overall, short-term control-to-treated differences were not consistent or large enough to be considered biologically significant (despite finding of statistical significance in ANOVA)
- Variability in individual metrics was generally high between and within sites, and between and within sampling events

CONCLUSIONS
Longer-Term Seasonal Trends

BASKET SAMPLE DATA:

- Trends between reaches generally parallel (although slightly higher measures for control reach)
  - *Some divergence between reaches later in the season may be important ecologically?*

KICK SAMPLE DATA:

- Trends between reaches <u>not</u> parallel

CONCLUSIONS
Basket vs. Kick Sampling

- Kick samples provided a better representation of the overall benthos
  - Baskets dominated by subset of filter feeders
- Kick samples suggest control-to-treated differences not evident in basket data
- Selectivity of baskets may reduce ability to detect pulsed-flow disturbances
  - *Basket data followed natural seasonal trends for those dominant taxa?*
  - *Those taxa more robust to flow-related changes?*

RECOMMENDATIONS

- Evaluations of pulsed recreation streamflows in the NFFR should be repeated using a similar BACI study design based on *kick sampling only*
- Post-flow samples should be collected 7-14 days following flow events, not the day after flows when variability is higher

RECOMMENDATIONS

- Multiple pre-flow and post-flow sampling events per disturbance event would strengthen the study design
- The Hydro-MMI was useful for both discriminating baseline control-to-treated differences and detecting pulsed-flow-related disturbances

RECOMMENDATIONS

- Future studies would ideally include some variation in the timing of flow events (e.g., pulsed flows clustered more in the spring, as opposed to spread out during the low-flow season, would more closely mimic the natural hydrograph)

ACKNOWLEDGEMENTS

- Financial support provided by:
  - Public Interest Energy Research (PIER) Program of the California Energy Commission
  - Division of Water Rights of the State Water Resources Control Board (SWRCB) through the Pulsed Flow Program of the Center for Aquatic Biology and Aquaculture (CABA) at UC Davis
  - Pacific Gas and Electric Company (PG&E)
- *Special thanks to:*
  - Andy Rehn (CDFG, ABL) for review and assistance with applying the Hydro-MMI
  - Jim Karr (U of Wash) for assistance with B-IBI application
  - Jon Lee and Wayne Fields for taxonomic efforts

THE END…

…QUESTIONS?…COMMENTS?

Exhibit 14

200609195054 Received FERC OSEC 09/19/2006 06:32:00 PM Docket# P-2107-000

DECLARATION OF EVIN COLBURN

I, KEVIN COLBURN, declare the following:

1. I submit this declaration in support of Butte County and American Whitewater's Comments on the Draft Environmental Assessment.

2. The facts stated herein are known personally to me.

3. I am currently the National Stewardship Director for American Whitewater (AW). I have worked for AW for just over five years and throughout that time generally have become familiar with the issues surrounding the regulation of the Feather River and its Forks by multiple dams. I have personally paddled and visited both the Rock Creek and Cresta reaches of the Feather River.

4. I received a Bachelors of Science degree in environmental studies with an emphasis in field ecology and ecosystem restoration, from the University of North Carolina at Asheville in 1998.

5. I received a Masters of Science degree in environmental studies focused on river restoration, from the University of Montana in 2001.

6. I have a diverse background of applied science and river management, and five years of experience working on dozens of regulated river restoration projects.

7. David Steindorf and I recently conducted an Indicators of Hydrologic Alteration (IHA)[1] analysis of river flow data collected by the United States Geological Survey's (USGS) North Fork Feather River at Pulga gage.

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[1] IHA is a model produced and freely made available to the public by the Nature Conservancy. More information on IHA is available at: http://www.nature.org/initiatives/freshwater/conservationtools/art17004.html

8. Our methodology consisted of inserting flow data from the United States Geological Service (USGS) flow gage within Project 2107, during the period from 1911 through 2005, into the IHA model and conducting model runs, with the purpose of comparing PG&E's synthesized flow data for the period from 1911 through 2005 (PG&E's IHA analysis).

9. I entered the flow data into the IHA model.

10. The data I entered into the IHA model was unaltered from its original USGS form, with the exception of removing a one-year period (10/1/1937 - 9/30/1938), for which there was no flow information from the data set. This step was required, as the model would not accept the flow data unless I removed the one-year period for which there was no flow data, from the data set.

11. I declare under penalty of perjury of the laws of the State of Montana and the United States of America that the foregoing is true and correct, and that this declaration was executed this 18th day of September, 2006 at 1035 Van Buren St, Missoula, Montana.

Respectfully submitted,

Kevin Colburn
National Stewardship Director
AMERICAN WHITEWATER

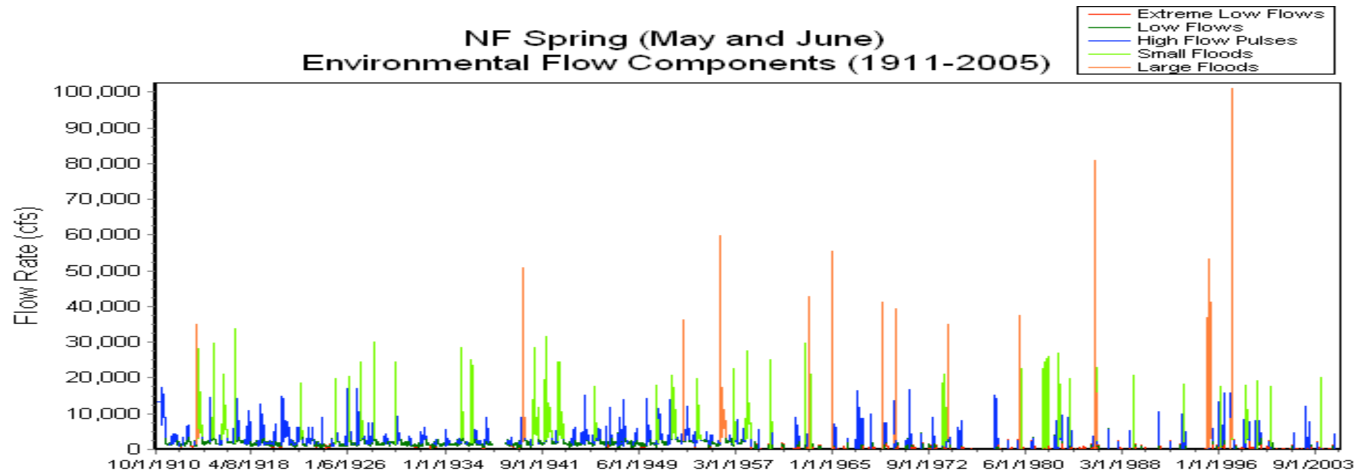
Exhibit 15

200609195054 Received FERC OSEC 09/19/2006 06:32:00 PM Docket# P-2107-000

AW IHA Analysis
USGS North Fork Feather at Pulga Gauge 1911-1958
May and June

5 Messages:

The longest period of missing data is 183 days. Interpolating across this gap may cause anomalies in the statistics. Please use them with caution.
182Daily values have been interpolated in year 1
162Daily values have been interpolated in year 94



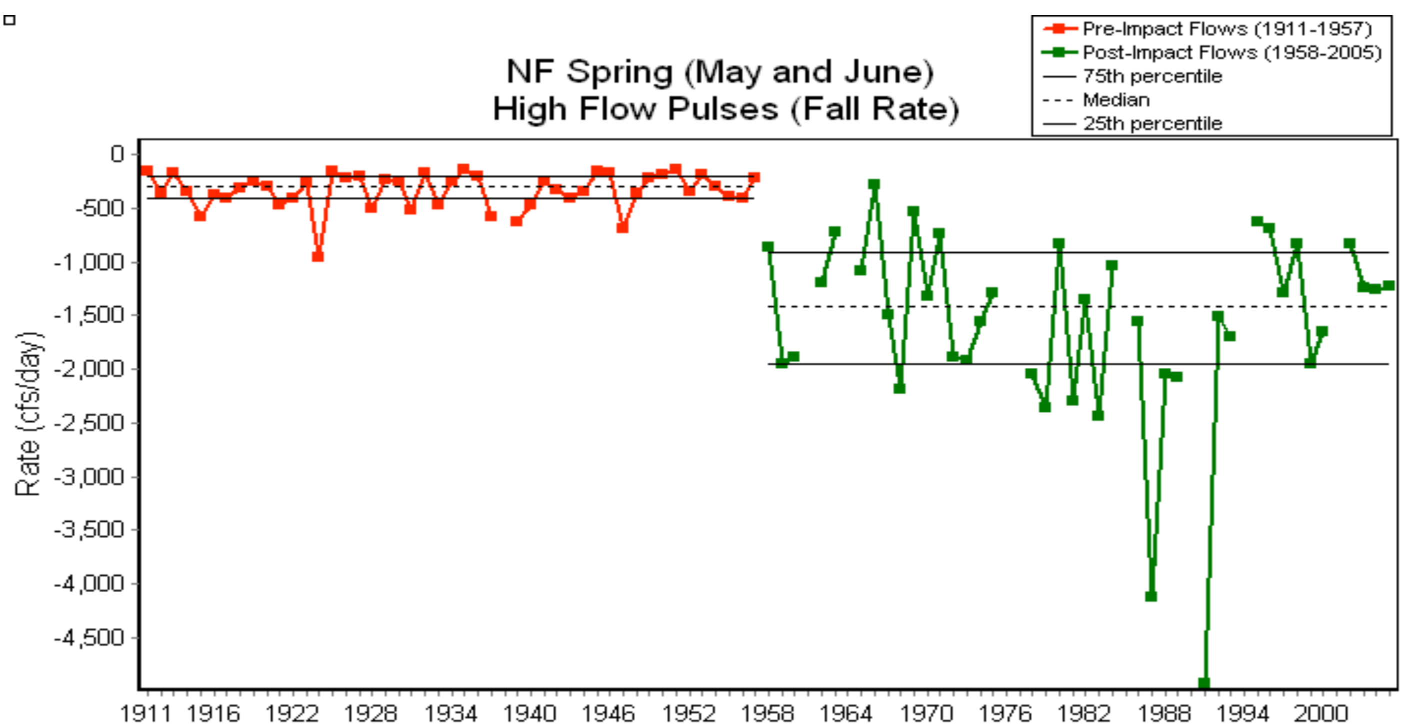


Exhibit 16

AW IHA Analysis
USGS North Fork Feather at Pulga Gauge 1911-1958

Non-Parametric IHA Scorecard

Pulga Non Parametric

	Pre-impact period: 1911-1957 (46 years)	Post-impact period: 1958-2005 (48 years)
Watershed area	1	1
Mean annual flow	2957	782.4
Mean flow/area	2957	782.4
Annual C. V.	0.4	0.08
Flow predictability	0.56	0.47
Constancy/predictability	0.81	0.85
% of floods in 60d period	0.37	0.37
Flood-free season	96	99

	MEDIANS		COEFF. of DISP.		DEVIATION FACTOR		SIGNIFICANCE COUNT	
	Pre	Post	Pre	Post	Medians	C.D.	Medians	C.D.
Parameter Group #1								
October	1505	58.5	0.4767	0.5214	0.9611	0.0936	0.3824	0.977
November	1658	61.5	0.4072	0.9878	0.9629	1.426	0.3143	0.2452
December	1750	68	0.53	0.864	0.9611	0.6301	0.2643	0.6116
January	1825	82.5	0.9342	2.021	0.9548	1.163	0.1061	0.05606
February	2365	110.5	1.015	3.207	0.9533	2.159	0.03604	0.01201
March	3010	142	0.7002	6.468	0.9528	8.238	0.05105	0.00
April	4513	130.8	0.7169	11.86	0.971	15.54	0.03203	0.00
May	3755	88.5	0.8489	16.69	0.9764	18.66	0.06306	0.00
June	1993	61	0.7804	1.057	0.9694	0.3549	0.2112	0.5986
July	1700	58	0.2412	0.1509	0.9659	0.3745	0.4835	0.9099
August	1635	58.5	0.2752	0.1709	0.9642	0.3789	0.4835	0.9129
September	1520	59.25	0.4268	0.2827	0.961	0.3376	0.4835	0.9199
Parameter Group #2								
1-day minimum	822.5	50.5	0.5742	0.2228	0.9386	0.612	0.3614	0.7037
3-day minimum	936.5	51.17	0.4281	0.1726	0.9454	0.5967	0.4154	0.7878
7-day minimum	1050	52.43	0.4536	0.1737	0.9501	0.6171	0.4655	0.7848
30-day minimum	1233	54.7	0.3915	0.1473	0.9557	0.6237	0.4835	0.8148
90-day minimum	1312	56.58	0.4374	0.1546	0.9569	0.6467	0.4835	0.8769
1-day maximum	17400	13550	1.035	1.671	0.2213	0.6148	0.4044	0.06406
3-day maximum	14600	9920	1.017	1.901	0.3207	0.8691	0.2132	0.02703
7-day maximum	10720	6421	0.9491	2.042	0.4012	1.151	0.1602	0.006006
30-day maximum	6139	2629	0.9739	2.141	0.5718	1.198	0.01602	0.004004
90-day maximum	4543	1415	0.8329	2.294	0.6886	1.754	0.004004	0.00
Number of zero days	0	0	0	0			0.00	0.00
Base flow	0.3821	0.1366	0.4787	2.986	0.6426	5.236	0.00	0.00
Parameter Group #3								
Date of minimum	315	286.5	0.2343	0.2384	0.1557	0.01749	0.09309	0.9289
Date of maximum	47.5	44.5	0.2111	0.1482	0.01639	0.2977	0.6537	0.2382
Parameter Group #4								
Low pulse count	13	4	1.019	1.438	0.6923	0.4104	0.006006	0.2392
Low pulse duration	2	13	1	5.077	5.5	4.077	0.00	0.02202
High pulse count	5	2.5	1	2	0.5	1	0.2012	0.008008
High pulse duration	4	3	1.625	0.8333	0.25	0.4872	0.1542	0.1171
Low Pulse Threshold	1450							
High Pulse Level	3120							
Parameter Group #5								
Rise rate	120	3	0.5146	1.625	0.975	2.158	0.1992	0.1502
Fall rate	-115	-3	-0.6087	-1.833	0.9739	2.012	0.1051	0.05906
Number of reversals	148	147	0.1723	0.216	0.006757	0.2536	0.6577	0.2623

AW IHA Analysis
USGS North Fork Feather at Pulga Gauge 1911-1958

EFC Low flows								
October Low Flow	1528	1545	0.437	0.3576	0.01146	0.1817	0.9139	0.4575
November Low Flow	1600	1400	0.3547	0.2357	0.125	0.3354	0.1211	0.2683
December Low Flow	1613	1510	0.355	0.1987	0.06357	0.4404	0.2963	0.0981
January Low Flow	1678	1520	0.3845	0.2952	0.09389	0.2322	0.1862	0.4945
February Low Flow	1810	1460	0.5083	0.1815	0.1934	0.6429	0.008008	0.2523
March Low Flow	2323	1480	0.3579	0.3446	0.3628	0.03721	0.001001	0.8639
April Low Flow	2685	1710	0.352	0.5965	0.3631	0.6948	0.08809	0.03103
May Low Flow	2453	1600	0.2997	0.6023	0.3476	1.01	0.04204	0.02002
June Low Flow	1875	1450	0.3453	0.2	0.2267	0.4208	0.03003	0.2212
July Low Flow	1700	1325	0.2294	0.6038	0.2206	1.632	0.00	0.005005
August Low Flow	1650		0.2545				0.00	0.00
September Low Flow	1520		0.4054				0.00	0.00
EFC Parameters								
Extreme low peak	877.5	93.5	0.2382	0.8984	0.8934	2.772	0.4154	0.1361
Extreme low duration	2	18.75	0.625	2.793	8.375	3.469	0.00	0.01902
Extreme low timing	317	59	0.1858	0.1588	0.5902	0.1452	0.00	0.4725
Extreme low freq.	3	4.5	3.75	1.111	0.5	0.7037	0.1331	0.1011
High flow peak	3330	4083	0.3172	0.6972	0.226	1.198	0.001001	0.01101
High flow duration	4.25	3	0.7353	0.6667	0.2941	0.09333	0.1081	0.7407
High flow timing	47.25	53.25	0.2199	0.1322	0.03279	0.3991	0.5686	0.2362
High flow frequency	7	3	0.7143	1.667	0.5714	1.333	0.01902	0.002002
High flow rise rate	615.8	2184	0.5511	0.6598	2.546	0.1972	0.00	0.4785
High flow fall rate	-305.8	-1422	-0.6719	-0.7377	3.651	0.09791	0.00	0.7698
Small Flood peak	24380	20300	0.3446	0.3091	0.1672	0.103	0.1612	0.7698
Small Flood duration	70.5	11	1.326	1.318	0.844	0.006077	0.1772	0.993
Small Flood timing	52	49	0.1653	0.127	0.01639	0.2314	0.7077	0.5806
Small Flood freq.	0	0	0	0			0.00	0.00
Small Flood riserate	2907	7430	1.138	0.9365	1.556	0.1773	0.00	0.6947
Small Flood fallrate	-409.8	-2514	-2.32	-1.135	5.135	0.511	0.00	0.2102
Large flood peak	43650	41300	0.5092	0.7203	0.05384	0.4147	0.7207	0.7077
Large flood duration	66.5	21	1.868	0.7857	0.6842	0.5795	0.2402	0.5285
Large flood timing	5	24	0.1428	0.1434	0.1038	0.004785	0.3574	0.99
Large flood freq.	0	0	0	0			0.00	0.00
Large flood rise	10370	13730	0.4351	0.9016	0.3236	1.072	0.2923	0.1141
Large flood fall	-684.8	-4624	-0.7173	-0.6945	5.751	0.03171	0.00	0.982

Flow level to begin a high flow event is 3130.000
Flow level to end a high flow event is 1920.000
Flow level to begin an extreme low flow is 1050.000

Exhibit 17

DECLARATION OF SHAWN H. O'BRIEN

I, SHAWN H. O'BRIEN, declare the following:

1. I submit this declaration in support of Butte County and American Whitewater's Comments on the Draft Environmental Assessment.

2. The facts stated herein are known personally to me. The opinions set forth in this declaration are a result of and are offered as evidence herein pursuant to my education, training and experience, and as to said opinions, I am informed and believe them to be correct. If called as a witness, I would and could competently testify to all of the aforementioned facts and opinions set forth herein.

3. I received a Bachelor of Science degree in Civil Engineering from San Jose State University in May 1980, with an emphasis in Construction and Transportation. I received a Masters in Master of Business Administration degree from U.C. Davis in August 1997, with an emphasis in Finance and Management.

4. I have been employed as a registered Professional Civil Engineer for 23 years.

5. I am a registered Professional Civil Engineer in California (36979), Oregon (58763PE) and Washington (35037).

6. I am a registered California Land Surveyor (No. 6387).

7. I have worked extensively in the area of and have managed several road and highway construction and maintenance projects.

8. As a result of my education and experience, I am familiar with road design, composition and construction techniques/methodologies, the costs of road construction and repair, and also with road wear/damage and their primary and secondary causes.

9. Generally, heavy equipment and heavy vehicles (for example, large trucks) cause the most significant road wear. Generally, road wear caused by ordinary vehicles is insignificant, when compared to wear caused by heavy equipment and heavy vehicles (for example, large trucks).

10. Lack of adequate drainage facilities, combined with heavy winter and spring runoff can frequently result in a complete or partial failure of a road's bed (foundation), which, of course, can heavily damage such a road and, hence can impact road users, by impacting driving safety.

11. As a result of my education and experience, I am familiar with road construction, reconstruction and maintenance costs.

12. I am currently employed by Butte County as the Assistant Director of the Public Works Department. I have been so employed since February, 2005.

13. During the time I have been employed by Butte County Department of Public Works, I have become familiar with County ordinances requiring that an encroachment permit be obtained prior to construction of a access to properties adjoining County roads and I have become familiar with the official records kept by the Department, including but not limited to the County's official maps maintained by the Department, records concerning County rights of way, financial records setting forth the costs of road construction and repair projects and records concerning permits issued by the Department. I am familiar with how said records have been and are created and organized and, hence, I am familiar with how to access records of the Department.

14. Bardees Bar Road is a substandard, non-surfaced road in Butte County. It is approximately 6.2 miles long and extends from its intersection with Big Bend Road to Bardees

Bar, on the North Fork Feather River.

15. The County has spent, currently spends and intends to spend, for the foreseeable future, limited time/resources maintaining Bardees Bar Road, as there has been and is limited use by county residents. I recently reviewed Public Works records concerning encroachment permits issued. The Department has issued two driveway encroachment permits to, Jamie Kern and Peggy Camp, owners of property on Bardees Bar Road.

16. I recently reviewed Public Works records concerning transportation permits issued. On January 29, 2004, the Department issued Transportation Permit #040111M for an over-legal-weight (permit required) Crane to travel to the Poe Powerhouse. The Department also issued a permit in 1997 (970534) to PG&E for a road repair of Bardees Bar Road.

17. I recently reviewed the County's official maps maintained by the Department, in order to determine how many parcels are owned by individuals other than PG&E and Union Pacific Railroad. Eight such parcels are adjacent to Bardees Bar Road.

18. I recently reviewed Department records concerning County rights of way and located, with the assistance of the Deputy County Surveyor, Stuart Edell, an 80 foot wide easement granted to the County by Great Western Power, which is for the area of the road which passes through PG&E land. Exhibit A to this declaration is said easement, which does not discuss maintenance of the Road.

19. I traveled the most of the length of Bardees Bar Road on Monday, January 30, 2006, and observed the road's condition, as well as intersections of the road with other roads and roads/driveways accessing private property along Bardees Bar Road. I also made observations of the conditions adjacent to the road in the area of the parcels referenced above.

20. PG&E's Poe Powerhouse Access Road intersects with Bardees Bar about 1.3

miles from the Big Bend Road.

21. In the area of the parcels referenced above adjacent to Bardees Bar Road, only two appear to have developed any sort of dwelling units. Use of Bardees Bar would appear to be limited to these two dwelling units, occasional recreational use, and access to the Poe Powerhouse by PG&E and the Union Pacific Rail line by Union Pacific Railroad.

22. Aside from PG&E's Poe Powerhouse Access Road, there are only three accesses to private property on Bardees Bar Road which in my opinion are lawful, the two previously mentioned driveway encroachments and one access near Big Bend Road. It is likely that this last access road predates the County ordinance which requires that encroachment permits be obtained, prior to construction of access to properties adjoining County roads.

23. A small slide had occurred on Bardees Bar Road, prior to my visit, between the Powerhouse access road and the intersection of Big Bend Road. It occurred in a section of the road within an easement granted to the County by the Great Western Power Company of California in 1927. Based upon my education and experience, in my opinion, factors that may have contributed to the slide are the inadequacy of the ditches that feed the culvert, which drains runoff from above the road bed in that area, to accommodate heavy winter and spring runoff, in the aftermath of a fire in the Poe area several years ago. The slide has heavily damaged the road and resulted in partial failure of the road's bed, which had caused an unsafe driving condition in the area of the slide, as of the date of my visit. In this area, the road was barely passable on the date of my visit. The Department has conducted only minor repairs to the road since the slide.

24. In my opinion, it is necessary to reconstruct Bardees Bar Road along its entire length and repair it in the location of the slide and in several other areas where the road bed has completely washed out, to ensure the safety of the traveling public which uses Bardees Bar

Road. The repair in the location of the slide will require re-establishment of the flow lines in the ditches that feed the culvert, as well as a substantial amount of excavation, filling and regrading of the travel way. The road reconstruction and repair, as set forth in Exhibit B to this declaration, an itemized estimate, will cost approximately $2.6 million.

25. I was present at an onsite meeting held to discuss the possible repair of the slide on Monday, January 30, 2006. Representatives from Butte County Department of Public Works, PG&E and the Union Pacific Railroad also were present. At the above referenced meeting, a PG&E representative requested that Butte County repair and improve Bardees Bar Road, particularly in the area of the slide, so that PG&E could transport new penstocks, via heavy equipment, to the Poe Powerhouse area.

26. Union Pacific Railroad representatives indicated that Union Pacific Railroad uses the road to periodically to transport maintenance equipment to the railway and to relieve/exchange train crews.

27. Based upon my education and experience, as well as remarks made by the PG&E representative at the above referenced meeting and observations I made of Bardee's Bar Road during my visit on Monday, January 30, 2006, it is my opinion that the majority of the wear on the section of the road used by PG&E occurs as a result of the fact that PG&E uses heavy equipment, including large trucks, on that section of the road, which includes the area in which the slide occurred, which has been heavily damaged, and is likely still in an unsafe condition.

28. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct, except as to opinions expressed herein, and as to those opinions, I am informed and believe them to be correct, and that this declaration was executed this 18th day of September, 2006, at the office of the Butte County

Counsel at 25 County Center Drive, Oroville, California 95965.

Respectfully submitted,

Shawn H. O'Brien

Shawn H. O'Brien,
Assistant Director of the
Public Works Department,
BUTTE COUNTY

Exhibit 17.A

217 Pulga Rd. 130

GREAT WESTERN POWER COMPANY OF CALIFORNIA

To

COUNTY OF BUTTE

3731

THIS INDENTURE, made this 30th day of September, 1927, by and between GREAT WESTERN POWER COMPANY OF CALIFORNIA, a California Corporation, party of the first part, and COUNTY OF BUTTE, a political subdivision of the State of California, party of the second part,

WITNESSETH: That for good and valuable consideration, said party of the first part hereby grants unto said party of the second part a right of way and easement for roadway uses and purposes over and across lands in Butte County, California, described as follows, viz.:

A strip of land 80.0 (eighty) feet wide, being forty (40.0) feet on each side of the surveyed center line of the Hog Wallow Gap-Pulga Road as surveyed by the County Road Engineer of Butte County, California, and described as follows:

Beginning at a point in the Section line common to sections 25 and 36 of T. 22 N., R. 4 E., M.D.M. 248.0 feet Westerly along said Section line from the S. E. Corner of the S.W. Quarter of S. W. Quarter of said section 25. Said point of beginning being designated as Engineer's Station 10+22.0 of said road survey.

Thence N. 28° 44' W. 29.0 feet; thence on a curve to the left having a radius of 200.00 feet a distance of 77.0 feet; thence on a curve to the right having a radius of 70.0 feet a distance of 70.3 feet; thence continuing on a curve to the right having a radius of 125.0 feet a distance

DEEDS 217 131

of 127.7 feet; thence N. 65° 18' E. 181.0 feet; thence on a curve to the right having a radius of 250.0 feet a distance of 42.6 feet; thence on a curve to the left having a radius of 250.0 feet a distance of 86.2 feet; thence N. 55° 18' E. 243.0 feet; thence on a curve to the left having a radius of 125.0 feet a distance of 104.46 feet; thence on a curve to the right having a radius of 200.0 feet a distance of 89.83 feet; thence N. 33° 08' E. 66.8 feet; thence on a curve to the left having a radius of 100.0 feet a distance of 30.8 feet; thence N. 15° 28' E. 103.2 feet; thence on a curve to the left having a radius of 50 feet a distance of 42.9 feet; thence on a curve to the right having a radius of 60 feet a distance of 92.6 feet; thence on a curve to the left having a radius of 125 feet a distance of 80.8 feet; thence N. 17° 33' E. 46.2 feet; thence on a curve to the left having a radius of 250.0 feet a distance of 39.4 feet; thence N. 8° 31' E. 126.0 feet; thence on a curve to the left having a radius of 250.0 feet a distance of 20.21 feet to a point in the East and West center line of the S. W. Quarter of said Section 25, said Township and range, said point being also designated as Engineer's Station 27+28.00 of said road survey and containing an area of 3.13 acres.

Also a strip of land eighty (80) feet wide, being forty (40) feet on each side of the surveyed center line of the Hog Wallow Gap-Pulga Road as surveyed by the County Road Engineer of Butte County, California and described as follows:

Beginning at a point in the West line of the Northeast Quarter of the Southeast Quarter of Section 13, T. 22 N., R. 4 E., M.D.B. &. M., 458.5 feet Northerly along said line from the Southeast corner of the Northwest Quarter of Southeast Quarter of Said Section 13; said point being designated as Engineers Station 220+83.0 of said road survey; thence on a curve to the right having a radius of 50.0 feet a distance of 40.0 feet. Tangent to said curve at the point of beginning bears N. 19° 22' E.; thence on a curve to the left having a radius of 50.0 feet a distance of 54.2 feet; thence on a curve to the right having a radius of 50.0 feet a distance of 131.0 feet; thence on a curve to the left having a radius of 50.0 feet a distance of 41.0 feet; thence on a curve to the right having a radius of 100.0 feet a distance of 102.6 feet; thence on a curve to the left having a radius of 150.0 feet a distance of 127.3 feet; thence continuing on a curve to the left having a radius of 50.0 feet a distance of 40.2 feet; thence on a curve to the right having a radius of 50.0 feet a distance of 61.5 feet; thence South 38° 00' East 69.8 feet; thence on a curve to the left having a radius of 125.0 feet a distance of 12.2 feet; thence South 44° 13' East a distance of 49.8 feet; thence on a curve to the left having a radius of 70.0 feet a distance of 115.7 feet; thence on a curve to the right having a radius of 70.0 feet a distance of 34.2 feet thence continuing on a curve to the right having a radius of 200.0 feet a distance of 111.8 feet; thence on a curve to the left having a radius of 125.0 feet a distance of 126.2 feet; thence on a curve to the right having a radius of 70.0 feet a distance of 101.8 feet; thence on a curve to the left having a radius of 125.0 feet a distance of 88.3 feet; thence on a curve to the right having a radius of 125.0 feet a distance of 96.0 feet; thence on a curve to the left having a radius of 100.0 feet a distance of 63.7 feet; thence South 86° 45' East a distance of 77.0 feet to a point on the/Section 13, T. 22 N. R. 4 E., M.D.B.&M., and Section line between Section 18 T. 22 N., R 5 E., M.D.B.& M., said point being designated as Engineer's Station 236+27 of said road survey; said point being 198.5 feet Northerly from the Southeast corner of the Northeast quarter of the Southeast Quarter of Section 13, T. 22 North, Range 4 East, M.D.B.&M., and containing an area of 2.84 acres.

Also a strip of land eighty (80) feet wide, being forty (40) feet on each side of the surveyed center line of the Hog Wallow Gap-Pulga Road as surveyed by the County Road Engineer of Butte County, California, and described as follows.

217 132

Beginning at a point in the North and South center line of Section 7, T. 22 N., R. 5 E., M.D.B.&M., 836.4 feet Northerly along said center line from the one-quarter Section corner between Sections 7 and 18, said Township and Range, said point being also designated as Engineer's Station 308+10 of the Pulga Road Survey; thence on a curve to the right having a radius of 50.0 feet a distance of 76.4 feet tangent to said curve at point of beginning bears South 38° 58' East; thence on a curve to the left having a radius of 125.0 feet a distance of 39.5 feet; thence South 24° 35' East a distance of 56.8 feet.

Thence on a curve to the left having a radius of 100.0 feet a distance of 132.3 feet; thence North 78° 40' East a distance of 164.6 feet; thence on a curve to the left having a radius of 150.0 feet a distance of 40.5 feet; thence on a curve to the right having a radius of 150.0 feet a distance of 74.0 feet; thence South 89° 05' East a distance of 62.4 feet; thence on a curve to the left having a radius of 70.0 feet a distance of 26.2 feet; thence North 70° 25' East a distance of 118.0 feet; thence on a curve to the left having a radius of 70.0 feet a distance of 55.6 feet; thence on a curve to he right having a radius of 50.0 feet a distance of 28.3 feet; thence North 56° 40' East a distance of 145.5 feet; thence on a curve to the left having a radius of 70 feet a distance of 70.7 feet; thence North 2° 30' West a distance of 82.0 feet; thence on a curve to the right having a radius of 125.0 feet a distance of 139.8 feet; thence on a curve to the left having a radius of 125.0 feet a distance of 52.8 feet; thence North 38° 40' East a distance of 27.0 feet; thence by the following courses and distances:

North 23° 50' East 60.2 feet.
North 26° 37' East 268.0 feet.
North 3° 31' East 303.8 feet.
North 34° 56' East 436.6 feet.
North 27° 22' East 149.9 feet.
North 46° 58' East 443.2 feet.
North 35° 37' East 148.5 feet.
North 29° 33' East 347.4 feet.
North 15° 43' East 231.5 feet.
North 53° 7' East 195.9 feet.
North 44° 53' East 100.0 feet.
North 19° 21' East 377.0 feet.
North 10° 09' East 342.0 feet.
North 13° 41' East 391.5 feet.
North 14° 31' East 145.7 feet.
North 0° 02' West 195.9 feet.
North 9° 20' East 296.4 feet.
North 22° 06' East 42.0 feet.

To a point in the Section line between Sections 7 and 8 T. 22 N., R. 5 E., M.D.B.& M., said point being designated as Engineer's Station 370+42 and being 326.45 feet Southerly along said Section line between Sections 7 and 28, said Township and Range from the Section corner common to Sections 5,6 and 7 and 8, T. 22 N., 5 E., M.D.B.&M., and containing an area of 10.96 acres.

The right of way and easement hereby granted is for the purpose of a public highway, and is granted without any warranty either express or implied.

IN WITNESS WHEREOF, said first party has executed these presents on the day and year first hereinabove written

Description Approved
O.K. HPM.B

Ch. Eng.

GREAT WESTERN POWER COMPANY OF CALIFORNIA,

By A. Emory Wishon
Vice President

By W. H. Spaulding
Secretary

DEEDS 217 133

STATE OF CALIFORNIA,)
) SS.
City and County of San Francisco)

On this 11th day of October in the year One Thousand Nine Hundred and Twenty-seven before me CATHERINE E. KEITH, a Notary Public in and for the said City and County, residing therein, duly commissioned and sworn, personally appeared A. Emory Wishon and W. H. Spaulding known to me to by the Vice President and Secretary, respectively of Great Western Power Company of California, the Corporation described in and that executed the within instrument, and also known to me to be the persons who executed it on behalf of the Corporation therein named, and they acknowledged to me that such Corporation executed the same.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, at my office in the City and County of San Francisco, the day and year in this certificate first above written.

(SEAL)

Catherine E. Keith....Notary Public
in and for the City and County of San Francisco, State of California.

My term expires October 20, 1930.

ACCEPTANCE OF DEED

FOR PUBLIC HIGHWAY

At this time a deed is received from GREAT WESTERN POWER COMPANY OF CALIFORNIA, a corporation, conveying to the COUNTY OF BUTTE, strips of land for road purposes, described as being forty feet in width on each side of the following described center lines, as described more particularly in that certain deed duly made September 30, 1927, and executed and acknowledged on October 11, 1927, by A. Emory Wishon, its Vice President and W. H. Spaulding, its Secretary, reference to said deed being particularly had for a more difinite and complete description of the said tracts conveyed.

After due consideration, it is moved by Supervisor Roohr, seconded by Supervisor Craig, that the said Deed be and the same is hereby accepted and that the land therein described be and the same is hereby declared a PUBLIC HIGHWAY OF THE COUNTY OF BUTTE, and the Clerk is directed to file the aforesaid deed for record, in the office of the County Recorder of Butte County.

VOTE: Ayes: SUPERVISORS CRAIG, MEEKER, ROOHR, AND PORTER

NOES: NONE Absent: SUPERVISOR WHITE.

State of California)
) ss.
County of Butte)

I, C. F. BELDING, County Clerk and Ex-Officio Clerk of the Board of Supervisors of the County of Butte, State of California, DO HEREBY CERTIFY that the foregoing is a true and correct copy of an order duly passed, and adopted, accepting deed from Great Western Power Company, a corporation, by the said Board of Supervisors of Butte County, at its session held, October 25th, 1927, as the same appears of record in the minutes of said Board of Supervisors, remaining of record and now on file in this office.

IN WITNESS WHEREOF I have hereunto set my hand and affixed the Official Seal of the said Board of Supervisors at my office in the City of Oroville, California, this 25th day of October 1927.

C. F. Belding, County Clerk

(SEAL)

By B. L. McCoy,
Deputy County Clerk.

Recorded at the request of B. L McCoy, Nov 4, 1927, at 40 min. past 11 o'clock A.M. in Book 217, page 130 of Deeds, Butte County Records. 134

B. G. Hudspeth Recorder.

No. 6649 Compared Book Pw Doc. MY

Exhibit 17.B

Bardee's Bar Road

Re-licensing of Poe Power Plant encourages expansion of recreational uses in the area. This will bring in more people who will have to traverse Bardee's Bar, a substandard County maintained gravel road. Bardee's Bar will need to be improved in order to accommodate the increased use.

PG&E should be required to design and rebuild Bardee's Bar Road to the following minimum standards:

Geometric design criterion:	County Improvement Standards, Caltrans Highway Design Manual, Plans and Specifications
Min. surface required:	double chip seal coat over 6" of compacted Class 2 AB
Max. cut slope:	1' vert. to 1.5' horz.
Max fill slope	1' vert. to 2' horz.

It is anticipated that the existing alignment will be used in most cases, however; modification of the existing cuts and fills to accommodate design standards may require additional right of way. PG & E owns land on either side of Bardee's Bar Road. An alternative to granting additional right of way would be the construction of retaining walls.

Approximate cost to design and construct the improvements to Bardee's Bar:

Rebuild approx. 6.2 miles of Bardee's Bar Road	$210,000/mile	$1,302,000
Double chip road surface	$100,000/mile	$ 620,000
Repair failed section		$ 200,000
Sub Total Construction Costs		$2,122,000
Design and Construction Management costs (20% of construction costs)		$ 424,400
Environmental documents		$ 30,000
Geotechnical consultant to review failed section		$ 30,000
Estimated Total costs		**$2,606,400**

Estimated costs do not include any additional right of way, retaining walls or environmental mitigation costs.

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Geotechnical consultant to review failed section		$ 30,000
	Estimated Total costs	$2,606,400

Estimated costs do not include any additional right of way, retaining walls or environmental mitigation costs.

Exhibit 18

DECLARATION OF GEOFFREY MCQUILKIN

I, GEOFFREY MCQUILKIN, declare the following:

1. The facts stated herein are known personally to me.

2. I am the Executive Director of the Mono Lake Committee, and I have worked for the Committee since 1990. The Mono Lake Committee is a non-profit citizens' group dedicated to protecting and restoring the Mono Basin ecosystem, educating the public about Mono Lake and the impacts on the environment of excessive water use, and promoting cooperative solutions that protect Mono Lake and meet real water needs without transferring environmental problems to other areas. The Mono Lake Committee has 15,000 members.

3. Mono Lake is an outstanding environmental resource of state, national, and international significance. The lake, its unique ecosystem, its migratory birds, its scenic views, and its surrounding wetlands and streams all have received protection and recognition through a variety of designations. These include the creation of a National Forest Scenic Area by the U.S. Congress, the creation of a State Reserve by the California Legislature, and the protection of Mono's Public Trust resources by the State Water Resources Control Board. Mono Lake was once the site of an epic water rights battle; now it is a model for the type of principled win-win environmental solutions that can preserve the vitality of our cities, economy, and the valuable natural areas on which they rely.

4. The lake is among the most popular destinations in Mono County, attracting over a quarter million visitors annually. However, thirty years ago Mono Lake was virtually

unknown, and very few people made it a travel destination. The establishment of two Mono Lake visitor centers in Lee Vining has been critical to changing this visitation pattern.

5. We have found that visitor centers, in the eyes of the public, indicate the existence of significant natural or cultural resources worth visiting. Accordingly, visitation to an area and use of a visitor center increase after establishment of a visitor center.

6. Mono Lake's two visitor centers were constructed because forward looking individuals and legislators recognized the existence of an outstanding natural resource of broad public interest. After construction, visitor centers created a venue for travelers to learn about Mono Lake. Demand for, and use of, the centers increased accordingly.

7. The first center was opened by the Mono Lake Committee in 1979. It was a small facility located in an existing commercial building. At the time, virtually no one identified Mono Lake as a travel destination. When given the opportunity to stop in at the visitor center and learn about the lake's unique resources, many people became fascinated with Mono Lake. Thus began Mono Lake's rise to its current status as a premier natural area destination in California.

8. In 1979 the visitor center served 4,060 individuals. Today, the same facility serves nearly 80,000 visitors annually.

9. The second center was opened by the United States Forest Service (USFS) in 1984. The USFS manages lands around Mono Lake, which have been reserved by Congress as a National Scenic Area. The legislation which created the Scenic Area also authorized construction of a visitor center, which was subsequently funded and opened in 1992. The

Forest Service Visitor Center is a substantial facility with excellent views of the lake, extensive educational exhibits, a theater (and award winning Mono Lake movie), and an interpretive staff. The center was constructed in recognition of Mono Lake's outstanding natural value. With its establishment, visitors soon followed and were rewarded by the opportunity to learn about Mono Lake. Visitation to the center has grown substantially since 1992.

United States Forest Service Visitor Center Visitation				
Year	1993	1999	2003	2005
Visitors	64,218	70,611	113,294	116,549

10. We have also found that our visitor centers enhance the local economy of our rural area. The information available at the visitor centers encourages visitation to our area, and it also encourages current visitors to plan longer stays. Local motels, restaurants, markets, service stations, and shops benefit economically as a result. Over the past 30 years our small town has come to see Mono Lake as a major economic asset due to the large increase in visitation facilitated by visitor center services. An extensive survey of visitors and their economic impact was conducted in the early 1990s by Jones and Stokes Associates. Using unadjusted figures from this study shows that current day visitation contributes in excess of $4 million to the local economy.

11. In summary, at Mono Lake we have found that exceptional natural resources are of public interest and a visitor center is an excellent way to identify the existence of the resource for travelers and to educate them about its value.

12. I declare under penalty of perjury of the laws of the State of California and the United States of America that the foregoing is true and correct and that this declaration was executed this 18th day of September, 2006 at Highway 395 at Third Street, Lee Vining, California.

Respectfully submitted,

____
Geoffrey McQuilkin
Executive Director
MONO LAKE COMMITTEE

Submission Contents

PartB.pdf.. 1-86

Attachment 3

200703155052 Received FERC OSEC 03/15/2007 03:02:14 PM Docket# P-2107-016, ET AL.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Pacific Gas and Electric Company, Poe Hydroelectric Project	)	P. no. 2107-016

COMMENTS OF BUTTE COUNTY ON 10(J) MEETING SUMMARY

Butte County comments on the "10(j) Meeting Summary" (Jan. 11, 2007) in this proceeding.

We are grateful for the opportunity to participate substantively in the Section 10(j) meeting which occurred on November 28, 2006. We believe that the summary is a generally accurate description of what Commission Staff and the resource agencies said. We submit these comments to underscore certain of our questions or recommendations that the meeting summary omits or only partly conveys.

1. Water Temperature Moderation Program

The meeting summary correctly reports that the resource agencies withdrew their initial proposal (April 2005) of a minimum flow schedule which included a bump-up via a Water Temperature Moderation (WTM) protocol. They stated that they now support a subsequent proposal (Oct. 2005), not analyzed in the Draft Environmental Assessment (DEA), whose higher minimum flows would provide similar temperature benefits. The meeting summary states that Commission Staff intend to analyze the October 2005 proposal in the Final Environmental Assessment (FEA).

During the discussion of this item, Butte County asked a question to the effect:

> *Will the FEA analyze alternatives responsive to the State Water Board's 2006 finding that the North Fork Feather (including the Poe Bypass Reach) does not attain water temperature standards and is impaired under Clean Water Act (CWA) section 303(d)?*

Flow regulation and hydromodification are the stated causes for this listing in Resolution 2006-079.[1] The U.S. Environmental Protection Agency has approved the State Water Board's *2006*

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[1] *See* http://www.waterboards.ca.gov/resdec/resltn/2006/rs2006_0079.pdf (resolution); http://www.waterboards.ca.gov/tmdl/docs/303dlists2006/final/r5_final303dlist.pdf, p. 13 (listings for Central Valley waters).

CWA Section 303(d) List of Water Quality Limited Segments: Central Valley Basin,[2] thus establishing federal and State obligations for correction of the causes of impairment.

As the State Water Board reported in their March 8, 2007 letter (eLibrary 20070308-5110), Commission Staff responded at the meeting that this listing is new information that the FEA will consider. It was our understanding that the Commission Staff were not aware of this listing prior to the meeting. We ask that Commission Staff address the following questions.

> *Will the FEA include new or modified alternatives to attain water temperature standards in the Poe Bypass Reach? If so, which?*
>
> *Does the October 2006 listing affect the legal standards which Commission Staff will apply under Federal Power Act (FPA) section 10(j) to determine the consistency of a minimum flow release and the purposes of the Federal Power Act? If so, how?*
>
> *In light of this impairment listing, does the Commission Staff consider the October 2005 proposal to be consistent, or inconsistent, with the purposes of the Federal Power Act? Why?*
>
> *Will the Commission analyze project impacts on the presence, distribution, and chemical composition (including the possibility of methylation) of mercury, and alternatives to mitigate any adverse impacts, in light of the CWA section 303(d) listing of the North Fork Feather, including the Poe Bypass Reach, as impaired by mercury?*[3]
>
> *Will the Commission analyze whether and, if so, how the project may contribute to the CWA section 303(d) listing of the Feather River below Oroville as impaired by mercury and "unknown toxicity"?*[4] *Butte County understands that (and asks that the State Water Board confirm whether) the latter impairment may include PCBs. If so, the Department of Water Resources has located PCB contamination in the North Fork Feather in the vicinity of the Poe Powerhouse.*[5]

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2. *See* http://www.waterboards.ca.gov/tmdl/docs/303dlists2006/final/usepa_partialapproval.pdf.

3. *See* footnote 1.

4. *Id.*

5. California Department of Water Resources, *Contaminant Accumulation in Fish, Sediments and the Aquatic Food Chain: Study Plan W2, Phase 2 Repor*t (2006), p. 5-8.

2. <u>Instream Flow Releases</u>

The meeting summary reports most of the discussion which related to the preliminary finding that the April 2005 proposal's minimum flow release for the benefit of aquatic habitat is inconsistent with the purposes of the Federal Power Act. We asked a question to the following effect:

> *In the FEA's developmental analysis, what specific standards will Commission Staff apply to evaluate the cost-effectiveness of a proposed flow schedule, and specifically, to determine whether a schedule is too costly in foregone generation relative to the benefit to aquatic resources?*

The participants also discussed how Poe Dam spills into the Poe Bypass Reach, when in-flow exceeds the diversion capacity. Butte County asked:

> *In the baseline condition, how frequently do such spills occur into the Poe Bypass Reach? Please provide a spill hydrograph, showing both frequency and magnitude of flow changes associated with such spills.*

Commission Staff requested responsive information. PG&E provided such information in its Dec. 13, 2006 and Jan. 5, 2007 submittals. The attachment, "RCC ERC Flow Presentation" (Nov. 11, 2006), shows frequency and magnitude of spills at Poe Dam from April – June in two years, 1998 and 2006. For example, the attachment shows that flow changes (during a 15-minute period) in the Poe Bypass Reach exceeded 1,000 cfs on 422 occasions in 1998 and 39 occasions in 2006.

Consistent with our question and the resulting discussion on November 28th, we request that the Commission Staff address the following questions.

What is the baseline condition for spills into the Poe Bypass Reach? Please display:

- *Frequency by month and year type. Years should not be limited to 1998 and 2006, unless the Commission finds that those years are representative of the entirety of the baseline condition.*

- *Magnitude of spills in increments (e.g., 100, 500, and 1,000 cfs, as in the RCC ERC Flow Presentation) meaningful to the condition of the aquatic resources.*

- *Time step which is also meaningful to the condition of aquatic resources. In its RCC ERC Flow Presentation, PG&E used a 15-minute time step. PG&E did not explain why that is the appropriate time step to analyze project spills and their impacts on aquatic resources. Specifically, they did now explain*

> *whether the impact to a life stage (eggs, juveniles, etc.) of a given aquatic resource is materially less if a given magnitude of spill occurs across a somewhat longer time step, such as 30 minutes or 1 hour. We believe that, if such a longer time step is used, the frequency of spills of any magnitude may increase in any given year. Thus, Commission Staff should evaluate whether the 15-minute time step used in the RCC ERC Presentation may understate the frequency of spills adverse to aquatic resources. The analysis in the FEA should use the time step which shows the maximum frequency of spills probably adverse to aquatic resources. Or, if the power of this variable is disputed, the analysis should show frequency of a given magnitude of spill across different time steps.*

The DEA suggests that a supplemental flow release for recreational boating in the Poe Bypass Reach may have adverse impacts on frogs and macroinvertebrtates.

- *If so, does an operational spill of comparable flow magnitude cause comparable impacts on aquatic resources?*
- *If so, will the FEA consider alternatives to prevent or moderate such impacts?*

What is the flow hydrograph below the Poe Powerhouse? E.g., how often do flow changes of 100, 500, and 1,000 cfs or more occur, by month and year type?

- *Does any frog or macroinvertebrate habitat exist there?*
- *If so, what is the impact of powerhouse operations on those aquatic resources?*
- *Will the FEA consider alternatives to prevent or moderate such impacts?*

3 - 4. No comments.

5 – 8. Aquatic Resources Monitoring.

In the Nov. 28th meeting, Butte County recommended that the monitoring program include management objectives for the condition of the aquatic resources, as well as testable hypotheses how the required flow schedule and other mitigation measures will affect such condition. In other words, it is not meaningful for PG&E to monitor population trends for a given resource, in the absence of a scientific method to use such data to evaluate the effectiveness of the mitigation measures. Agencies agreed. Butte County proposed Article 415 in the new license for Roanoke Rapids Project (P-2009) as one example of such a method.

Will the FEA analyze or recommend management objectives or testable hypotheses as elements of the monitoring program, to evaluate the effects of the flow schedule or other mitigation measures on such resource?

Schedule

At the November 28th meeting, Butte County recommended that Commission Staff consult with the State Water Board to determine how to coordinate the FEA and the environmental record for the water quality certification. State Water Board and other agency staff concurred. Unfortunately, in a Feb. 5, 2007 letter (eLibrary 20070205-3049), Commission Staff stated their target of March 2007 to publish the FEA. To the best of our knowledge, they have not consulted with State Water Board staff regarding scope or content of the FEA, and specifically, how they plan to respond to water quality issues raised by the State Water Board's or other comments on the DEA.

In a Feb. 21, 2007 letter (attached as Attachment 1, not yet docketed in eLibrary), the State Water Board staff stated that they would prepare a separate environmental document under the California Environmental Quality Act (CEQA) as the basis for certification of this project, if the FEA does not "...adequately address resource issues affecting surface waters." Indeed, the State Water Board is preparing a CEQA document in the relicensing proceeding for the Upper North Fork Feather, because it found that the Commission's EIS did not adequately analyze temperature impacts. *See* eLibrary 20060127-0074 (Jan. 11, 2006), 20051011-0151 (Sept. 29, 2005); *see also* Attachment 2 (description of ongoing temperature studies).[6]

The target publication of the FEA in this proceeding – while taking the "monkey off the back" of Commission Staff – would delay the actual relicensing decision if, as a result of unmet needs, the State Water Board would then prepare a duplicative environmental document for its certification. Under Clean Water Act section 401(a)(1), the relicensing decision can only occur after certification. We respectfully submit that it is in the public interest for the Commission and the State Water Board to coordinate in a manner that maximizes the extent to which the Board may rely on the FEA.

In our DEA Comments (Sept. 19, 2006), Butte County requested that Commission Staff hold a technical conference to address disputed factual issues relevant to both the licensing and certification decisions. We regret that Commission Staff has not responded to that request. We renew that request.

The conference should address disputed issues of fact which are plainly not resolved by the written filings in the record. These include: (1) the comparative effectiveness of the October 2005 flow schedule, Staff Recommendation, and the NLA proposal to prevent or

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6 This attachment was prepared by the State Water Board's consultant in that proceeding, North State Resources. *See* http://www.waterrights.ca.gov/FERC/ceqa_projects.html.

mitigate temperature exceedances that occur in the baseline condition; (2) whether the State Water Board would require analysis, additional to what is in the relicensing record, as the basis for its certification decision on temperature impacts, particularly in light of the *2006 CWA Section 303(d) List*; (3) the comparative impacts of operational spills versus a supplemental boating flow schedule on aquatic resources in the Poe Bypass Reach; and (4) whether a supplemental boating flow schedule would result in a substantial increase in boating and other recreational uses of the Poe Bypass Reach and, if so, the associated economic benefits.

The technical conference will help the Commission consider whether these disputed issues may be resolved through further written filings. In the absence of a timely response from Commission Staff, Butte County will move that the Commission hold a trial-type hearing before an Administrative Law Judge. We believe that the resolution of the disputed issues of fact above plainly would benefit from cross-examination to test the data and analytical methods, as well as the motives and credibility, of experts proffering contradictory evidence on these issues. *See* 18 C.F.R. § 4.34(a), 18 C.F.R. § 385.501; *Hydropower Licensing under the Federal Power Act,* 104 FERC ¶ 61,109, Ps. 211 – 212; *General Motors Corporation v. FERC*, 656 F.2d 691, 709 (D.C. Cir. 1981); *Environmental Action v. FERC*, 996 F.2d 401 (D.C. Cir. 1993); and *Louisiana Association of Independent Producers and Royalty Owners v. FERC*, 958 F.2d 1101, 1103 (D.C. Cir. 1993).

Comprehensive Plan

Pursuant to 18 C.F.R. § 2.19 and 18 C.F.R. § 385.212, Butte County hereby moves that the Commission accept the State Water Board's *2006 CWA Section 303(d) List of Water Quality Limited Segments: Central Valley Basin,* as a comprehensive plan under FPA section 10(a)(2) for the purpose of this proceeding. This list is a *de jure* amendment to the *Water Quality Control Plan,* which is already accepted as a comprehensive plan.[7] The list is "a comprehensive study" of all designated beneficial uses of all surface waters in the State, in compliance with 18 C.F.R. § 2.19(b)(1). The record for this list includes a description of the methods and data relied on, in compliance with *id.*, § 2.19(b)(2).

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7. OEP's *List of Comprehensive Plans* (Sept. 2006) includes *Water Quality Control Plan Report* (1995). *See* http://www.ferc.gov/industries/hydropower/gen-info/licensing/complan.pdf, p. 12. We request confirmation that this 1995 report, as filed with the Commission, includes the *Central Valley Basin Plan* (1994). We note that the DEA in this proceeding (p. 238) lists that Basin Plan as a filed comprehensive plan.

Dated: March 15, 2007

Respectfully submitted,

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Robert MacKenzie, Deputy County Counsel
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Richard Roos-Collins

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On behalf of BUTTE COUNTY

CERTIFICATION OF SERVICE

Pacific Gas and Electric Company, Poe Hydroelectric Project (P-2107-016)

I hereby certify that I have this day served the foregoing document, "**COMMENTS OF BUTTE COUNTY ON 10(J) MEETING SUMMARY,**" upon each person designated on the official service list compiled by the Secretary in this proceeding. Consistent with 18 C.F.R. § 385.2010(f), service is by email only unless a person is designated for mail service.

Dated: March 15, 2007

By:

C. Russell Hilkene
NATURAL HERITAGE INSTITUTE
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San Francisco, CA 94111
(415) 693-3000 ext. 118
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Attachment 1

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor ♦ Sacramento, California 95814 ♦ 916.341.5300
P.O. Box 2000 ♦ Sacramento, California 95812-2000
Fax: 916.341.5400 ♦ www.waterrights.ca.gov

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

February 21, 2007

Mr. Tom Jereb
Pacific Gas and Electric Company
Mail Code N11C
P.O. Box 770000
San Francisco, CA 94177

Dear Mr. Jereb:

REQUEST FOR WATER QUALITY CERTIFICATION ON RELICENSING OF THE POE HYDROELECTRIC PROJECT (FERC PROJECT NO. 2107)

Thank you for your letter to the State Water Resources Control Board (State Water Board), requesting water quality certification or waiver pursuant to Section 401 (a)(1) of the Federal Clean Water Act (CWA) (33 USC §1341), for relicensing of Pacific Gas and Electric Company's (PG&E) Poe Hydroelectric Project (Project No. 2107). The letter, received January 22, 2007, also serves as a formal withdrawal of PG&E's prior request of record (January 27, 2006) for certification of this project. Receipt of the PG&E letter initiates a one-year time clock for the State Water Board to act on the request for water quality certification, subject to completion of the environmental process described below.

A Section 401 water quality certification may be issued if it is determined that there is reasonable assurance that an activity is consistent with federal and state water quality standards. Issuance of a water quality certification is a discretionary act and is subject to the California Environmental Quality Act (CEQA). The State Water Board must consider a final environmental document on the Poe Project that satisfies CEQA. This document must identify measures, if necessary, that will avoid, reduce or mitigate potential significant impacts to the designated beneficial uses of the surface waters affected by the project, and any monitoring program necessary to ensure compliance. It is our understanding that the Federal Energy Regulatory Commission (FERC), acting as the federal lead agency under the National Environmental Policy Act (NEPA) for the Poe Project, will prepare and issue shortly, a final environmental document for their licensing action. CEQA encourages the use of an existing NEPA document (Pub. Res. Code §21083.7), in lieu of preparing a new environmental document. As long as the federal document meets CEQA requirements and adequately addresses resource issues affecting surface waters, the final NEPA document may be used to satisfy our CEQA needs. However, in the event that the NEPA document prepared by FERC is not adequate for CEQA compliance, a separate effort will be required to meet the requirements of CEQA.

A final environmental document, determined adequate for State Water Board use in CEQA compliance, must be provided to State Water Board staff no later than October 19, 2007, to allow adequate time for staff to review and to prepare water quality certification recommendations for action by the State Water Board Executive Director. If the final environmental document is not provided by the date identified above, State Water Board staff will recommend denial of water quality certification without prejudice subject to completion of an adequate environmental document. In the event that an adequate final CEQA document is not available for PG&E's timely submittal to State Water Board staff, PG&E may choose to avoid a denial action by withdrawing the request for 401 Certification.

State Water Board staff appreciates the cooperation of PG&E staff and looks forward to working with you on this matter. Should you have questions regarding this project please contact me at (916) 341-5397 or e-mail: sstohrer@waterboards.ca.gov, or you may contact Les Grober, Chief of the Hearings and Special Projects Section, at (916) 341-5428.

Sincerely,

ORIGINAL SIGNED BY

Sharon Stohrer
Environmental Scientist

cc: Ms. Magalie R. Salas, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Mr. John Mudre
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Ms. Alexis Strauss, Director
Water Division
USEPA, Region
75 Hawthorne Street
San Francisco, CA 94105

Mr. James C. Pedri, Assistant Executive Officer
CA Regional Water Quality Control Board
415 Knollcrest Drive
Redding, CA 96002

Ms. Pamela Creedon, Executive Officer
CA Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

Mr. Randy Livingston
Pacific Gas and Electric Company
Mail Code N11E
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San Francisco, CA 94177

Attachment 2

UPPER NORTH FORK FEATHER RIVER PROJECT (FERC #2105) PROJECT RE-OPERATION/WATER TEMPERATURE STUDIES - SUMMER 2006 FOR DEVELOPMENT OF CEQA ALTERNATIVES

BACKGROUND

The Upper North Fork Feather River Hydroelectric Project (FERC #2105), owned by Pacific Gas and Electric Company (PG&E) is currently in the process of federal relicensing. Prior to issuance of a water quality certification for relicensing of the hydroelectric project, the State Water Resources Control Board (State Water Board) must evaluate the whole of the hydroelectric project and its potential for impacts to the environment, including effects to water quality and water temperature within and downstream of the project. Water temperature impacts have been identified in the North Fork Feather River (NFFR), and the State Water Board continues to investigate measures that can effectively minimize those impacts. As required by the California Environmental Quality Act (CEQA), the State Water Board is developing an Environmental Impact Report in connection with the State Water Board's water quality certification decision. The EIR will analyze CEQA Alternatives that consist of a suite of resource measures including measures to reduce seasonal water temperatures in the NFFR.

A broad range of potential measures for reducing water temperature along the NFFR to restore and protect the cold freshwater habitat beneficial use have been developed by PG&E and supplemented by Stetson Engineers from the North State Resources Team, consultants to the State Water Board. Various combinations of these measures could achieve the water temperature goal of 20 °C or below, established in the Rock Creek Settlement Agreement. A plan for special study of hydroelectric re-operation and water temperature relationships was developed by Stetson Engineers, in close collaboration with PG&E, for implementation in Summer 2006. The study plan establishes two water temperature monitoring programs occurring concurrently: 1) a special re-operation of FERC Project #2105 and focused monitoring program of selected water bodies (hereinafter, "special testing program"), and 2) a routine monitoring program of the NFFR water bodies. The overall objectives of these two programs are:

- To demonstrate, through actual operation and field measurement, the effectiveness of certain measures aimed at reducing water temperature along the NFFR; and,
- To provide data to support development of new or enhancement of existing computer simulation models of water temperature to enable formulation and evaluation of the effectiveness of CEQA alternatives for achieving the temperature objective.

SPECIAL TESTING PROGRAM UPDATE

Five special tests were recently completed. These tests include:

- **Special Tests 1, 2 and 4 - Increased Canyon Dam Release Test with Strict Peaking Operations for Caribou #2 Powerhouse**
  The purpose of this special test was to better understand the effects of increased releases (at three different release rates: 90 cfs, 250 cfs, and 600 cfs) from the Canyon Dam low level outlets on: 1) rate of warming along the Seneca Reach, 2) the thermal structure at Belden Reservoir, 3) the water temperature of Belden Dam releases, and 4) thermal responses in the downstream reaches (i.e., Rock Cree, Cresta, and Poe reaches). These special tests are designed based on the principle that denser cold water from the Canyon Dam low level outlet would plunge into the bottom of Belden Reservoir without mixing during the Caribou #2 PH off-peaking hours and then transport along the bottom to Belden Dam for release to the river. During the Caribou #2 PH on-peaking hours, the cold water from the Canyon Dam low level

outlet would be completely mixed with much higher warm water discharges from the Caribou #2 PH.

- **Special Test 3 - Extended Off-Peaking Hours Test for Caribou #2 Powerhouse with Increased Canyon Dam Release at 250 cfs**
  The purpose of this special test was to better understand the effects of peaking operations at the Caribou #2 Powerhouses on the thermal structure at Belden Reservoir and the water temperature of Belden Dam releases. This special test is designed based on the principle that extended off-peaking hours for the Caribou #2 Powerhouse will provide more opportunity for cold water from Canyon Dam's low level outlet to plunge to the bottom of Belden Reservoir.
- **Special Test 5 - Caribou Special Test with Reduced Butt Valley PH Flows at 500 cfs**
  The purpose of this special test was to better understand the relationship between Prattville Intake flow rates and discharge water temperature at the Butt Valley PH, and whether cold water discharged from the Butt Valley PH (under reduced intake rates) would plunge without mixing and travel submerged in Butt Valley Reservoir to become available for withdrawal at the Caribou #1 Intake. Historical data indicated that decreasing volume and approach velocity at Prattville Intake would reduce tailrace discharge water temperature.
- **Special Test 6 - Increased Grizzly Creek Release Test**
  The purpose of this test is to better understand the effectiveness of increased Grizzly Creek releases on reducing warming rate as flow travels down the creek and is delivered to the Cresta reach.

Special tests 1 – 5 were conducted in a coordinated fashion from July 2 through August 5. Data from these tests is currently being collected and prepared for further examination and analysis. Special test 6 is scheduled for August 10 – 15.

ROUTINE MONITORING PROGRAM

The routine water temperature monitoring program includes NFFR stream flow and temperature data collection, powerhouse discharge and temperature data collection, reservoir temperature profile monitoring, and meteorologic monitoring. The purpose of this routine monitoring is to 1) collect a complete and comprehensive set of data along the entire NFFR for recalibration of the existing reservoir water temperature models for Lake Almanor, and 2) to develop and calibrate new reservoir water temperature models for Butt Valley, Belden, and possibly Rock Creek Reservoirs. This routine monitoring program is similar to the monitoring program conducted by PG&E in 2002-2004, under the Rock Creek-Cresta License. It covers the watershed from Lake Almanor to the Poe Powerhouse and will enhance the understanding of thermal responses for the entire NFFR system to cool water infusion during the special tests, changes in reservoir operations, and meteorologic conditions. The routine monitoring program consists of:

- Continuous monitoring of stream flow and water temperature at selected stations;
- Continuous monitoring of reservoir water temperatures at about 5 feet depth intervals and lake stage in Lake Almanor, Butt Valley, Belden, and Rock Creek Reservoirs as well as periodic water temperature profile monitoring at more refined intervals;
- Continuous monitoring of local meteorologic conditions using the existing meteorology stations at Prattville Intake and Rock Creek Dam.

The routine monitoring program was initiated in April and will end in early October. This time period overlaps with the special testing program and covers the complete stratification cycle in the reservoirs.

Submission Contents

Response of Butte County to 10(j) Meeting Summary
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Attachment 4

BEFORE THE UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Pacific Gas and Electric Company,	)	
Poe Hydroelectric Project	)	FS Docket No. _____
FERC No. P-2107	)	
	)	

NOTICE OF APPEARANCES AND REQUEST FOR HEARING BY BUTTE COUNTY, CALIFORNIA AND AMERICAN WHITEWATER REGARDING FINAL SECTION 4(E) CONDITIONS FOR POE HYDROELECTRIC PROJECT

I. INTRODUCTION

On May 28, 2007, the Forest Service filed, before the Federal Energy Regulatory Commission, "Final Section 4(e) Terms and Conditions and Section 10(a) Recommendations; Poe Hydroelectric Project, FERC No. 2107" (e-Library no. 20070528-5003) (May 28, 2007). Pursuant to 7 C.F.R. § 1.621, Butte County, California and American Whitewater (AW) file this request for hearing within 30 days of the Forest Service's filing of the Final Section 4(e) Conditions. This request challenges disputed issues of material fact related to the ramping rates established by Conditions 24.2, 24.5, and 27.1.

The redlining convention used in the Final Section 4(e) conditions shows that these specific conditions are "new." *See id.*, pp. 13, 16, 17. That convention means that these specific conditions did not appear in the Preliminary Section 4(e) Conditions, as filed on April 6, 2005 in this proceeding. *See* eLibrary no. 20050406-5026.

Preliminary Condition 24.5 proposed ramping rates for Poe Diversion Dam. These rates were "for the preservation and improvement of aquatic resources in the Project area." *Id.*, p. 17.

They applied to controllable releases from Poe Dam. They did not apply to uncontrollable releases and powerhouse discharges. *Id.* These rates were: 250 cfs/hour up-ramp and 150 cfs/hour down-ramp, as measured at NF 23, for the period March through June; and 400 cfs up-ramp and 1,500 cfs down-ramp, during the remainder of the year. *Id.* The preliminary conditions did not provide for recreational flow releases and thus did not include a ramping rate for that purpose.

The Forest Service concluded that the ramping rates proposed by Preliminary Condition 24.5 were "…deemed to be not adequate for the protection of fylf [foothill yellow-legged frogs]." Supplemental Rational Information, p. 2. Final Conditions 24.2, 24.5, and 27.1[1] set ramping rates based on stage rather than fixed flow values. *See id.*

- <u>When egg, metamorph, and juvenile life stages of the foothill yellow-legged frog (FYLF) are not present in the bypass reach.</u> For the purpose of a controllable[2] spill which both is "non-discretionary"[3] and does not result in a powerhouse outage, the final ramping rate is: 1 foot/hour (or less) up and .5 foot/hour (or less) down. Final Condition 24.5(a), p. 16. Under Condition 24.5(c), for the purpose of recreation flow releases during this period, the ramping rate

[1] Final Condition 24.1 requires PG&E to provide minimum flow releases for the preservation and improvement of aquatic resources. This flow schedule is different than the counterpart in the preliminary conditions. Butte County and AW support this new flow schedule.

Final Condition 27.1 requires the licensee to provide 6,000 acre-feet/year in Normal or Wet years for the purpose of recreational flow releases. *Id.*, p. 17. Butte County and AW support this new flow schedule.

[2] Controllable is defined as "releases into the Poe Bypass Reach greater than the required baseflow but less than 3,000 cfs that can be controlled by regulating flow through the governing units." Final Condition 24.5(a), p. 16.

[3] "Non-discretionary" is described as "natural." Final Condition 24.5(a), p. 16. "Discretionary" is defined as a "flow that the licensee chooses to spill into the Poe bypass reach above the required minimum instream flow when there is flow capacity available in the governing units that could capture such spill." Final Condition 24.2, p. 13.

is different: .5 foot/hour (or less) up or down, with a 2-hour step between each step down. *Id.*, p. 17.

- When those life stages are present in the bypass reach. For the purpose of controllable, non-discretionary spills, the final ramping rate is: .5 foot/hour (or less) up or down, with a 2-hour separation between each down step. Final Condition 24.5(a), p. 17. For the purpose of "controllable" and "discretionary" spills, the condition requires that PG&E undertake "...reasonable controllable actions to minimize the magnitude, duration, and potential adverse ecological impacts of such flow, including compliance "...to the extent practicable" with these stage limitations. *See* Final Condition 24.2, p. 13, *as incorporated* by Condition 24.5(a). Finally, for the purpose of recreational flow releases, the ramping rate is different during this period: ".2 foot stage change (approximately 100 cfs)." Condition 27.1, p. 17.

Butte County and AW enthusiastically support the Forest Service's Final Section 4(e) Conditions in all respects other than the ramping rates stated above. These conditions will significantly enhance the baseline condition of the public trust resources affected by the Project. Such conditions include: the minimum flow schedule in Condition 24.1; the recreation flow schedule in Condition 27.1; the Recreation River Flow Technical Review Group in Condition 27.3; and the Recreation Enhancement, Construction, and Implementation Plan in Condition 29. We are very grateful for the hard work and leadership of the Forest Service - through the Plumas National Forest, Regional Office, and Office of Regional Counsel - in seeking to resolve disputed issues of fact and law over the course of the many years of this proceeding. Our hearing request is limited to the factual basis for the ramping rates stated in Conditions 24.2, 24.5, and 27.1; and specifically, addresses the factual statements used to justify the different ramping rates for power operations and boating flow releases into the Poe bypass reach.

II.
PARTY STATUS

Butte County is a party in the relicensing proceeding. FERC granted Butte County's unopposed motion to intervene on July 8, 2004. *See* e-Library no. 20040708-3078. As a license party, Butte County may file this hearing request under 7 C.F.R. § 1.22(a)(1)(i).

On April 28, 2004, American Whitewater (AW) filed a timely motion to intervene in the relicensing proceeding. *See* e-Library no. 20040428-5024. Because the motion was unopposed, AW became a party by operation of law 15 days after its motion was filed. *See* 18 C.F.R. § 385.214. As a license party, AW may file this hearing request under 7 C.F.R. § 1.22(a)(1)(i).

III.
NOTICE OF APPEARANCES

Pursuant to 7 C.F.R. §§ 1.10 - 1.11, Butte County and AW hereby enter appearances of our representatives in this proceeding.

Butte County

Richard Roos-Collins is authorized to appear in this proceeding as Special Deputy District Attorney on behalf of Butte County. He is a member in good standing of the State Bar of California (Bar. No. 127231). His contact information is:

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(415) 693-3000 ext. 103
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rrcollins@n-h-i.org.

Bruce Alpert is authorized to appear in this proceeding as County Counsel for Butte County. He is a member in good standing of the State Bar of California (Bar. No. 075684). His contact information is:

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25 County Center Drive
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Harold M. Thomas is authorized to appear in this proceeding as Special Deputy District Attorney on behalf of Butte County. He is a member in good standing of the State Bar of California (Bar. No. 131212). His contact information is:

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Rob Mackenzie is authorized to appear in this proceeding as outside counsel for Butte County. He is a member in good standing of the State Bar of California (Bar. No. 131653). His contact information is:

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1395 Ridgewood Drive, Suite 300
Chico, CA 95973
(530) 895 9902
rwm@mackenzielandlaw.com.

American Whitewater

Dave Steindorf is authorized to appear in this proceeding on behalf of American Whitewater (AW). He is a full-time employee of AW, as California Stewardship Director. His contract information is:

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California Stewardship Director
American Whitewater
1325 Deodara Way
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(530) 876-1335
dave@amwhitewater.org.

IV. APPLICABLE LAW

Energy Policy Act (EPAct) section 241 amended Federal Power Act (FPA) section 4(e), 16 U.S.C. §§ 797(e), to provide that any party to a relicensing proceeding may obtain a trial-type hearing of any disputed issue of fact material to the agency's mandatory conditions for protection and utilization of a federal reservation. FPA section 4(e), as amended, provides:

> "That licenses shall be issued within any reservation only after a finding by the Commission that the license will not interfere or be inconsistent with the purpose for which such reservation was created or acquired, and shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservation: The license applicant and any party to the proceeding shall be entitled to a determination on the record, after opportunity for an agency trial-type hearing of no more than 90 days, on any disputed issues of material fact with respect to such conditions. All disputed issues of material fact raised by any party shall be determined in a single trial-type hearing to be conducted by the relevant resource agency in accordance with the regulations promulgated under this subsection and within the time frame established by the Commission for each license proceeding."

16 U.S.C. § 797(e).

The implementing rules permit a trial-type hearing of disputed issues of fact material to preliminary conditions, even though the statute refers generally to "conditions." Thus, the rules require a hearing request to be filed within 30 days after the deadline for the Department to file preliminary conditions with FERC. *See, e.g.,* 7 C.F.R. § 1.621.

On December 16, 2005, and pursuant to 7 C.F.R. §§ 1.604 and 1.621, PG&E filed a hearing request challenging Standard Conditions; Preliminary Condition 24.3, which provided for modification of the minimum flow schedule set in Condition 24.1 for temperature moderation; and other conditions. This hearing request did not address the ramping rates proposed by Preliminary Condition 24.5. Consistent with 7 C.F.R. § 1.622, Butte County and AW intervened in that hearing. The request was eventually resolved by stipulation reflected in amendments in Standard Conditions and other preliminary conditions.

The Department's rules do not prohibit a request for a hearing related to final Section 4(e) conditions which are new or significantly changed relative to the preliminary conditions. We are not aware of any precedent where the Forest Service has addressed whether an EPAct section 241 hearing is permitted in this circumstance. The ramping rates in Final Conditions 24.2, 24.5, and 27.1 raise disputed issues of material fact not raised by Preliminary Condition 24.5 in this proceeding. Further, we understand that PG&E intends to file a request for hearing to challenge new or modified conditions. We expect that the Forest Service, in an answer pursuant to 7 C.F.R.§ 1.624 or otherwise, will address whether a hearing request under EPAct section 241 may properly challenge final conditions. Butte County and AW respectfully request that the Forest Service refer this request for hearing, pursuant to 7 C.F.R. § 1.625, if it also refers any request which PG&E may make.

V.
DISPUTED ISSUES OF MATERIAL FACT

Disputed Issue 1: Whether the ramping rates in Conditions 24.2 and 24.5 will protect foothill eggs, metamorphs, and juveniles of foothill yellow-legged frogs in the Poe Bypass Reach.

1. Specific factual statements that are disputed.

"This condition provides protection for eggmasses and tadpoles from discretionary spills by the licensee." Supplemental Rationale, p. 1.

"The rates that are in the new condition primarily address the fylf tadpole's sensitivity to changes in velocity in streamflows but also protect to some extent, egg masses that are generally deposited at depths within 2 feet of the water's surface." *See id.*, p. 2.

2. Basis for opinion that disputed factual statements are unfounded or erroneous.

The down-ramping rates in Conditions 24.2 and 24. 5 for controllable spills will lower stage to an extent that will expose and dewater FYLF egg masses. The permitted swing in flow stage approaches 6 feet per day and will affect many egg masses located in cobble bar or other edgewater habitat.

The up-ramping rates in Conditions 24.2 and 24.5 for controllable spills will result in increased flow velocities that will displace FYLF egg masses and tadpoles located in cobble bar or other edgewater habitat.

The Supplementary Rationale does not state any estimate or other description of the comparative scales and frequencies of changes in flow stage and velocity under: (A) Final Conditions 24.2 and 24. 5, (B) Preliminary Condition 24.5, (C) the original license, and (D) natural variability.

The Supplementary Rationale states that Condition 25.5 will protect egg masses to "some extent." *Id.*, p. 2. The extent of such protection is unclear. By plain meaning, "some" is more than 0% and less than 100%.

Monitoring data and analysis for the Rock Creek-Cresta Project show that controllable spills comparable to the ramping rates permitted by Conditions 24.2 and 24.5 have dewatered egg masses and displaced juveniles in that upstream reach.

Conditions 24.2 and 24.5 and the Supplementary Rationale do not state any scientific method or standard to determine whether the ramping rates provide the intended level of protection for FYLF egg masses, metamorphs, and juveniles.

3. Basis for opinion that disputed factual statements are material.

Butte County and AW challenge the factual statement that Conditions 24.2 and 24 5 will protect the FYLF egg masses and tadpoles against adverse changes in velocity and stage associated with controllable spills. This issue is material to Conditions 24.2 and 24.5. If we prove that the ramping rates stated in Conditions 24.2 and 24.5 will permit adverse impacts to these life stages, that proven fact will affect the Department's decision whether to affirm, modify, or withdraw Conditions 24.2 and 24.5, within the meaning of 7 C.F.R. § 1.602.

Disputed Issue 2: Whether there is a biological basis for the differences between the ramping rates in Conditions 24.2, 24.5, and 27.1.

1. Specific factual statements that are disputed.

"This condition [24.2] provides protection for eggmasses and tadpoles from discretionary spills by the licensee." Supplementary Rationale, p. 1.

"The rates that are in the new condition [24.5] primarily address the fylf tadpole's sensitivity to changes in velocity in streamflows but also protect to some extent, egg masses that are generally deposited at depths within 2 feet of the water's surface." *See id.*, p. 2.

"The sideboards contained in this condition [27.1] should allow for a whitewater experience that is shaped and scheduled in a way that also allows for the protection of the FYLF within the reach." *Id.*, p. 3.

Recreation flow releases will be provided at times "...in which there are no adverse effects on biota in the Poe reach." Final Condition 27.1, p. 17.

2. <u>Basis for opinion that disputed factual statements are unfounded or erroneous.</u>

The Supplementary Rationale does not provide any biological basis for different ramping rates for power-related spills under Conditions 24.2 and 24.5 and for recreational flow releases under Condition 27.1.

By comparison to recreational flow releases, controllable spills under Conditions 24.2 and 24.5 will cause more frequent, and larger, changes in flow stage and velocity in the bypass reach.

A recreational flow release, and specifically, the increase from the minimum flow release stated in Condition 24.1 to a navigable flow (700 – 1,200 cfs), will not cause significant adverse impact on FYLF egg masses, metamorphs, or juveniles in the period July through September.

Monitoring data and analysis for the Rock Creek-Cresta Project show that recreational flow releases comparable to those permitted by Condition 27.1 have not caused significant impacts to FYLF egg masses, metamorphs, or juveniles in that upstream reach.

Condition 27.1 and the Supplementary Rationale do not state any method or standard to determine that a recreational flow release will have "no adverse effect" on aquatic biota. Using a scientific method, it may be impossible to prove that a release will have "…no adverse effect," if that term is intended literally.

The ramping rate in Condition 27.1 and the requirement for "no adverse effect" will probably prevent recreational flow releases in most years from April through November.

3. Basis for opinion that disputed factual statements are material.

Butte County and AW challenge the factual statements that seek to justify much more restrictive ramping rates for recreational flow releases than power operations. We will seek to prove that, during the period when FYLF egg masses, metamorphs, and juveniles are present, the stage and velocity changes in the bypass reach resulting from power operations will substantially exceed the changes resulting from recreation. We will also seek to prove that the ramping rate specified in Condition 27.1 will have the effect of preventing recreational flow releases in most years from April through November. These facts, if proven, will affect the Department's decision whether to affirm, modify, or withdraw Condition 27.1, within the meaning of 7 C.F.R. § 1.602.

VI.
LIST OF WITNESSES

Pursuant to 7 C.F.R. § 1.621(c), Butte County and AW intend to call the following witnesses.

1. Doug B. Demko. His contact information is: 3188 Wood Creek Drive, Chico, CA 95928, (530) 342-9262, dougdemko@fishbio.com.

Mr. Demko earned his Bachelors degree in Biological Sciences from California State University, Chico in 1992. He earned his Juris Doctorate from CalNorthern School of Law in 2001. He has been employed as the President and Principal of FISHBIO Environmental, Inc., since its formation last year. Previously he served as the Senior Vice President of Cramer Fish Sciences for approximately 14 years. Mr. Demko has created and reviewed the design of biological sampling programs for the majority of his professional career.

Mr. Demko is expected to testify regarding his analysis of the FYLF tadpole survey conducted in Project 1962 Cresta reach by GANDA from 2002-2004, particularly as related to the statistical methods employed in presenting the monitoring data.

2. **Terry Strange**. His contact information is: PO Box 129, Wilseyville, CA 95257, (209) 419-2997, strageaqua@volcano.net.

Mr. Strange earned his Bachelors degree in Wildlife Management from Humboldt State University in Arcata California in 1984. He earned his Bachelors degree in Fisheries Biology from Humboldt State University in Arcata California in 1984. He earned his Masters degree in Watershed Management from Humboldt State University in Arcata California in 1989. He has owned and operated Strange Aquatic Resources since its formation in 1990. Mr. Strange conducted biological sampling for the majority of his 20-year professional career.

Mr. Strange is expected to testify regarding his analysis of the FYLF tadpole survey conducted in Project 1962 Cresta reach by GANDA from 2002-2004, particularly as related to the statistical methods employed in presenting the monitoring data.

3. **Gary E. Smith**. His contact information is: 3009 Roman Court, Sacramento, CA 95826, (916)-363-7525, fishman3009@sbcglobal.net.

Mr. Smith earned a Master of Science in Fisheries Management and a Bachelor of Science in Fisheries Management from Humboldt State University. Mr. Smith has been employed by the California Department of Fish and Game (DFG) for almost 40 years. Although retired in 2004, he presently serves as a retired annuitant assisting DFG staff with instream flow and habitat suitability issues, completing and publishing pending technical reports, and serving as editor of the Stream Evaluation Report series and other stream assessment reports. His previous positions have included Stream Evaluation Program Leader, State Instream Flow Coordinator, Stream Requirements Program Leader, Mono Lake Basin Investigations and Litigation Program Leader, Klamath River Anadromous Salmonid Habitat Suitability Criteria Investigation Project Leader (1996 to 2004), and Oil Spill Prevention and Response Stream Habitat Restoration Program Leader (2003-2004). He also participates in a number of fisheries organizations, including the National American Fisheries Society and the Instream Flow Council.

Mr. Smith is expected to testify regarding the potential adverse impacts of alternative ramping rates on aquatic resources.

4. **John L. Turner**. His contact information is: 7022 Cinnamon Teal Way, El Dorado Hills, CA 95672, (916) 672-9945, johnturner55@comcast.net.

Mr. Turner earned his Masters degree in Biological Sciences and Chemistry from Sacramento State University in 1976. He earned his Bachelors of Art in Zoology from University of California at Davis in 1966. He has been employed as an Environmental Program Manager I for the Department of Fish and Game (DFG), Office of Spill Prevention and Response, for the past 9 years. Previously he served as the Chief of the Environmental Services Division for DFG. He is a Commission Member on the El Dorado Fish and Game Commission, and a member of the

Board of Directors on the California Association of Professional Scientists.

Mr. Turner is expected to testify regarding his analysis of the FYLF tadpole survey conducted in Project 1962 Cresta reach by GANDA from 2002-2004.

5. **David Steindorf**. His contact information is: California Stewardship Director, American Whitewater, 1325 Deodara Way, Paradise, CA 95969, (530) 876-1335, dave@amwhitewater.org.

Mr. Steindorf earned a Bachelors of Arts in Economics from California State University, Chico in 1985. He earned a Master of Education degree from California State University, Chico in 1998. He is currently employed as the California Stewardship director for AW. He previously worked as a recreation consultant for several hydroelectric utilities in the Western United States, including, PG&E, SMUD, Pacificorp and AVISTA, for a combined total of 5 years. He has participated in 15 recreational in-stream river flow studies, as well as studies on angling, flat-water boating and aesthetics.

Mr. Steindorf is expected to testify regarding the adverse impacts of out-of-season, uncontrolled spills caused by project operations on FYLF; the absence of evidence to support a finding of adverse impact from a recreational flow schedule of 700 cfs to 1,200 cfs from July to September; and the conditions necessary for suitable whitewater boating.

VII.
LIST OF EXHIBITS

Ex. No.	Document Title	Location	Issue
1	Butte County and American Whitewater. 2006. "Amended Comments on Draft Environmental Assessment," Exhibit 5. September 2006.	e-Library no. 20060919-505	1,2

2	Butte County. 2005. "Recommended Conditions for New License." April 2005.	e-Library no. 20050411-5081	1,2
3	FERC. 2007. *Final Environmental Assessment, Poe Hydroelectric Project* (Project No. 2107-016). March 2007.	e-Library no. 20070329-3045	1,2
4	Forest Service. 2007. "Final Section 4(e) Terms and Conditions and Section 10(a) Recommendations; Poe Hydroelectric Project, FERC No. 2107." May 2007.	e-Library no. 20070528-5003	1,2
5	Garcia and Associates (GANDA). 2007. *Summary Results For The 2006 Cresta And Poe Reach Amphibian Surveys*. Submitted to PG&E.	Forest Service Administrative Record[4]	1,2
6	GANDA. 2006. *Identifying Climatic And Water Flow Triggers Associated With Breeding Activities Of A Foothill Yellow-Legged Frog (Rana Boylii) Population On The North Fork Feather River, California*. Prepared for California Energy Commission Public Interest Research Program.	E-library 20070531-5039	1,2
7	GANDA. 2006. *Evaluating The Impacts of Manufactured Recreation Streamflows on the Macroinvertebrate Community of A Regulated River*. Prepared for California Energy Commission, Public Interest Energy Research Program. December 2006. CEC Report: CEC-500-2006-078.	FERC Record[5]	1,2
8	GANDA. 2004. *Identifying Microclimatic and Flow Level Triggers Associated With the Onset of River Breeding Activities of the Foothill Yellow-Legged Frog (Rana Boylii) On the North Fork Feather River, California*. Prepared for	FERC Record[6]	1,2

4 We have not been able to locate this document within the record. Under 7 C.F.R. § 1.620(a), the Forest Service is required to file with FERC any document relied upon, but not already entered into the FERC record, at the same time it files its prescriptions. We subsequently will amend this List of Exhibits to include the eLibrary citation.

5 We believe this document is in the FERC record for PG&E's Rock Creek Cresta Project, P-1962. We subsequently will amend our List of Exhibits to include the specific eLibrary citation.

	California Energy Commission, Public Interest Research Program. Revised February 2004.		
9	GANDA. 2004. *Results Of 2002 Surveys And Monitoring For Foothill Yellow-Legged Frog (Rana Boylii) Within The Rock Creek-Cresta Project Area, North Fork Feather River, Recreation And Pulse Flow Biological Evaluation.* Prepared for PG&E. 2004.	FERC Record[7]	1,2
10	GANDA. 2004. *Results Of 2003 Surveys And Monitoring For Foothill Yellow-Legged Frog (Rana Boylii) Within The Rock Creek-Cresta Project Area, North Fork Feather River, Recreation And Pulse Flow Biological Evaluation.* Prepared for PG&E. Revised 2004.	FERC Record[8]	1,2

VIII.
CONCLUSION

Butte County and American Whitewater respectfully submit this request for hearing of disputed issues of fact material to Final Conditions 24.2, 24.5, and 27.1. We further request that the Forest Service and PG&E undertake, with us and other parties, to resolve these and other remaining disputes by settlement.

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6 This document was cited in the Final Environmental Assessment in this proceeding. We believe it was submitted in PG&E's responses (*see* e-Library nos. 20050119-0240, -0239, 0237; 20050121-0008, -0001) to Staff's AIR (*see* e-Library no. 20041124-3016). We have not been able to confirm because some of these eLibrary files are damaged and cannot be opened. We subsequently will amend our List of Exhibits to include the specific eLibrary citation.

7 *See* note 6.

8 *See* note 6.

Dated: June 26, 2007

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On behalf of AMERICAN WHITEWATER

VERIFICATION

I hereby certify that I have read this document; to the best of my knowledge, information, and belief, the statements contained herein are true; and this document is not being filed for the purpose of causing delay.

Dated: June 26, 2007

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CERTIFICATE OF SERVICE

I hereby certify that I filed and served this "**NOTICE OF APPEARANCES AND REQUEST FOR HEARING BY BUTTE COUNTY, CALIFORNIA AND AMERICAN WHITEWATER REGARDING FINAL SECTION 4(E) CONDITIONS FOR POE HYDROELECTRIC PROJECT,"** as stated below**.**

FILING

I filed this Request for Hearing via overnight delivery, sent June 26, 2007 for delivery the next day, to:

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I served the Request for Hearing as indicated to each representative below. This service list is based on FERC's official list, amended to add new entries for representatives active in the proceeding, or to correct other obvious errors in entries for representatives. Such changes are marked with an *.

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Submission Contents

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Attachment 5

DRAFT
Drum-Spaulding Hydroelectric Project
FERC No. 2310
Yuba-Bear Hydroelectric Project
FERC No. 2266
Rationale Report for
Preliminary License Conditions
And Recommendations

27 July 2012

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Drum-Spaulding Hydroelectric Project
FERC No. 2310
Yuba-Bear Hydroelectric Project
FERC No. 2266
Rationale Report for
Preliminary License Conditions
And Recommendations

INTRODUCTION

The following five agencies have participated in the collaborative relicensing process and development of proposed license conditions and recommendations:

- California Department of Fish and Game (CDFG)
- California State Water Resources Control Board (State Water Board)
- USDA FS (FS)
- USDI Bureau of Land Management (BLM)
- USDI National Park Service (NPS)

For the purposes of this Rationale Report, the following agencies are defined herein as "Resource Agencies": CDFG, FS, BLM, and NPS.

Additionally, many non-governmental organizations and individuals have participated in the collaborative process.

This Rationale Report provides supporting documentation and the rationale used in developing the proposed license conditions and recommendations for consideration by FERC in its environmental analysis for the Drum-Spaulding and Yuba-Bear Hydroelectric Projects. The Rationale Report includes descriptions of the relationship between the supporting information and the resulting proposed license conditions and recommendations. However, the Rationale Report does not constitute the entire record supporting the proposed license conditions and recommendations nor does it detail every source of information used and every consideration made in developing the proposed license conditions and recommendations. Rather, the Rationale Report should be considered in conjunction with the balance of the record supporting the application for new license.

RESOURCE OBJECTIVES

The following resource objectives were developed from agency mandates, with consideration of Licensee, and NGO goals. It is recognized that factors beyond Licensees' control could affect attainment of these objectives and that some or all of the objectives may not be achievable within the proposed license conditions and recommendations. The following objectives encompass FS's Tahoe National Forest Land and Resource Management Plan (Forest Plan) and the BLM Sierra Resource Management Plan (RMP); however, more specific existing desired conditions are described in the following sections.

Aquatic Biota Objectives

Populations of native aquatic biota, including fish, benthic macroinvertebrates (including aquatic mollusks), amphibians, reptiles, and riparian species are viable with adequate habitat consistent with species' needs. Maintain, enhance, or restore all life stages of native aquatic species. Meet FS Riparian Conservation Objectives from the Forest Plan.

- Maintain, recover, and restore riparian resources, channel condition, and aquatic habitat.
- Maintain, recover, and restore streamflow regime sufficient to sustain desired conditions of native riparian, aquatic, wetland, and meadow habitats.
- Protect aquatic systems to which species are uniquely adapted.
- Maintain and restore spatial and temporal connectivity for aquatic and riparian species within and between watersheds to provide physically, chemically and biologically unobstructed movement for their survival, migration and reproduction.

Threatened, Endangered, and Sensitive Species and Management Indicator Species Objectives

- Ensure that proposed license conditions and recommended measures provide for well distributed, viable populations of special status species including threatened, endangered and BLM/FS sensitive species, and are consistent with any applicable biological opinion issued under the federal or state Endangered Species Act. Ensure that proposed license conditions and recommended measures comply with the Forest Plans and/or BLM plans and policy. Minimize the effects of stream diversion or other flow modifications from hydroelectric projects on threatened, endangered, or sensitive species.
- Manage sensitive species to ensure that species do not become threatened or endangered.
- "Manage National Forest System habitats and activities for threatened and endangered species to achieve recovery objectives so that special protection measures provided under the Endangered Species Act are no longer necessary." (FS Manual 2670.21).
- Maintain and restore habitat to support viable populations of TES species. Work cooperatively to reduce impacts to native populations where invasive species are adversely affecting the viability of native species.
- "Conserve and/or recover ESA-listed species and the ecosystems on which they depend." (BLM 2008 Special Status Species Management policy)

- Avoid impact to species designated as fully protected under FGC sections 3511(b) and 4700(b).
- Avoid or minimize impacts to species whose viability has been identified as a concern.
- If impacts cannot be avoided, analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole.
- Conduct field surveys for TEPS plant species early enough in project planning process that the project can be designed to conserve or enhance TEPS plants and their habitat (SNFPA ROD page 66, S&G #125).
- Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining fen ecosystems and plant species that depend on these ecosystems (SNFPA ROD page 65, S&G #118).

Entrainment Objective

Minimize or avoid the entrainment effects of stream diversions or other flow modifications from hydroelectric projects on aquatic life including threatened, endangered, and sensitive species and fish. Mitigate for losses of fish and wildlife due to entrainment at tunnel intake structures and at the outlets of the reservoirs.

Macroinvertebrate Objectives

Maintain high macroinvertebrate indices of biotic integrity (IBIs (metrics)) in project streams to demonstrate healthy stream function and provide adequate prey base. Benthic aquatic invertebrates comprise the foundation of the food web critical to all aquatic carnivores, including fish. The organisms are also indicative of the overall aquatic habitat condition in which they occur because different kinds of taxa predominate in differing habitat conditions. Project bypassed reaches and reservoirs will receive increasing public visitation pressure into the foreseeable future. Watershed development adjacent to Project facilities may also occur. The prescribed benthic invertebrate sampling will be key to monitoring the status of the indicative populations that could be affected by Project-related disturbance sources. It is possible that, due to their primary role in the aquatic food web, changes to the basic composition of the aquatic invertebrate fauna over time may be evident through this sampling prior to the changes becoming evident by fish or hydrologic sampling**.**

Ensure that proposed license conditions and recommendations provide for well distributed, viable populations of native aquatic mollusks.

Ensure that the level of large woody debris in streams (including but not limited to Bear River below Rollins Reservoir and Bear River Canal Diversion Dam) is within the range of natural variability in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions as needed to prevent further declines or cause an upward trend in condition. Ensure large woody debris passage beyond dams and diversions.

Natural Hydrograph Objective

- Develop and implement streamflow regimes that simulate the shape of the natural hydrograph in duration, magnitude, timing, rate of change, and frequency to the extent necessary to restore or protect applicable ecological functions.
- Ensure that seasonally-appropriate geomorphic flows occur at magnitudes and recurrence intervals necessary to maintain healthy stream processes and prevent riparian encroachment within channels that leads to channelization while allowing riparian establishment along stream banks.
- Minimize project-caused flow fluctuations uncharacteristic of the natural hydrograph to protect biota and maintain public safety.
- Manage spills from project reservoirs to simulate timing on natural hydrograph.

Channel Morphology, Sediment Transport, and Riparian Objectives

- Maintain or restore channel integrity.
- Maintain, improve, or restore fluvial processes to provide for balanced sediment transport, channel bed material mobilization and distribution, and channel structural stability that contribute to diverse aquatic habitat and healthy riparian habitat.
- Maintain sediment regime that addresses ecosystem values.
- Ensure delivery and transport of sediment are balanced so that stream channels are not excessively aggrading or degrading over time, and particle size distribution allows for diverse bed form within the stream channel.
- Keep sediment regimes as close as possible to those which aquatic and riparian biota evolved.
- Ensure stream channels have appropriate cross-section size (width to depth) and stable stream banks, and floodplains and flood-prone areas have connectivity to the stream channel.
- Maintain riparian vegetation in proper functioning condition.
- Maintain or restore riparian resources.
- Maintain or restore streamflow regime sufficient to sustain desired conditions of native riparian, aquatic, wetland, and meadow habitats.
- Address Riparian Conservation Objectives from Forest Plan.
- Manage streamflows so they are sufficient to sustain desired conditions of riparian plant communities.
- Manage streambanks and shorelines to minimize erosion and sustain desired riparian habitats.
- Manage riparian plant communities to maintain and improve the species composition and structural diversity to provide desired habitats and ecological functions..
- Manage riparian plant communities to maintain and/or improve spatial and temporal connectivity for native riparian plant species within and between watersheds to provide physically, chemically and biologically unobstructed movement for their survival, migration and reproduction.
- Maintain and restore the distribution and health of biotic communities in special aquatic habitats (such as springs, seeps, vernal pools, fens, bogs, and marshes) to perpetuate their unique functions and biological diversity.

- Maintain and restore the connections of floodplains, channels, and water tables to distribute flood flows and sustain diverse habitats.

Water Quality Objective

Ensure compliance with the water quality objectives to fully protect the beneficial uses as designated in the Central Valley Regional Water Quality Control Board Basin Plan (Basin Plan).

Water Temperature Objective

Ensure that flows are protective of the designated beneficial uses of cold freshwater habitat and warm freshwater habitat as appropriate, and do not adversely affect water temperatures for local aquatic- and riparian-dependent species assemblages.

Aquatic Invasive Species (AIS) Objectives

- Maintain ecosystem health including water quality through prevention of the introduction and establishment of aquatic invasive species such as quagga and zebra mussels, Eurasian water-milfoil, and Hydrilla. Develop and implement a Prevention Program for project reservoirs with boating and fishing activities (FGC §2302), and project waters as per National Direction (FSM 2900).
- Keep project reaches free of *Didymosphenia geminata* (diatomaceous algae).

Non-Native Invasive Plant Objectives

- Implement measures to rapidly detect and treat target non-native invasive plants (NNIP) before they become established.
- Establish management actions and monitoring to prevent the introduction of target NNIP into new areas; to maintain habitat conditions that reduce the risk of NNIP establishment, and to control known NNIP infestations on FS/BLM lands within and adjacent to the FERC Project boundary.
- Develop and implement an Integrated Pest Management Plan to control NNIPs on federally managed lands to maintain or improve the health of those ecosystems. The Plan includes NNIP education, prevention, treatment, monitoring/surveying, and reporting consistent with the Sierra RMP, FS Regional strategy, and Noxious Weed MOU.
- During O&M activities, determine actions that favor the establishment and spread of non-native invasive plants and design BMPs to reduce the risk of infestation and/or spread of NNIP.

Reservoir Level Objective

Maintain reservoir levels in Project reservoirs to protect beneficial uses. Maintain reservoir levels sufficient to ensure that aesthetic, recreational, ecological, and power production needs are addressed.

Recreation Management Objective

- Provide for quality day use and overnight recreation opportunities associated with the Project and ensure that other resources are not adversely impacted by this recreational use.
- Ensure adequate streamflows for boating, fishing, swimming, and other water play.

Recreation Design Objective

Ensure Project-related facilities meet current FS and BLM design standards and standards for accessibility.

Public Safety Objective

Provide a safe recreational experience for the public. Provide public safety information at project reservoirs and primary river recreation access points. Provide an administrative presence during the public recreation and whitewater boating season.

Project-Related Recreation

- Ensure Licensee provides for and is responsible for project-related recreation, including providing facilities, long-term maintenance, and periodic heavy maintenance.
- Post appropriate signs, including interpretive signs.

Reservoir Angling

- Protect and enhance reservoir angling opportunities (shoreline and boat) at Project reservoirs consistent with overall reservoir-based recreation and reservoir level goals through fish stocking, maintenance of structures, and access.

- Ensure fish stocking in Project reservoirs is adequate for a quality angling experience. CDFG classifies a reservoir fishery as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour.

Streamflow and Reservoir Level Information Objective

Provide streamflow and reservoir level information for Project-affected reaches and reservoirs that is available to the general public and is adequate for river and reservoir recreation use.

Visual Resource Objective

Ensure that visual quality meets appropriate management area direction.

Cultural Resources Objectives

- Evaluate cultural resources that may be affected by the project (including project-related activities), and protect/conserve significant resources, or mitigate effects to those resources.
- Conduct, as part of Section 106 compliance, on-going consultation with the appropriate Native American tribe(s) as defined by the FS and BLM.
- Ensure full compliance of Section 106 through a Programmatic Agreement.

Transportation and Facilities Management Objectives

- Ensure appropriate level of maintenance on Project-related roads and trails. Ensure roads and trails are operated and maintained to established FS and BLM standards and are consistent with the Forest and BLM Plans. Ensure that substandard Project Roads and Trails conditions are brought up to current standards.
- Ensure Project-related facilities are appropriately identified and maintained.
- Ensure Licensee is authorized for the use and is responsible for their commensurate share of road maintenance and repairs of General Access National Forest System Roads used to access Project facilities.
- Ensure that all traffic and information signs in project facilities comply with current MUTCD and FSH 7700-15 for size, shape, message, color, symbology and maintenance and replacement.

Special-Use Authorization Objective

Ensure that Project-related special-use authorizations are up to date and address current uses.

Vegetation Management and Fire Prevention Objective

Ensure appropriate vegetation management for Project-related activities. Minimize loss of resources from Project-related fires. Implement vegetative treatments to reduce hazardous fuels at recreation sites, along transmission lines, around structures, Project and Project related roads, etc.

Consistency with Plans

Ensure that hydropower operations are consistent with the applicable resource agency plans (for example, Forest Plan, Basin Plan, BLM Sierra Resource Management Plan, and their revisions over the life of the license.

Outages Objective

Ensure outages for routine and non-routine planned and unplanned project maintenance outages are scheduled to occur at times that minimize adverse effects. Ensure adequate streamflows and water temperatures in affected streams are maintained during planned and unplanned outages. Avoid flow fluctuations associated with outages through appropriate ramping rates. Ensure that higher flows during unplanned outages do not adversely affect foothill yellow-legged frog life stages during their sensitive reproductive period.

RATIONALE FOR PRELIMINARY CONDITIONS AND RECOMMENDATIONS – ECOLOGICAL RESOURCES

The following section describes the scientific information and the rationale for the specific protection, mitigation, and enhancement measures.

Existing Conditions

- The minimum streamflows are generally fixed minimums without a natural seasonal hydrograph shape. Some reaches do not have a required minimum streamflow. There are inter-basin water transfers that result in less available water to address ecological resources in some watersheds, and high a-seasonal flows that have ecological resource effects in other reaches.
- Project reservoirs reduce large woody debris supply in some reaches.
- The Bear River receives higher than unimpaired flows that result in affects to Bear River Meadow.
- In some reaches, summer water can reach temperatures that result in adverse effects to resident native fish.
- There are sensitive species in some reaches, in particular foothill yellow-legged frog and hardhead.
- Numerous sensitive species are present within and adjacent to the project, where project-associated activities such as vegetation maintenance (running chainsaws, falling trees), routine maintenance, and recreation-associated activities have the potential to reduce the reproductive output of individuals and long-term occupancy of these sites.
- Project water conveyances--pipes, flumes, canals--that interfere with wildlife movement. No structures have been built that are specifically designed for wildlife to cross conduits; all potential locations where wildlife can cross are opportunistic in the landscape, nor do they occur regularly enough to provide for the life history needs of most species.
- Invasive mussels are not known to occur in project waters, but no systematic monitoring program is in place to find new occurrences, and no preventative measures (i.e. boat inspections, washing stations, public education) are applied throughout the watersheds.

Desired Conditions

- Ensure that sensitive aquatic species and their habitat are adequately protected, including foothill yellow-legged frog, hardhead, and western pond turtle.
- Ensure that native fish populations are protected and maintained. Improve habitat capability for native trout.
- Ensure the Project does not adversely affect water temperatures necessary for aquatic-dependent assemblages. Maintain or improve selected habitats for coldwater and warm-water species.
- Maintain water quality adequate to protect beneficial uses and meet state water quality standards.

- Ensure plant communities in riparian areas and wetlands are diverse and healthy and provide essential ecological functions.
- Maintain channels in a healthy, functioning condition, including Bear Valley area.
- Monitor to ensure objectives are met. Include consultations to discuss measures that may be implemented if objectives are not met.
- Provide habitat for healthy macroinvertebrate populations.
- Project-related activities are conducted in a way that reduces unnecessary disturbances within sensitive sites.
- Project facilities provide sufficient movement for wildlife to: (1) Sustain viable populations of all native and desirable non-native species; and (2) Utilize the capability of the land to support those populations.
- Project conduits are safe and humane for wildlife.
- Project facilities are managed so that human food attractants are not available to wildlife.
- A comprehensive aquatic invasive program is implemented throughout the Project that includes: public education, prevention, and monitoring.
- There is no large woody debris in the reach below Rollins Reservoir and Bear River Canal Diversion Dam.

General Measures

OBJECTIVES ADDRESSED BY GENERAL MEASURES

Threatened, endangered, and sensitive species

INFORMATION USED TO ESTABLISH GENERAL MEASURES

- Tahoe National Forest Land and Resource Management Plan
- BLM Sierra Nevada Resource Plan
- Other agency directives

RATIONALE FOR GENERAL MEASURES - ANNUAL EMPLOYEE TRAINING

The purpose of this measure is to minimize the possibility that continued Project O&M would adversely affect special-status species. The measure requires Licensee to provide training to Project O&M staff when they are first assigned to the Project and to provide group training to Project O&M staff annually. Providing training to staff when they are first assigned to the Project will allow new staff to be quickly trained, and annual training will serve as a refresher for staff and to note any changes since the preceding year. Training will include the general identification of special-status species and their location within the Project Area. Training will also include procedures for reporting to Licensee's management if staff observes any Project activity directly affecting these sensitive areas.

RATIONALE FOR GENERAL MEASURES - COORDINATED OPERATIONS PLAN

The Drum-Spaulding and Yuba-Bear Hydroelectric Projects are hydraulically interconnected as, in some instances, flow releases from one Project flow in and out of the other Project's facilities. The extent of future coordination needed for each Project to comply with its license conditions will need to be defined in a Coordinated Operations Plan. The plan will address how Licensees will coordinate operations between the Drum-Spaulding and Yuba-Bear Hydroelectric Projects and will also address how the projects will coordinate operations to support license compliance requirements. An example of operational coordination between the Drum-Spaulding Project and the Yuba Bear Hydroelectric Project is the minimum streamflow requirement downstream of Rollins Reservoir in the Bear River and coordinated operations of the Drum-Spaulding Project's Bear River Canal Diversion.

Flow Measures

OBJECTIVES ADDRESSED BY FLOW MEASURES

- Aquatic biota
- Threatened, endangered, and sensitive species
- Entrainment
- Macroinvertebrate
- Natural hydrograph
- Channel morphology, sediment transport, and riparian
- Water quality
- Water temperature
- Reservoir level
- Reservoir angling
- Aquatic invasive species

INFORMATION USED TO ESTABLISH FLOW MEASURES

- Technical Memorandum 1-1: Channel Morphology
    - Attachment 1-1I: Large Woody Debris by Size and Diameter Class
- Technical Memorandum 2-1: Water Quality
- Technical Memorandum 2-2: Water Temperature Monitoring
- Technical Memorandum 2-3: Water Temperature Modeling
- Technical Memorandum 3-1: Stream Fish Populations
- Technical Memorandum 3-2, Instream Flow
    - Attachment 3-2A Habitat Mapping and Channel Characterization Report
- Technical Memorandum 34: Fish Passage
- Technical Memorandum 3-6: Special-Status Amphibians – FYLF VES
- Technical Memorandum 3-7: Special-Statue Amphibians – FLYF Modeling
- Technical Memorandum 3-8: Special-Status Amphibians – SNYLF

- Technical Memorandum 3-9: Special-Status Reptiles - WPT
- Technical Memorandum 3-10: Aquatic Macroinvertebrates
- Technical Memorandum 3-13: Western Placer County Streams
- Technical Memorandum 3-14: Western Pond Turtle Basking Study
- Technical Memorandum 3-16: Fish Barriers
- Technical Memorandum 6-1: Riparian Habitat
- Yuba-Bear Amended Final License Application,
  - Amended Appendix E4: Clear and Trap Creek Channel Stabilization Plan
- Drum-Spaulding Final License Application

RATIONALE FOR FLOW MEASURES – WATER YEAR TYPES (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS

This measure establishes six water year (WY) types that would trigger various conditions (for example, minimum flow releases) in the new licenses for the Drum-Spaulding and Yuba-Bear Hydroelectric Projects. The WY types are linked to DWR's forecasts for annual unimpaired flow volume in the Yuba River at Smartville. Because the California Department of Water Resources (CDWR) bulletin and end of year runoffs are periodically not published until as late the 10th of the month, the WY type would take effect beginning on the 15th of the month in which it is published or otherwise made available. There is also an "October update" using DWR's monthly full natural flow for the Yuba River near Smartville, when data are published in October for the full water year. Relicensing Participants agreed that performing an October update to the WY type when possible based on the observed runoff volume allows operations to be more reflective of actual hydrologic conditions, rather than continuing to implement a forecast-based WY type after the water year has finished. Any updates to the WY type in fall must be available by November 1 in order to be implemented in some of the high-elevation locations in the Project. In case CDWR has an excessive delay in publishing the data and monthly full natural flow totals are not available in October, or if CDWR discontinues publication of these data, Licensee will continue implementing flows according to the forecast based WY type determined by the last published CDWR Bulletin 120.

Relicensing Participants jointly concluded that the range of anticipated flows in the projects could best be divided into six WY types, based on data for the last 33 years of record. From a climatology standpoint, annual runoff volumes are distributed over a long period of time in such a way that the distribution can be described by its median and the amount of "skew" in the data. This skew is caused by wetter years having a larger variation away from the median than drier years, in terms of absolute differences in volume. This inherently splits the data into two asymmetrical tails. Because of the different influences on both sides of the median, the first split in hydrology types chosen was a "below normal" and "above normal" type. This is because the "normal" value is essentially the median (in this case, 2,190,000 ac-ft of runoff in a given water year as forecasted in the Yuba River at Smartville). All of the CDWR forecast data for the 33 years in the relicensing Period of Record (WY 1976 through WY 2008) were ranked by volume, plotted and analyzed for statistical differences.

The Extreme Critically Dry WY type would take effect when CDWR's forecast is 615,000 ac-ft or less of runoff at Smartville.[4] This WY type has the most extreme low streamflows in all seasons as compared to median conditions, due to a negligible snowpack and a lack of spring rain events to augment the flow. This leads to a very dry watershed throughout the spring and summer months. In these years, the Drum-Spaulding and Yuba-Bear Hydroelectric Projects would not meet a major portion of consumptive water delivery demands for the duration of the summer and fall months. In the 33 years in the relicensing hydrology period of record, there was one (3 percent of the record) Extreme Critically Dry WY: 1977. This Extreme Critically Dry WY type has been added to the proposed WY types in recognition of the extraordinary conditions and potential for major effects on consumptive water supply deliveries in an extremely dry year such as WY 1977.

The Critically Dry WY type would take effect when CDWR's forecast is between 616,000 and 900,000 ac-ft of runoff at Smartville. This WY type has low streamflows in all seasons as compared to median conditions, due to a negligible snowpack and a lack of spring rain events to recharge the storage reservoirs. This leads to a dry watershed throughout the spring and summer months and less water available to meet minimum streamflow requirements and consumptive water supply deliveries. In the 33 years in the relicensing hydrology period of record, there were three Critically Dry WYs (9 percent of the record): 1976, 1987, and 1988.

The Dry WY type would take effect when CDWR's forecast is between 901,000 and 1,460,000 ac-ft of runoff at Smartville. In Dry WYs, relatively low streamflows occur in the late winter and early spring due to a limited snowpack, and no spring rain events occur to recharge the storage reservoirs. This leads to a dry watershed throughout the late spring and summer months and less water available to meet minimum streamflow requirements and consumptive water supply deliveries. In the 33 years in the relicensing hydrology period of record, there were seven (21 percent of the record) Dry WYs: 1978, 1984, 1989, 1993, 1996, 1999, and 2000.

The Below Normal WY type would take effect when CDWR's forecast is between 1,461,000 and 2,190,000 ac-ft of runoff at Smartville. This type of WY has a similar hydrograph shape to the Dry WY in the late winter and early spring due to a similar snowmelt, but these years typically have an increased volume of spring and early summer runoff that help to recharge the watershed and reservoirs during those months. In the 33 years in the relicensing hydrology period of record, there were eight (24 percent of the record) Below Normal WYs: 1985, 1990, 1991, 1992, 1994, 2001, 2007 and 2008.

The Above Normal WY type would take effect when CDWR's forecast is between 2,190,000 and 3,240,000 ac-ft of runoff at Smartville. The typical Above Normal WY includes a relatively large snowmelt that starts in early spring and lasts through early summer, along with several storm events that cause spikes in the hydrograph throughout the spring. In the 33 years in the relicensing hydrology period of record, there were six (18 percent of the record) Above Normal WYs: 1979, 1981, 2002, 2003, 2004 and 2005.

The Wet WY type would take effect when CDWR's forecast is more than 3,240,000 ac-ft of runoff at Smartville. The typical Wet WY includes similar snowmelt characteristics to the Above Normal WY type, but is distinct in that it includes either several large spring storms or an especially large amount of snowmelt runoff. These runoff events often dwarf the remainder of the hydrograph and can act as geomorphic flushing flows. The late summer and fall portions of the Wet WY hydrograph are similar to an Above Normal WY. In the 33 years in the relicensing hydrology period of record, there were eight (24 percent of the record) Wet WYs: 1980, 1982, 1983, 1986, 1995, 1997, 1998 and 2006.

RATIONALE FOR FLOW MEASURES – MINIMUM STREAMFLOWS (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

The approach for evaluating and developing minimum streamflows for all Project-affected stream reaches included the following steps, focused on the needs of the aquatic-dependent biota (primarily fish, amphibians, macroinvertebrates, and riparian vegetation): (a) establishment of resource objectives for each reach, (b) evaluation of ecosystem conditions under regulated and unimpaired streamflows, (c) review of the ecosystem attributes (which are based on the resource objectives for each reach) to determine which attributes are important at different times of the year and where there may be limiting factors, (d) review of study results to develop a minimum streamflow regime for each water year type based on review of the unimpaired hydrology and study results, while considering changes in precipitation/snowmelt magnitude and timing, and (e) re-evaluation of the resulting minimum streamflows and adjustments to meet the interests of other parties, in particular, the hydroelectric generation and water supply interests.

Streamflow is strongly correlated with many critical physicochemical characteristics of rivers, such as channel geomorphology, water temperature, and habitat diversity, and can be considered a "master variable" that limits the distribution and abundance of riverine species (Power et al. 1996 and Poff et al. 1997). The natural, unregulated flow regime plays a critical role in sustaining native biodiversity and ecosystem integrity in rivers (Poff et al. 1997). Higher spring flows are essential for maintaining resident native fishes in good condition for spawning and rearing (Moyle et al. 1998).

The following sections describe the minimum streamflow approach with the specific process for each reach.

Evaluation of Aquatic Ecosystem Conditions Under Regulated and Unimpaired Streamflows

Aquatic ecosystem conditions under existing minimum streamflows were evaluated for each Project-affected stream reach, based on a comparison with unimpaired conditions and with conditions in similar unaffected stream reaches both within the Middle Yuba, South Yuba, Bear River, and North Fork of the North Fork American River Watersheds and elsewhere in the Sierra Nevada mountains. Knowledge of existing and historical conditions was primarily based on: (a) studies conducted related to hydrology, geomorphology, fish populations, fish habitat, amphibians, macroinvertebrates, riparian vegetation, water quality, and water temperature; (b) personal field observations; (c) pertinent literature; (d) information from other hydroelectric relicensings, and (e) professional judgment. Existing fish population data from Project-affected stream reaches were compared between sampling sites and reaches, and with existing data from similar unaffected reaches in the drainage, historical data from the same reaches, and a compilation of historical data from several Sierra Nevada mountain drainages (Gerstung 1973).

Macroinvertebrate data from Project-affected stream reaches were compared between sampling sites and reaches and with data from similar unaffected reaches in the drainage.

Comparison of Regulated and Unimpaired Streamflow Data

Regulated streamflow data were compared with unimpaired streamflow data for Project-affected stream reaches over a 33-year period to determine how hydrological conditions have been affected by Project operations on a seasonal basis. The average monthly streamflow was evaluated for each stream reach. The frequency, magnitude, and duration of peak flow events were also evaluated.

Review of Ecosystem Attributes and Identification of Potential Limiting Factors

Based on review of the ecosystem attributes and hydrology data, potential limiting factors for aquatic biota (primarily fish, amphibians, and macroinvertebrates) were identified under both unimpaired and regulated streamflow conditions. Examples of limiting factors include: no streamflows requirements in some reaches, low summer streamflows under unimpaired conditions, water temperatures that are too warm (according to the Basin Plan) or too cold, flow fluctuations caused by Project operations, reduced winter/spring streamflows, and delayed or lack of spring runoff under Project operations. Potential improvements were identified to restore the aquatic ecosystem as close as possible to a natural condition while addressing hydroelectric generation and recreation interests. The following factors were considered while developing minimum streamflows: (a) a resource management emphasis on native species (particularly rainbow trout, foothill yellow-legged frogs, western pond turtles, and hardhead), (b) the importance of mimicking the natural hydrograph for the protection of overall ecosystem function and individual target biota (for example, amphibians and riparian vegetation), (c) maintenance of cold water and transitional habitats where appropriate, (d) maintenance of beneficial water quality conditions, (e) connectivity of flows above and below Project features, (f) preservation of geologic integrity, (g) recreational opportunities, (h) hydroelectric operations, (i) consumptive water deliveries, and (j) other resource objectives listed above.

Development of a Range of Minimum Streamflows to Protect Aquatic Resources

Minimum streamflows were developed on a seasonal and monthly basis to protect aquatic resources, recognizing that higher flows than the minimum streamflows (including natural peak flow events) may occur at times due to tributary accretion, storm runoff, fall releases, and snowmelt runoff. Results of the various studies listed above were used as tools in developing the minimum streamflows. Generally, because spring is a very important time of year for breeding, spawning, and other ecosystem processes, results of the various streamflow studies were used to establish springtime minimum streamflows. The springtime flows were generally designed to provide habitat levels from 80 to 100 percent of optimum weighted usable area (WUA) for the various life stages of rainbow trout in wetter water year types when adequate flow is available, although this varied at times due to the importance of other ecological objectives occurring within specific reaches. Once springtime flows were developed, emphasis was placed on developing streamflow regimes that mimicked the natural hydrograph as much as possible for overall protection of the aquatic ecosystem, although this was not always followed due to the importance of other ecological objectives or other objectives within specific reaches.

Streamflow regimes for drier water year types were developed following a pattern similar to that of the wetter water year types but generally providing habitat levels with less than optimum WUA for the various life stages of rainbow trout, with careful consideration of flow characteristics offering protections for FYLF life stages (velocity and temperature) in those reaches which support known populations. This also varies at times due to the importance of other ecological objectives within specific reaches.

In some instances, flows vary from these patterns in an effort to meet hydroelectric generation, water supply, or reservoir level objectives in specific reaches. In all cases, there may be variations in this process due to ecological objectives within a specific reach.

The following steps describe how minimum streamflows were developed for each season.

High Flow Spring Period

Primary considerations during this period included spawning rainbow trout, initiation of foothill yellow-legged frog breeding, channel maintenance, sediment and large woody debris transport, and riparian habitat conditions. Spring is a critical time for fisheries reproduction and setting the stage for amphibian life stage activity for reproduction in late spring and early summer. During spring months it is important to have adequate flow and water temperatures for trout and hardhead spawning. Existing streamflows during non-spill periods are substantially less than unimpaired conditions, potentially affecting aquatic biota and fluvial geomorphology processes. Increased minimum streamflow levels were included in the new streamflow regimes based on providing improved rainbow trout spawning and rearing at the 80-100 percent range of optimum WUA where possible and for riparian habitat. The concept of providing spill cessation flows in key stream reaches (see Rationale for Spill Cessation Flows) in combination with minimum streamflows and naturally occurring peak flows or spill flows to provide for channel maintenance, sediment and large woody debris transport, riparian habitat, and sensitive species protection was included.

Late Summer and Early Fall

The relatively low streamflows that naturally occur during this period create limiting factors to aquatic biota such as reduced living space and potentially warm water temperatures. In reaches with upstream storage reservoirs, existing minimum streamflows provided by Licensee vary from base flow over unimpaired conditions in most water year types. In reaches without upstream storage, new minimum streamflows will allow for a closer representation of unimpaired base flow conditions. In general, where deemed necessary, the existing minimum streamflows (or flows of at least a similar magnitude) during late summer/early fall were included in the new streamflow regimes based on overall augmentation/maintenance values relative to unimpaired conditions, rearing suitability for rainbow trout, temperature control, and metamorphosing foothill yellow-legged frog tadpoles. In reaches with foothill yellow-legged frogs, during the period from approximately June through September, it was important to maintain a fairly stable flow (without substantial fluctuations), and during approximately July and August, it was important to maintain temperatures of at least 17ºC (daily average) for tadpole rearing and successful metamorphosis.

Late Fall/Winter

The remainder of the year was considered a transition period between the low-flow late summer/early fall period and the high-flow spring period. Existing streamflows during the late fall/winter are lower than unimpaired conditions and lack the typical transition pattern provided by the natural hydrograph. Minimum streamflows for this transition period were included to bridge the gap between low-flow and high-flow periods in a step-wise fashion and thus mimic the pattern of the natural hydrograph, although there are variations in some reaches to meet other objectives. Development of minimum streamflows during the transition period also took into consideration the occurrence of accretion flows (including peak flow events). Flows at this time are important to provide overwintering habitat for trout. Trout are known to feed in winter, and actively catch macroinvertebrates, even when water is between 32º and 33ºF (approximately 0ºC) (Needham and Jones 1959). In some instances, flows were reduced in this season in an effort to meet hydroelectric generation, water supply, or reservoir level objectives in specific reaches.

Hydrology Evaluation for Minimum Streamflows

The information in hydrologic data bases provided by Licensees was used as baseline information for comparison of daily average impaired and regulated streamflows for the 33-year period of record. Annual streamflow hydrographs were constructed for each Project-affected reach using available streamflow data generated by Licensee. Components of the hydrograph (spring, summer, fall, and winter baseflow; fall and winter storm runoff; and ascending and descending limbs of the snowmelt hydrograph) that relate to each of the ecosystem attributes were examined for: (a) comparison of the regulated and unimpaired streamflows and (b) indications of the typical magnitude of high and low streamflows for each time of the year.

Licensee and Resource Agencies developed an operations model to help evaluate and understand the effects of various streamflow and reservoir elevation target alternatives. Licensee also provided detailed information on the physical features and operating criteria for each of the Project facilities. Using the model, the Resource Agencies and other relicensing participants were able to view the impacts of the streamflow and reservoir elevations within the bounds of the historic natural water balance in the system.

Evaluation of Aquatic Biota Condition

Fish

The Resource Agencies considered fish to be in good condition if individual fish, fish populations, and the fish community exhibit all the following characteristics:

Individual fish have: robust body conformation, are relatively free of diseases, parasites, and lesions, are relatively free of the effects of inbreeding, outbreeding, or other negative genetic factors, have a reasonable growth rates for the region, and respond to stimuli appropriately. In all cases, stranding fish as the result of otherwise lawful diversion operations does not keep fish in good condition.

Fish populations have: good quality habitat available for all life history stages during times that each stage would require it, water quality needed to sustain fish populations, distribution and connectivity of habitats within the stream to sustain species (barring stream-long catastrophes, and for salmonids, viable populations in terms of diversity, spatial structure, abundance, and productivity. In all cases, dewatering of historically wetted habitat does not keep fish in good condition.

Fish communities are: dominated by co-evolved species, resilient in recovering from extreme events, persistent in species membership through time, and are represented geographically within ecological regions. Fish communities must also have predictable structure such as limited niche overlap and multiple trophic levels.

Benthic Macroinvertebrates

Benthic macroinvertebrates are an important part of the aquatic food chain. Additionally, benthic macroinvertebrate assemblages can be used as indicators of whether or not aquatic life is protected, and whether water flow is sufficient to protect fisheries.[1] According to the SWAMP Bioassessment Quality Assurance Project Plan:

> The utility of BMIs is based on at least six factors: 1) BMIs have low mobility so they cannot escape water quality stressors; 2) BMIs integrate stressors over time; 3) BMIs respond to cumulative stressors; 4) BMIs have relatively short lifespans (typically weeks to months) so they respond to recent stressors; 5) BMIs have a diverse community structure with individual species having differential sensitivity to stressors, allowing discrimination of gradients in magnitude of impact can be ascertained; and 6) BMIs provide a direct measure of the aquatic life beneficial use that is to be protected rather than surrogate measures of water quality such as chemistry or toxicity.

These samples are snapshots of the conditions at the time they were taken and not only should be used to compare between reaches, but each reach site should be used as a baseline for future monitoring of that reach. Eighteen macroinvertebrate metrices and two multi-metric indices – the Index of Biotic Integrity (IBI) and the multi-metric index (MMI) – were calculated using the macroinvertebrate assemblages for each site. As described in Technical Memorandum 3-10, these indices (both adjusted to a 100-point scale) are used to assess stream health, with higher scores representing better conditions compared to lower scores.

Foothill Yellow-Legged Frog

[1] California State Water Resources Control Board Surface Water Ambient Monitoring Program List of Potential Indicators. http://www.waterboards.ca.gov/water_issues/programs/swamp/tools.shtml#indicator

The foothill yellow-legged frog (*Rana boylii*) is one of a few California amphibians whose entire life cycle is completed in flowing water. This riverine frog historically occurred in the coast range and Sierra Nevada foothills of California. Over the last half century, this species has declined dramatically and is currently a USDA FS California Sensitive species, USDI Bureau of Land Management sensitive species, and California Species of Special Concern (Lind 2005). It recently been petitioned for listing under the Federal Endangered Species Act (Adkins Giese et al. 2012). Dams and reservoirs have been cited as likely factors in this decline as they drastically alter stream flow regimes and sediment budgets. In managed rivers, the timing, duration, and magnitude of large-scale discharge events can disrupt frog reproduction. Under a natural flow regime, discharge gradually declines throughout the summer such that eggs and tadpoles rarely experience large magnitude flows.

FYLF's lay eggs in the spring, and tadpoles develop during the late spring and summer of each year in a variety of stream environments from small creeks to large rivers (Figure 1) (Wheeler and Welsh 2008). In the Sierra Nevada, foothill yellow-legged frogs are adapted to the predictability of the snowmelt recession and typically lay eggs, attaching them to rocky substrates in river margins, during the middle to the tail end of that period (Yarnell et al. 2010a). Because of this adaptation, these frogs are considered to be an indicator species for other native riverine species that are less well-studied, like non-game fishes and aquatic bugs. Tadpoles develop through the summer and metamorphosis occurs in late summer. Once metamorphosis has occurred it takes 2-3 years for frogs to reach maturity (Figure 1). During this time, frogs typically inhabit springs and small streams (Kupferberg et al. 2009a). Population demography has been studied in several regulated and unregulated rivers in the coastal ranges and Sierra Nevada of California. Because egg masses are relatively easy to count, a common index of population size is the 'number of egg masses / km'. Females lay only one egg mass per year, so this index directly represents the size of the female breeding population at a given location. Populations in regulated rivers (n=16 rivers), averaged 5.5 ($\pm$ 1.2, s.e.) egg masses/km while in unregulated rivers (n=11) they averaged 31.1 ($\pm$ 9.2, s.e.) egg masses/km (Kupferberg et al. 2012).

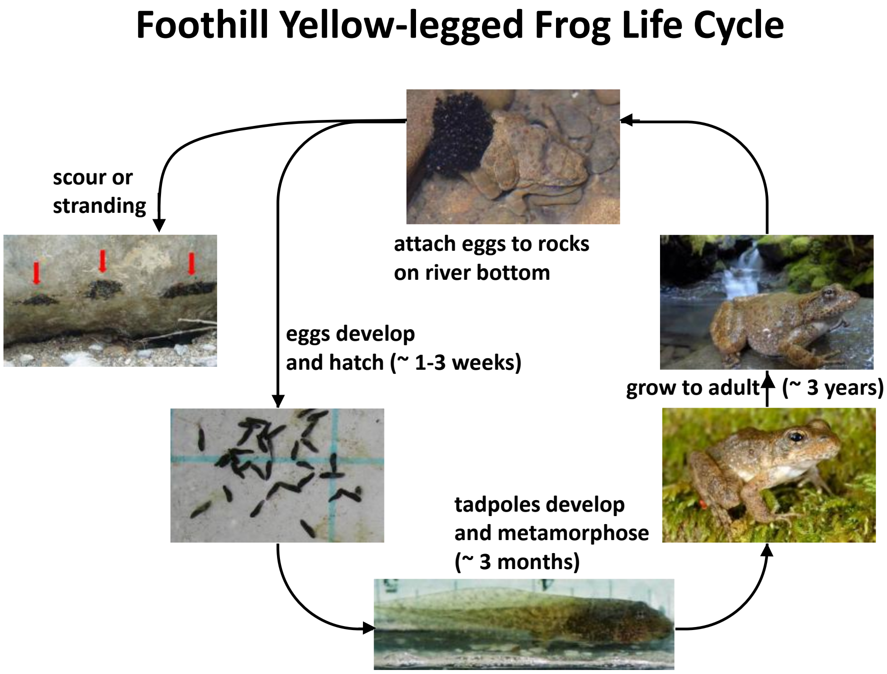
The primary risks to aquatic lifestages of foothill yellow-legged frogs from altered flow regimes and flow fluctuations are scouring and stranding of eggs and tadpoles and low water temperatures during tadpole rearing periods (Kupferberg et al. 2009a & b, Kupferberg et al. 2011, Kupferberg et al. 2012 Yarnell et al. 2010b).

Scouring can occur if water flows fluctuate and increase substantially after eggs have been laid. Stranding can occur if the flow recession rate is too fast relative to the time it takes for eggs to develop and the water depth at which the eggs were laid. Egg development time is dependent on water temperature, but typically ranges from 2-3 weeks in mid-elevation Sierran rivers (based on S. Kupferberg 2008, unpublished data). Based on egg mass and tadpole habitat studies in the northern Sierra Nevada (including data from Yuba-Bear/Drum-Spaulding studies) upwards of half of all egg masses are laid at water depths of 1 foot or less (Nevada Irrigation District and Pacific Gas and Electric Company 2010, Yarnell et al. 2011). Thus, to protect egg masses from stranding and to reduce local population extinction risk, the recession rate would need to be less than 1 foot over 3 weeks or 1/3 foot per week. At river cross-sections where frogs breed, gradual

(9 percent to 3 percent) daily percent changes in flow translate to gradual changes in water depths that protect frog eggs from stranding and allow tadpoles to successfully develop through the summer (S. Yarnell, pers. comm., Lind and Yarnell 2011).

Low water temperatures during tadpole rearing periods can increase development time, reduce size at metamorphosis, and potentially result in poor or no recruitment. These effects have been demonstrated in both field distributional studies and field and laboratory experiments. By examining the distribution of foothill yellow-legged frog breeding sites along a river that had a longititudinal temperature gradient, it was demonstrated that successful reproduction was only seen at sites with daily average water temperatures greater than 15.5°C for three to four months (Placer County Water Agency 2008). In field and laboratory experiments, tadpoles reared at sites with daily average temperatures of 16.5 to 20 °C in June through August resulted in the highest survival rate with very low survival below 16.5°C (S. Kupferberg, pers. comm. April 2010).

Figure 1. Life cycle of the foothill yellow-legged frog with estimates of duration of life stage.



Western Pond Turtle

The western pond turtle (WPT, *Actinemys marmorata*) is California's only native aquatic turtle species. The species occurs along the Pacific coast, west of the Sierra/Cascade divide, from northern Washington south to northern Baja California, Mexico. The WPT has declined precipitously over most of its range, and is now considered endangered in Washington, threatened in Oregon, a Species of Special Concern in California, and a USDA FS California Sensitive Species. Western pond turtles that inhabit river environments are adapted to the hydrologic cycles of wet winters and dry summers in California rivers. Preferred riverine habitats include slow flowing areas and backwater environments with basking sites (woody debris, floating vegetation) and underwater refuges (undercut banks, large root wads, rock crevices) where they feed on aquatic insect larvae, crustaceans, small vertebrates (e.g., amphibian eggs and tadpoles), and possibly carrion. Vegetation is also thought to be an important part of their diet. All feeding is done underwater as WPT cannot swallow in air (Reese and Welsh 1998a, Bury and Germano 2008). As with other native aquatic species, the life cycle of WPT results in use of the rivers primarily in the summertime and avoidance of higher winter flows in winter (Table 1). Females travel into upland environments to nest in mid-summer and may produce more than one clutch of approx. 4-8 eggs each year (Table 1, Reese and Welsh 1997, Kelly 2007, Bury and Germano 2008, Scott et al. 2008).). The relatively low reproductive effort and longevity of WPT (~ 40 years) means that this species' population recovery time (after disturbances or local extinctions) is relatively slow compared to other native aquatic species. Population sizes of WPT were documented in two forks of the Trinity River in northern California in the early 1990's. In the mainstem Trinity, the average number of turtles was 39/km and in the south fork, the average was 34/km. The mainstem has a slightly larger drainage area than the south fork (Reese and Welsh 1998b).

Recent studies have focused directly on water flow and temperature effects on WPT. Freshwater turtles bask to warm their body. Turtles in the colder rivers spend significantly more time engaged in aerial basking than turtles in warmer rivers (Ashton et al. 2006, Bettaso et al. 2006). Changes in normal thermoregulatory behaviors may affect several aspects of general life history traits such as growth patterns, age at maturity, and size at maturity, which in turn could affect age- and size-specific reproductive investments and the size at birth of offspring. The significant amount of time WPT spend in upland environments (for nesting and overwintering) means that effects of roads and canals and extreme flow fluctuations during winter months, in both rivers and reservoirs, needs to be evaluated. Canals can act as barriers to upland movements and potentially result in mortally if turtles fall in and cannot climb out. Road mortality effects on sex ratios (reduction in adult females) have been documented for many other species of turtles (Gibbs and Steen 2005).

Table 1. Seasonal use of aquatic, riparian, and upland habitats by riverine populations of western pond turtles in the foothill regions of the Sierra Nevada and Northern California Coast Ranges.

LIFE STAGE	SEASON			
	Summer	**Fall**	**Winter**	**Spring**
Eggs	deposited by adult females in riparian/upland nests, dug in ground	in nest		
Hatchlings		hatch in nest	overwinter in nest	migrate to small aquatic environments (e.g., springs, shallow river backwaters)
Juveniles	springs, small creeks, backwaters and small pools of rivers	overwinter in dry upland sites/"burrows"	overwinter in dry upland sites/"burrows"	springs, small creeks, backwaters and pools of rivers
Adult Females	pools and backwaters of creeks and rivers; nesting forays to	overwinter in dry upland sites/"burrows";	overwinter in dry upland sites/"burrows";	pools and backwaters of creeks and rivers

LIFE STAGE	SEASON			
	Summer	**Fall**	**Winter**	**Spring**
	riparian/upland areas in mid-summer	may also use ponds	may also use ponds	
Adult Males	pools and backwaters of creeks and rivers	overwinter in dry upland sites/"burrows"; may also use ponds	overwinter in dry upland sites/"burrows"; may also use ponds	pools and backwaters of creeks and rivers

Additional Considerations for Determining Minimum Flows

If the aquatic biota were determined not to be in good condition in a particular stream reach, the Resource Agencies attempted to consider all of the following elements to develop a minimum flow regime that improves the condition of the fishery and provides adequate protection of the aquatic biota.

Water for maintaining a living stream at all times. Sufficient flows should be released during the summer to keep resident fish in good condition and to keep the stream connected to a lower order stream or estuary, including consideration of the stream's natural perennial or ephemeral character. (SWE-1)

Water flow regime that mimics natural flows. Flow recommendations should consider the extent the flow regime below a dam mimics natural flow regimes. To the extent possible, the preservation of the timing and magnitude of natural water flow should be required, including conserving natural high flow events during wet season and natural low flow events during the dry season. (SWE-2)

Water for maintaining resident native fish migration, spawning and rearing habitat. Sufficient flows should be released during the spring to keep resident fish in good condition. Spring flows should be increased from summer flow levels to support spawning and rearing of native fishes. (SWE-3)

The Resource Agencies initially applied instream flow assessment method(s) that represent the best available science to determine minimum flows that would improve fish condition and provide adequate protection of the aquatic biota.

Site-specific incremental assessments of flow versus habitat relationships, such as those derived from one- or two-dimensional PHABSIM-type studies, are the preferred method for addressing SWE-1, and -3. In the event site-specific PHABSIM-type studies are not available, the Resource Agencies attempted to apply other field-based standard setting habitat assessment methods, including the wetted-perimeter method.

In the absence of data to support field-based habitat assessments, the Resource Agencies applied standard setting methods that are based on unimpaired hydrology, such as the Tennant Method (aka Montana Method) and Tessmann's adaptation of the Tennant Method. Generally, the

Resource Agencies applied Tessman's adaptation of the Tennant Method in stream reaches with larger watersheds and good year-round access. Use of the basic Tennant Method was reserved for smaller watersheds and/or locations with extremely difficult winter access.

In order to address SWE-2, the Resource Agencies evaluates the unimpaired hydrology and to ensure that spawning flows are timed to coincided with the peak of the unimpaired hydrograph.

Aquatic Ecosystem Re-Evaluation of Minimum Streamflows

Once the Resource Agency initial minimum streamflow recommendations were reviewed using the operations model, adjustments were made to individual values to address site-specific considerations at various locations. The adjustments were made after lengthy collaborative discussions and negotiations among relicensing participants and attempted to balance the minimum streamflows with other interests, including hydroelectric generation, consumptive water deliveries, angling opportunities, reservoir levels, winter access challenges, infrastructure limitations and recreational streamflows.

Specific Rationale for Stream Reaches

The following section details the rationale, by reach, for the streamflows submitted by the Resource Agencies in their conditions and recommendations. The projects consist of several small streams that flow from small reservoirs high up in the projects, several large river streams, and several streams that are bi-sected by the Bowman-Spaulding Conduit. Many of the smaller streams and those bi-sected by the conduit do not have existing streamflow requirements.

Middle Yuba River Below Jackson Meadows Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

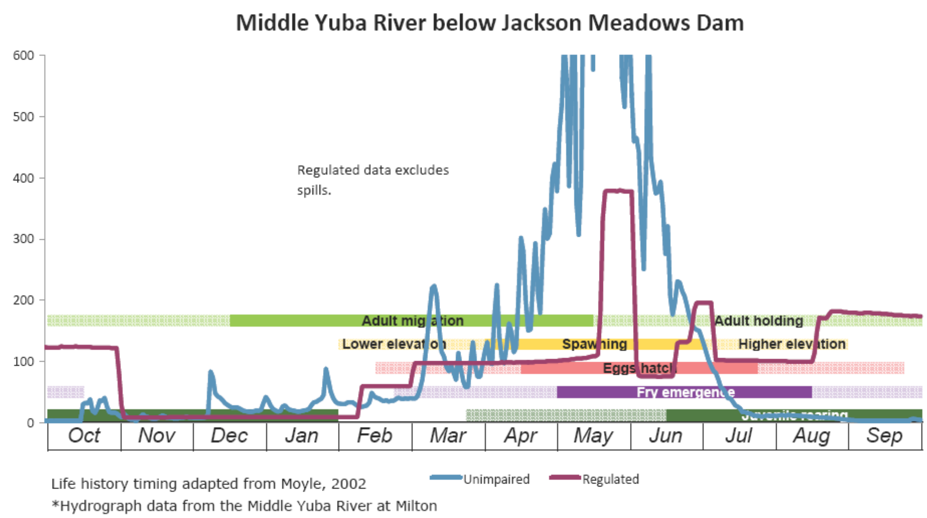
The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The reach of the Middle Yuba River below Jackson Meadows Reservoir Dam reach is 1.6 mi long and extends from the outlet at Jackson Meadows Dam (El. 6,000 ft) to the high-water pool of Milton Diversion Impoundment (El. 5,690 ft). The channel gradient is 3.9 percent (Technical Memorandum 3-2). The watershed above Jackson Meadows Dam is approximately 37 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 113 cfs. While the existing minimum streamflow requirement in this reach is 5 cfs (FLA, April 2011), this reach is heavily used for conveyance and routinely experiences high aseasonal flows.

Figure JM-1 shows regulated releases for the Middle Yuba River below Jackson Meadows Reservoir Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra.

Figure JM-1. Rainbow trout lifestage periodicity and the regulated and unregulated hydrographs for the Middle Yuba River below Jackson Meadows Reservoir Dam.



Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a quantitative (Level II) representative fish population survey in this reach according to standard fish population sampling protocols. This included both electrofishing and snorkeling.

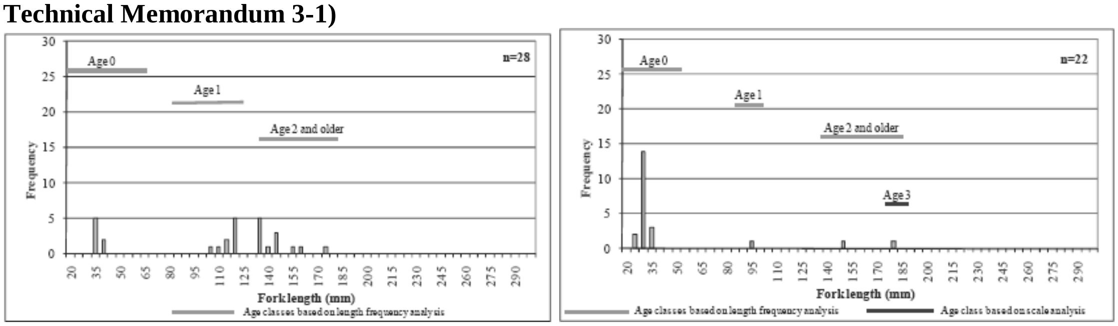
The site was located at RM 46.4, which is 0.7 miles downstream of Jackson Meadows Reservoir Dam and 1.1 miles upstream of Milton Reservoir, at an elevation of 5,750 ft. Rainbow trout, brown trout and Lahontan redside (a native species) are present in this reach.

Electrofishing survey estimates of rainbow trout per mile in 2008 and 2009 were 786 and 702 respectively, rainbow trout biomass was 9.5 and 1.8 lbs/acre, and the Fulton's condition factor averaged 1.17 and 0.76.• While all age classes of rainbow trout were present in low numbers,

• The Resource Agencies do not agree that condition factors necessarily accurately represent the condition of salmonid individuals. For instance, Fulton-type condition factor values change depending on measurement units (Anderson, R. O., and S.J. Gutreuter. 1983. Page 296. Length, Weight, and Associated Structural Indices. *in* Neilsen, L. A., and D.L. Johnson, editors. *Fisheries Techniques*. The American Fisheries Society, Bethesda, MD.)

the population did not exhibit a typical age class distribution in either year, as can be seen in the figures below. A single Lahontan redside was captured in 2009. A 258.5 foot pool was also snorkeled in 2008 and 2009. The estimated section abundance of rainbow trout was 27 and 23 fish respectively, while the estimated section abundance of Lahontan redsides was 0 and 20 fish.

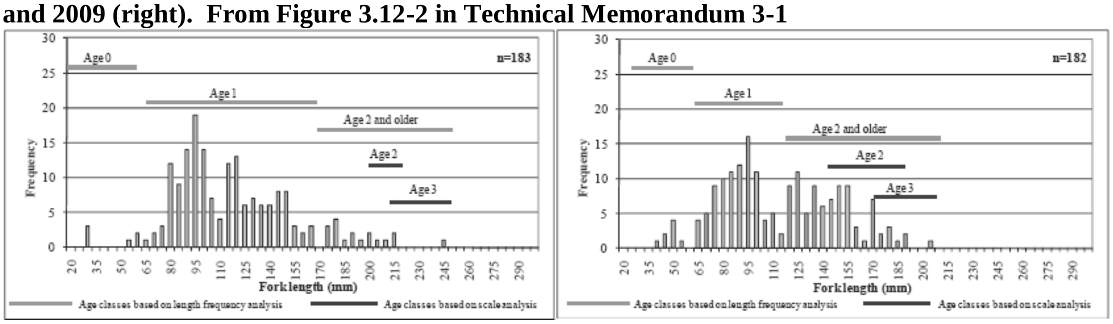
Rainbow trout length-frequency distribution and ages from 2008 (left) and 2009 (right) from Figures 3.1-2 in Technical Memorandum 3-1)



Reference Reach Information

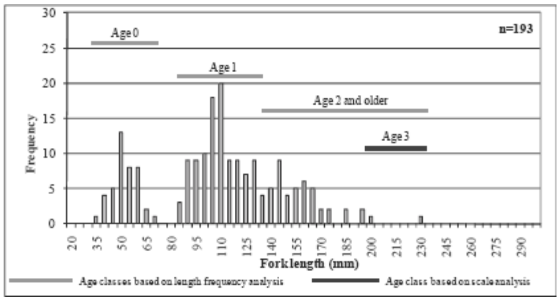
Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

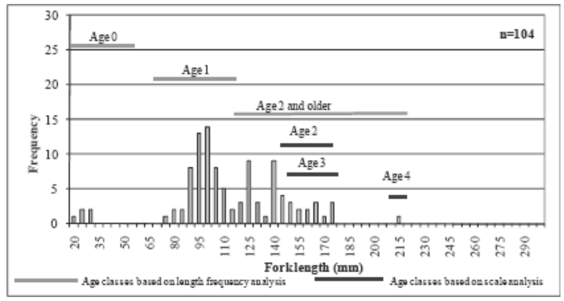
Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.

A Fulton's Condition Factor of 1.0 to 1.2 more likely represents a salmonid in poor to fair condition, and a factor below 1.0 represents a fish in extremely poor condition (Barnham, C., Baxter, A., 1998. Fisheries Notes: Condition Factor, K, for Salmonid Fish. State of Victoria, Department of Primary Industries)





Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

No benthic macroinvertebrate studies were conducted in this reach.

<u>Discussion of Foothill Yellow-legged Frog Surveys</u>

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

<u>Discussion of Western Pond Turtle Studies</u>

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

<u>Determination of Fish Condition</u>

Rainbow trout population and biomass estimates in the Middle Yuba River below Jackson Meadows Reservoir Dam were substantially lower than the North Yuba unimpaired reference reaches. In addition, the biomass estimates were substantially lower than an average North Sierra stream of this width (see Gerstung 1973). Further, the sampled rainbow trout population did not exhibit a robust age class structure likely due to the small numbers of fish caught. This does not indicate a viable population in terms of spatial structure, abundance or productivity.

Therefore the Resource Agencies do not consider the fish in the Middle Yuba River below Jackson Meadows Reservoir Dam to be in good condition.

Discussion of Relevant Instream Flow Related Studies

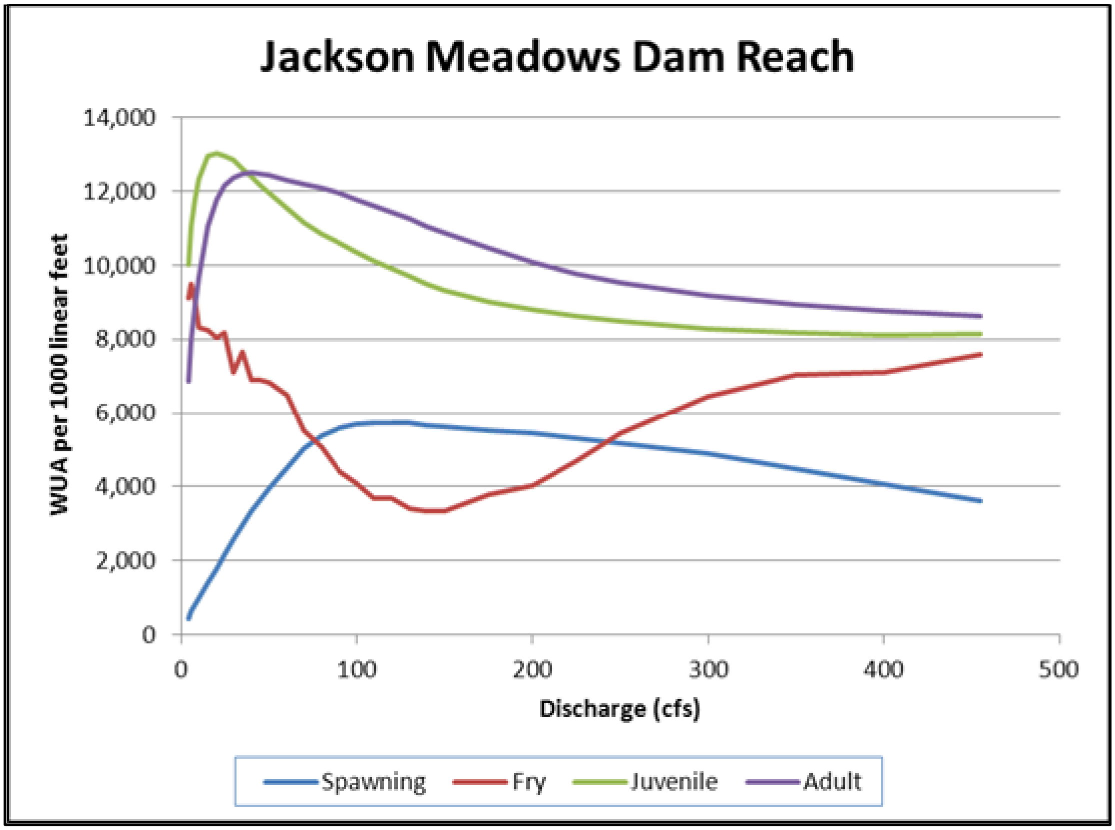
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are discussed below:

Mean unimpaired flows for the Middle Yuba River below Jackson Meadows Reservoir Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table JM-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table JM-1. Synthesized mean unimpaired flows for the Middle Yuba River below the Jackson Meadows Reservoir Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	12	10	10	10	22	47	143	147	30	6	4	5
Dry	11	17	18	22	35	78	211	229	64	13	6	6
Below Normal	3	12	29	40	48	104	264	392	110	15	5	3
Above Normal	10	52	65	107	82	156	268	548	280	44	10	8
Wet	15	79	203	167	230	220	288	587	433	111	15	11

Licensee conducted a PHABSIM-type instream flow study in the reaches between Jackson Meadows Reservoir Dam and the Milton Diversion Impoundment. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the two reaches:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table JM-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in the Middle Yuba River below Jackson Meadows Dam

	80% Max WUA	100% Max WUA
Adult	11 cfs	35 to 40 cfs
Spawning	61 cfs	120 cfs
Juvenile	5 cfs	20 cfs

The PHABSIM results indicate that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition (see above), the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table JM-2. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure JM-1, and determined minimum flows ranging from 11 cfs in CD water years to 40 cfs in Wet water years provide sufficient water during the months of August through February in accordance with SWE-1 and the rearing component of SWE-3.

Similarly, Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph (Table JM-1) to determine minimum flows ranging from 61 cfs in CD water years to 120 cfs in Wet water years during May provide sufficient water for spawning in accordance with SWE-3.

Flows were increased during March and April and decreased during June and July to attempt to recreate a more natural hydrograph in accordance with SWE 2.

Recommended minimum flows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

Table JM-3 presents the Resource Agencies' determination of flows that Licensee should release from Jackson Meadows Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table JM-3. Resource Agency initial minimum flow recommendations in the Middle Yuba River below Jackson Meadows Reservoir Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Critically Dry	11	11	11	11	11	15	30	70	30	11	11
Dry	13	13	13	13	13	20	35	80	35	20	13
Below Normal	15	15	15	15	15	25	50	90	50	25	15
Above Normal	25	25	25	25	25	35	60	110	75	35	25
Wet	40	40	40	40	40	60	100	120	100	60	40

<u>Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests</u>

Once the minimum streamflows were evaluated using the HEC-ResSim model, minor adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply; however, the Licensee said they could "live with" the streamflows given that this is a delivery reach. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	11	11	13	15	20	35
Nov	Adult	11	11	13	15	20	35
Dec	Adult	11	11	13	15	20	35
Jan	Adult	11	11	13	15	20	35
Feb	Adult	11	11	13	15	25	40
Mar	Adult	11	11	16	25	35	60
Apr	Spawn	30	30	30	50	60	100
May	Spawn	60	60	75	90	110	120
Jun	Spawn	21	21	30	50	75	100
Jul	Adult	11	11	16	25	35	60
Aug	Adult	11	11	13	15	25	40
Sep	Adult	11	11	13	15	20	35

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	80%	80%	83%	88%	94%	100%
Nov	Adult	80%	80%	83%	88%	94%	100%
Dec	Adult	80%	80%	83%	88%	94%	100%
Jan	Adult	80%	80%	83%	88%	94%	100%
Feb	Adult	80%	80%	83%	88%	97%	100%
Mar	Adult	80%	80%	90%	97%	100%	79%
Apr	Spawn	45%	45%	45%	69%	79%	99%
May	Spawn	79%	79%	91%	97%	100%	100%
Jun	Spawn	33%	33%	45%	69%	91%	99%
Jul	Adult	80%	80%	90%	97%	100%	79%
Aug	Adult	80%	80%	83%	88%	97%	100%
Sep	Adult	80%	80%	83%	88%	94%	100%

Conclusion

As mentioned above, this is a conveyance reach. Therefore flows are often higher than the minimum flows. Having these minimum flows in this reach will help buffer the effects of abrupt drops in flow, and reduce the potential for stranding in this reach. Monitoring of rainbow trout and benthic macroinvertebrate populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species and habitat quality.

Middle Yuba River Below Milton Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

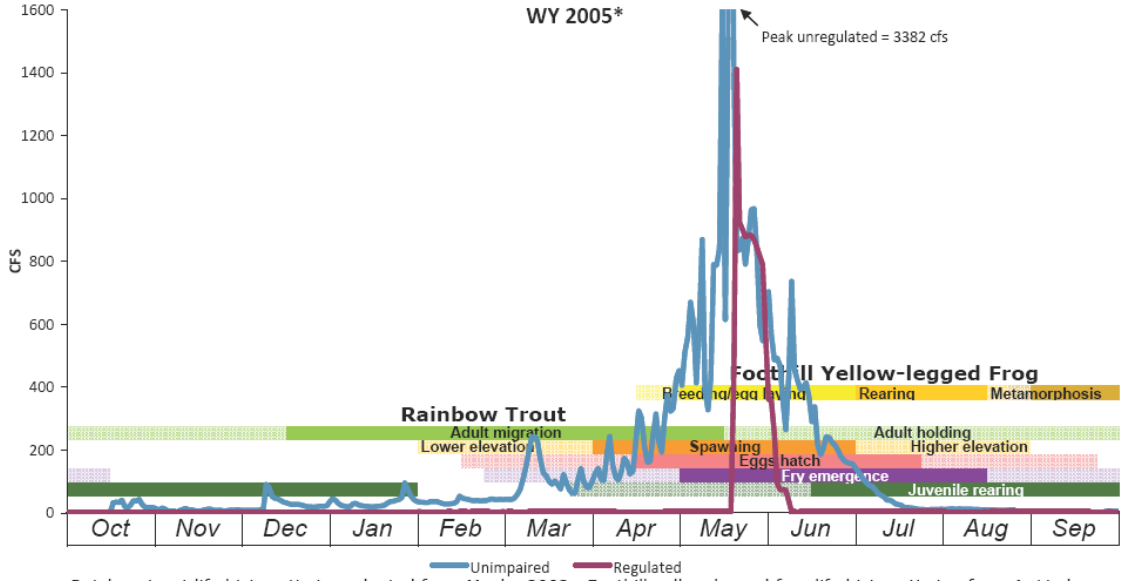
The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frogs and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Middle Yuba River below Milton Diversion Dam Reach is 32 mi long and extends from the outlet at Milton Diversion Dam (El. 5,690 ft.) to Yuba County Water Agency's Our House Dam (El. 4,720 ft.). The average channel gradient is 2.8 percent (Technical Memorandum 3-2). The watershed above Milton Diversion Dam is approximately 39.77 square miles, it is a snowmelt driven system, and has a mean annual unimpaired flow of 121cfs.

The existing minimum streamflow requirement in this reach is 3 cfs. Figure MY-1 shows regulated releases below Milton Diversion Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra Nevada.

Figure MY-1. Rainbow trout and yellow-legged frog lifestage periodicity and the regulated and unregulated hydrographs for the Middle Yuba River below Milton Diversion Dam.



Rainbow trout life history timing adapted from Moyle, 2002. Foothill yellow-legged frog life history timing from A. Lind

*Hydrology data from the Middle Yuba River below Milton Diversion Dam

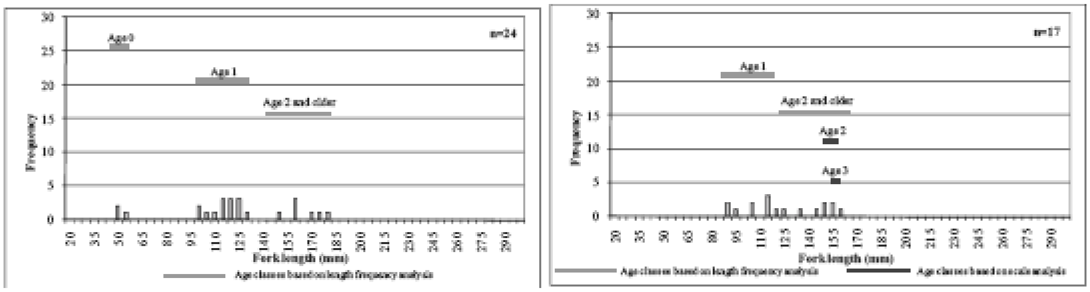
Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed Level II fish population surveys at an Upper, Middle and Lower section in this reach; electrofishing and snorkeling according to standard fish population sampling protocols. Due to site depth, the Lower site was only snorkeled.

The Upper reach site at river mile 43.6 was located 1.4 miles downstream of Milton Diversion Dam at an elevation of 5,550 ft. and was sampled on August 4, 2008 and July 13, 2009. Rainbow trout and brown trout are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 1364 and 632 in 2008 and 2009 respectively, rainbow trout biomass was 45.2 and 17.8 lbs/acre, and the Fulton's condition factor averaged 1.22 and 0.76. While multiple age classes of rainbow trout were present in small numbers in 2008, the age 0 class was missing in 2009, possibly due to the high elevation and early sampling date. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year. This is in part due to the low numbers of fish captured.

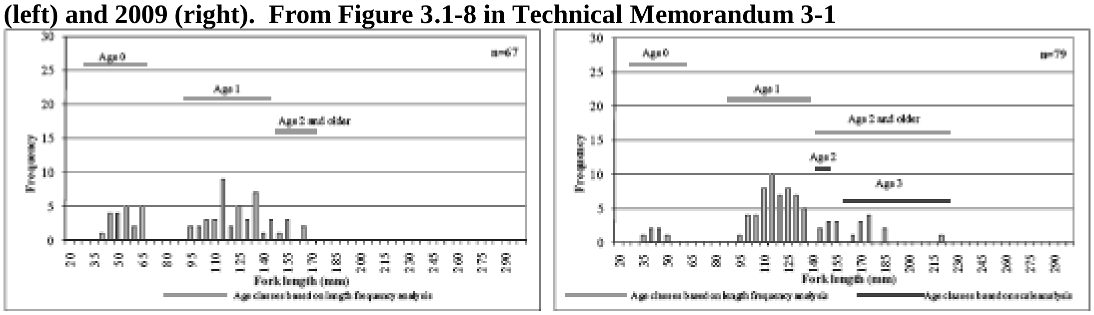
Rainbow trout length-frequency distribution and ages for the Middle Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.1-5 in Technical Memorandum 3-1



A 39.5 foot long deep pool was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 24 and 5 fish respectively.

The Middle reach at RM 26.6 was located 18.4 miles downstream of Milton Diversion Dam at an elevation of 3,000 ft and was sampled on August 5, 2008 and July 14, 2009. Rainbow trout and Sacramento sucker (a native species) are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 3,341 and 3,919 in 2008 and 2009 respectively, rainbow trout biomass was 26.9 and 41.2 lbs/acre, and the Fulton's condition factor averaged 1.23 and 1.08. Electrofishing estimates of Sacramento sucker per mile were 248 and 3,383 for 2008 and 2009. As can be seen in the figures below, multiple age classes of rainbow trout were present in both years and the population exhibited a more typical age class distribution than the Upper site.

Rainbow trout length-frequency distribution and ages for the Middle Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.1-8 in Technical Memorandum 3-1



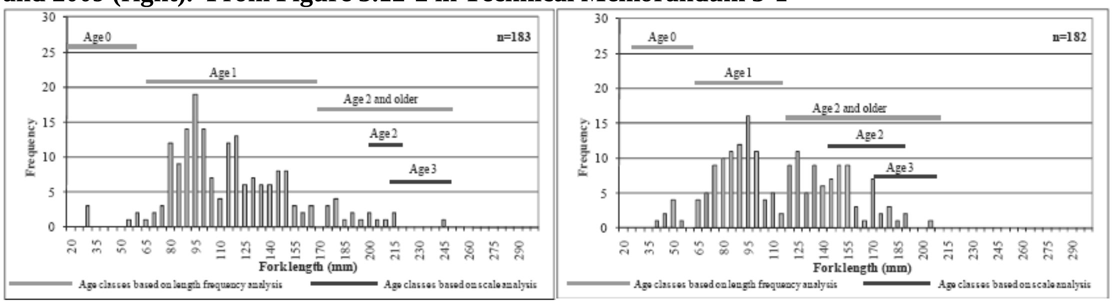
A 120.4 foot long deep pool was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 28 and 63 fish respectively, while the estimated section abundance of Sacramento sucker was 4 and 146.

The Lower reach at RM 13.6 was located 31.4 miles downstream of Milton Diversion Dam at an elevation of 2,000 ft, and was sampled on August 22, 2008 and July 23, 2009. Rainbow trout, Sacramento sucker and Sacramento pikeminnow (all native species) are present in this reach. The estimated site abundance of rainbow trout was 33 and 24 fish in 2008 and 2009 respectively, Sacramento sucker was 28 and 166, and Sacramento pikeminnow was 6 and 0.

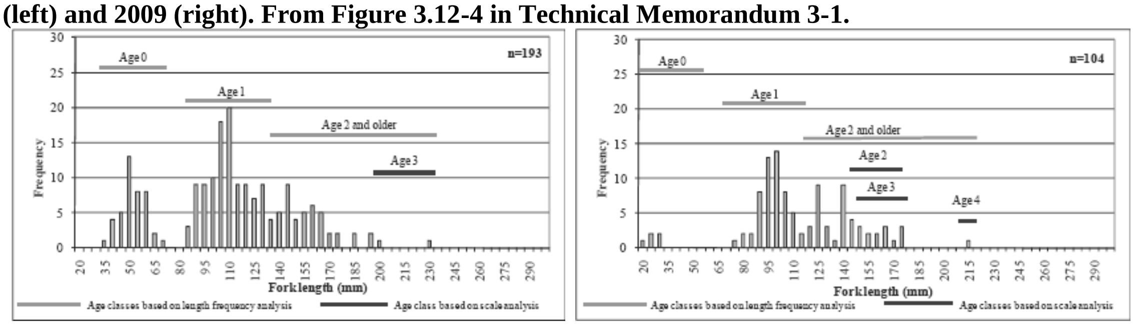
<u>Reference Reach Information</u>

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5,350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

Discussion of Foothill Yellow-legged Frog Studies

Four mainstem Middle Yuba River sites and three tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 (see table, Nevada Irrigation District and Pacific Gas and Electric Company 2010a). All life stages (egg masses, tadpoles, juveniles, and adults) were found in the reach with post-metamorphic lifestages (young of the year, juveniles, and adults) also found in the tributary surveys. Incidental sightings of all lifestages were also made throughout the Middle Yuba River, both within and outside of the Study 3-6 survey site boundaries in 2008 and 2009. The numbers of egg masses found during surveys were the second highest documented in the project area, averaging 13 per km with the highest numbers of egg masses at sites in the area of Wolf Creek and Kanaka Creek (18 and 30 miles downstream of Milton Reservoir Dam, respectively). While relatively high, this number is less than half of the densities typically seen in unregulated rivers (Kupferberg et al. 2012). Based on this information and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists and foothill yellow-legged frogs occur at moderate abundance, throughout the reach.

FYLF detections from survey sites in Middle Yuba River below Milton Dam in 2008; Table 3.4-2 from Technical Memorandum 3-6.

Reach/Site	Survey 1				Survey 2				Survey 3			
	Egg Mass[1]	Tadpole[1]	Juvenile	Adult	Tadpole[1]	Young[2]	Juvenile	Adult	Tadpole[1]	Young[2]	Juvenile	Adult
MY-2 Main	June 9, 2008				June 24, 2008				August 27, 2008			
	18 (G 17–22)	0	37	43	777 (G 24–28)	0	25	25	438 (G 39–45)	397	7	32
MY-4A Main	June 24, 2008				July 14 and 22, 2008				September 3, 2008			
	11 (G 24)	365 (G 24–25)	24	9	7/14: 3,187 (G 25–38) 7/22: 480 (G 35–40)	0	7/14: 11 7/22: 19	7/14: 9 7/22: 12	130 (G 41–44)	2,144	15	30
Tributary	0	0	9	11	0	0	4	3	0	148	15	8
MY-5 Main	June 19, 2008				July 8, 2008				September 5, 2008			
	23 (G 18–22)	80 (G 23–25)	2	3	140 (G 29–34)	0	1	0	138 (G 30–34)	197	1	9
Tributary	0	0	5	9	0	0	3	5	0	48	3	1
MY-6 Main	July 7, 2008				July 16, 2008				September 4, 2008			
	0	0	1	1	0	0	0	2	2 (G 35–36)	0	0	6
Tributary	0	0	2	0	0	0	1	1	0	0	0	0

1 "G" is developmental stage as described in Gosner (1960).
2 "Young" is young-of-year.

Discussion of Western Pond Turtle Studies

Basking site surveys were conducted at six sites on the Middle Yuba River (Study and Technical Memorandum 3-14; Nevada Irrigation District and Pacific Gas and Electric Company 2010c) in 2010. Only one adult western pond turtle was found during these surveys. This turtle was at a site approximately 29 miles downstream of Milton Reservoir Dam. No other incidental sightings were made of turtles in this reach. Conclusions about the status of this population cannot be made without quantitative surveys and documentation of age distribution.

Discussion of Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP). Samples were co-located with the Stream Fish Population sampling sites and sampled on the same dates in July of 2009. Technical Memorandum 3-10 states:

> BMI samples were taken at three [Middle Yuba River below Milton Diversion Dam] Reach sites. IBI scores varied with location: 26 at the upper reach site; 84 at the middle reach site; and 56 at the lower reach site. MMI scores followed a similar pattern, with the lowest value (48) at the upper reach site, the highest value (88) at the middle reach site, and a mid-value (68) at the lower reach site.

The dominant substrates at each site were: Upper - rough bedrock, Middle - fine gravel, and Lower - coarse gravel. The ecozone classification for the Upper and Middle sites was montane, while the Lower was classified as foothill.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Determination of Aquatic Biota Condition

Benthic Macroinvertebrates

The benthic macroinvertebrate IBI and MMI in the Lower site were slightly above the mean and median of all project affected sites, and the scores in the Middle site were the highest of all sites – including the reference reaches. However, the IBI and MMI scores in the Upper site were well below the mean and median for all project affected sites. In addition, the scores for the Upper site were well below those for the non-project affected reference reaches in the North Yuba River. These scores indicate that while the habitat quality in the lower site is about average for the project, and the habitat in the middle site is well above average, the habitat quality is low in the Upper site.

Foothill Yellow-Legged Frogs

Although the numbers of egg masses found during surveys were the second highest documented in the project area, as noted above, these numbers are less than half of the densities typically seen in unregulated rivers. Note in Figure MY-1 that regulated flows in this reach can drop abruptly during key breeding/egg laying periods for FYLF. While these fluctuations are likely moderated somewhat by accretion from tributary streams, this flow regime potentially desiccates egg masses and strands tadpoles.

Fish

Licensee's project generally diverts ~85 percent of the runoff in the Middle Yuba River above Milton Diversion Dam. This has an effect on biota throughout the river. Several large tributaries partially moderate the effects further down the river, and near the Wolf Creek confluence area (~RM 26), the benthic macroinvertebrate, frog, and rainbow trout populations were the best out of all the project affected reaches. Rainbow trout populations and biomass in the Middle reach site were still well below those in the unimpaired reference reaches, although the biomass was above the average North Sierra stream of this width (see Gerstung 1973). The Lower (snorkel only) site had a community of native species that included multiple age classes, although no pikeminnow were observed in 2009, indicating that the community may not be persistent in species membership through time.

However, the Upper site (~RM 43.6) suffers the most direct project effects. Rainbow trout population and biomass estimates were substantially lower than the North Yuba unimpaired reference reaches, including Lavezzola Creek. In 2008 biomass estimate was higher but the 2009 estimate was much lower than the average North Sierra stream of this width (see Gerstung 1973). Additionally, 2008, biomass estimates were comparable to those of Lavezzola Creek, but were much lower in 2009. It should be noted that the 2008 estimates unfortunately had a wide 95 percent confidence interval due to poor capture efficiencies. Multiple age classes were caught in this reach, which indicates that there is at least some breeding, but there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of diversity, spatial structure, abundance or productivity. Note in Figure MY-1 (above) that regulated flows in this reach are truncated compared to the natural hydrograph and drop abruptly during key spawning, egg hatching/fry emergence, and rearing periods for rainbow trout. This likely desiccates redds and strands fry and juvenile fish.

Determination

Taking the above benthic macroinvertebrate, foothill yellow-legged frog, and rainbow trout information into account, the Resource Agencies do not consider the aquatic biota in the Middle Yuba River below Milton Diversion Dam to be in good condition.

<u>Discussion of Relevant Instream Flow Related Studies</u>

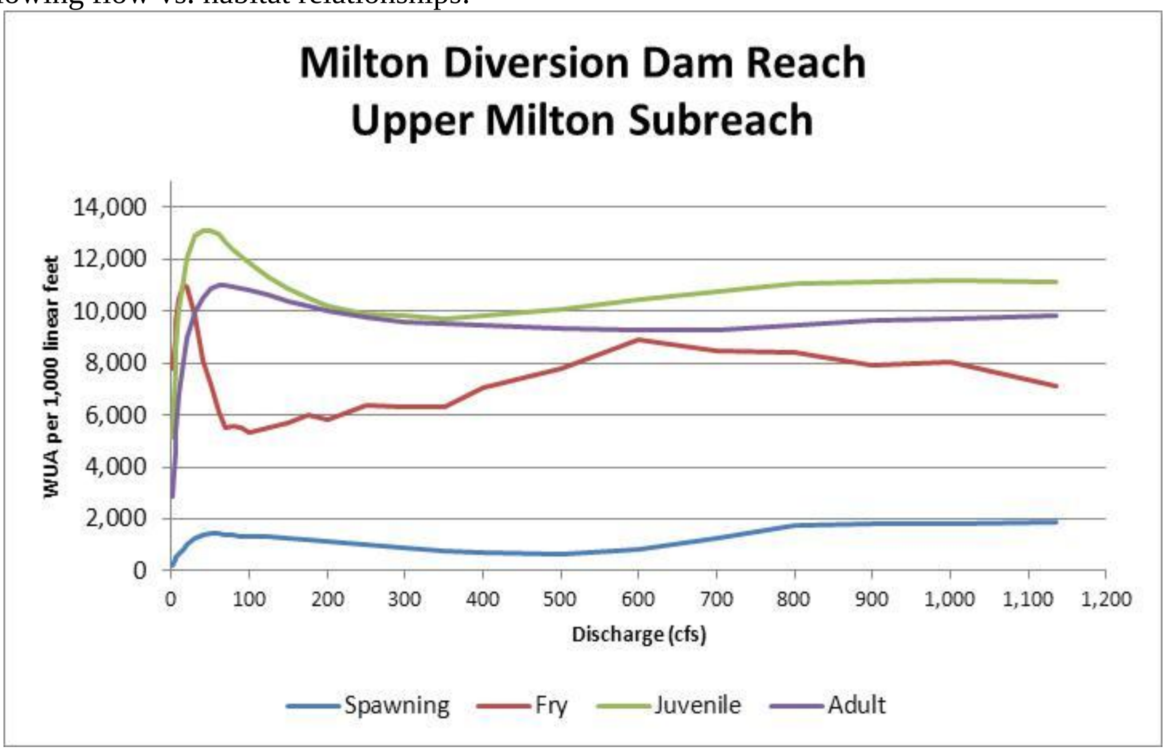
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) an SSTEMP-based water temperature modeling study. These studies are described below:

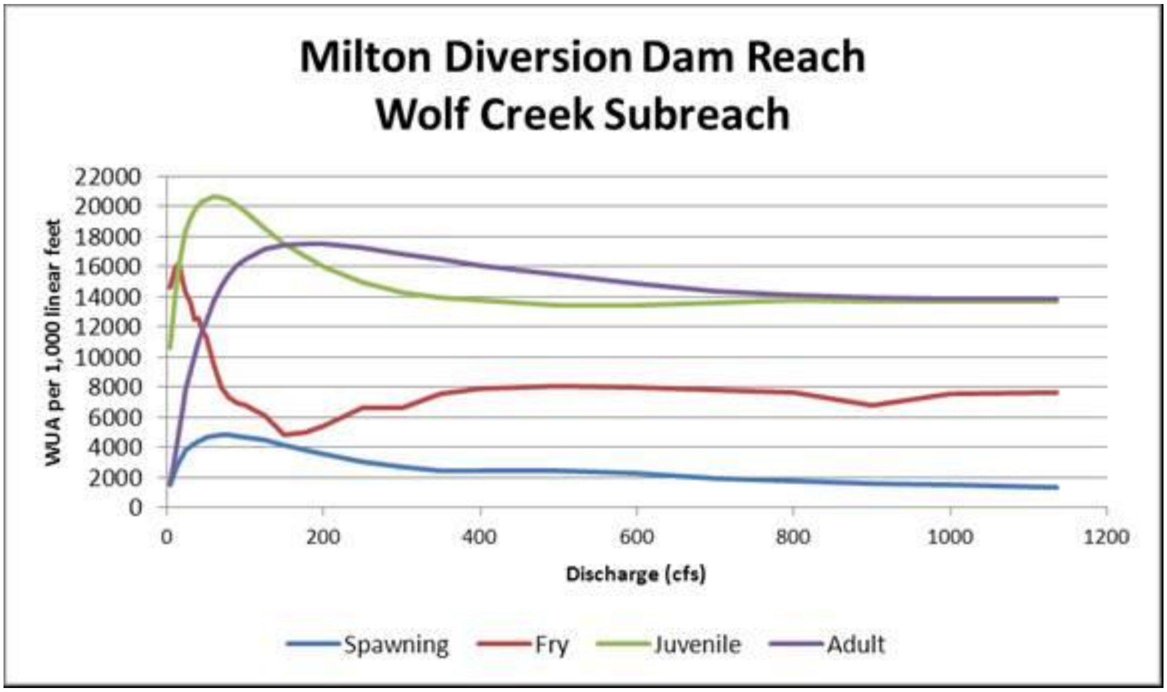
Mean unimpaired flows for the Middle Yuba River below Milton Diversion Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

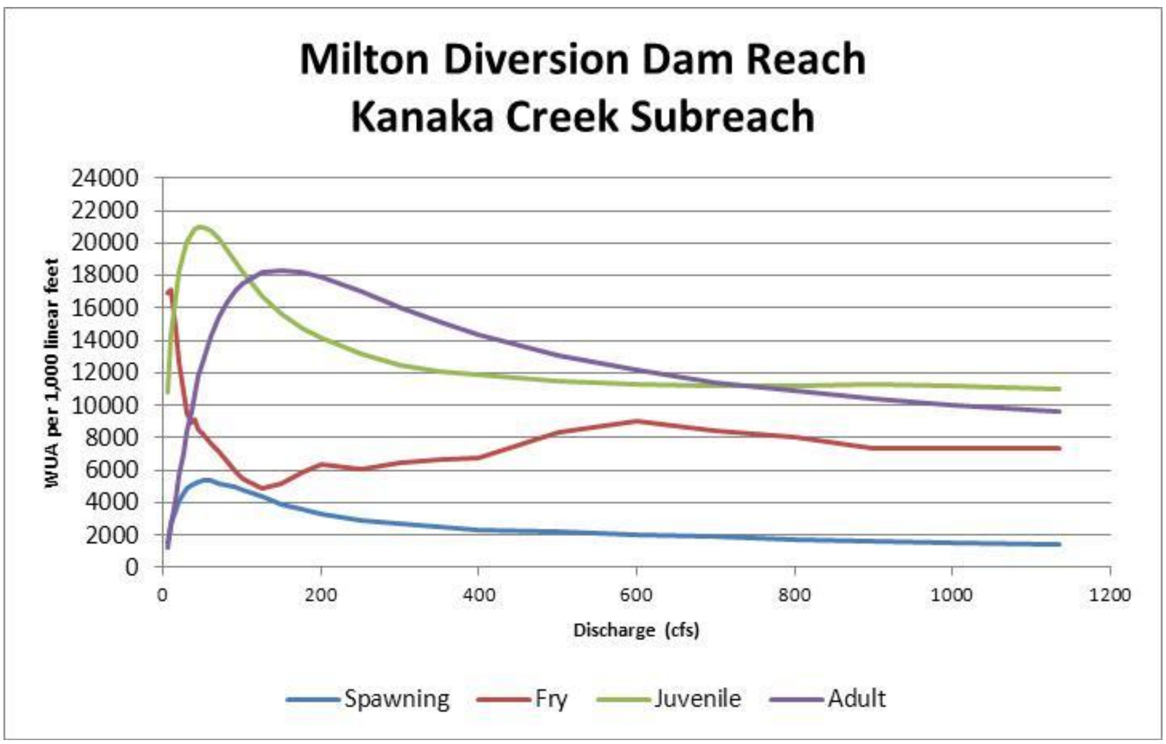
Table MY-1. Synthesized mean unimpaired flows for the Middle Yuba River below Milton Diversion Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	13	11	11	11	24	51	153	156	31	6	4	6
Dry	12	18	20	24	39	85	226	244	67	13	7	6
Below Normal	3	13	32	44	52	112	283	416	116	16	5	3
Above Normal	11	57	71	117	90	170	288	583	294	45	10	9
Wet	17	86	220	182	251	239	309	625	457	116	15	11

With Resource Agency staff participation (e.g. transect selection, habitat suitability criteria development, hydraulic model calibration), Licensee divided this reach into three sub-reaches and conducted a PHABSIM instream flow study in each sub-reach. The studies generated the following flow vs. habitat relationships:







Licensee has more "control" over flows in the Upper section of the reach, and therefore this is the section that Licensee minimum flows and other releases/spills directly affects, so the most pertinent results of the PHABSIM study are presented in the table below. This includes flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table MY-2. Eighty percent and 100 percent of the Maximum WUA in the Upper Milton Subreach for rainbow trout in the Middle Yuba River below Milton Diversion Dam

	80% Max WUA	100% Max WUA
Upper Milton Subreach		
Adult	19 cfs	60 to 70 cfs
Spawning	26 cfs	50 cfs
Juvenile	12 cfs	40 to 50 cfs

Determination of Minimum Streamflows

Because aquatic biota in this reach were determined not to be in good condition (see above), the Resource Agencies evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table MY-2 above. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure MY-1, and determined minimum flows ranging from 19 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 70 cfs, which represents 100 percent of the maximum WUA, in wet water years provide sufficient water during the months of June through February to address SWE-1 and the rearing component of SWE-3.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph (Table MY-2) to determine minimum flows ranging from 26 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 50 cfs, which represents 100 percent of the maximum WUA, in Wet water years during May provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during March and April from the adult RBT values to the RBT spawning values. Similarly, during June and July, flows were stepped back down from the RBT spawning values to the adult RBT values.

Recommended minimum flows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

The Resource Agencies then took into account the synthesized mean unimpaired flows, water temperatures that may adversely affect frogs lower down in the drainage, the fact that the Upper site is bedrock dominated, and the assumption that there would be a seasonal fish screen installed on the Milton Diversion (See Mitigation for Entrainment Measure), and reduced the flows accordingly.

Table MY-3 presents the Resource Agencies determination of flows that Licensee should release from Milton Diversion Dam to enhance the condition of the fishery and ensure adequate protection of aquatic biota (e.g. foothill yellow-legged frogs).

Table MY-3. Resource Agency initial mimimum flow recommendations in the Middle Yuba River below Milton Diversion Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	6	6	6	6	6	10	15	20	15	6	6	6
Dry	6	6	6	6	6	15	20	25	20	10	6	6
Below Normal	10	10	10	10	10	20	35	50	35	15	6	6
Above Normal	15	15	15	15	15	30	50	70	50	20	15	6
Wet	15	15	15	15	15	35	60	70	60	30	15	6

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	4	6	6	10	10	15
Nov	Adult	4	6	6	10	10	10 / 15*
Dec	Adult	4	6	6	10	10	10 / 15*
Jan	Adult	4	6	6	10	10	10 / 15*
Feb	Adult	4	6	6	10	15	15
Mar	Adult	4	6	6	20	25	30
Apr	Spawn	6	10	15	30	35	40
May	Spawn	6	20	30	50	60	70
Jun	Spawn	6	15	20	30	35	40
Jul	Adult	4	6	10	15	20	20
Aug	Adult	4	6	6	10	15	15
Sep	Adult	4	6	6	10	15	15

*See Measure No. 2/Condition No. 30 - Overwintering Minimum Streamflow Adjustments

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	39%	48%	48%	62%	62%	74%
Nov	Adult	39%	48%	48%	62%	62%	62%/74%

Dec	Adult	39%	48%	48%	62%	62%	62%/74%
Jan	Adult	39%	48%	48%	62%	62%	62%/74%
Feb	Adult	39%	48%	48%	62%	74%	74%
Mar	Adult	39%	48%	48%	82%	86%	91%
Apr	Spawn	35%	46%	58%	87%	92%	97%
May	Spawn	35%	69%	87%	100%	100%	98%
Jun	Spawn	35%	58%	69%	87%	92%	97%
Jul	Adult	39%	48%	62%	74%	82%	82%
Aug	Adult	39%	48%	48%	62%	74%	74%
Sep	Adult	39%	48%	48%	62%	74%	74%

While the resulting rainbow trout WUA for these negotiated minimum flows does not meet the optimal criteria described above (in 'Determination of Minimum Streamflows"), other measures for this reach are expected to improve habitat conditions for rainbow trout, other native fish, foothill yellow-legged frogs, and western pond turtles. The Middle Yuba River below Milton Diversion Dam spill cessation measure (see Measure No. 2/Condition No. 30 - Spill Cessation Measures) should reduce abrupt flow drops during critical breeding and rearing months for both rainbow trout and yellow-legged frogs. Increasing large woody debris in the reach (Measure No. 27/Condition No. 37 – Large Woody Debris) could help create additional habitat complexity. Monitoring of rainbow trout and foothill yellow-legged frog populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Canyon Creek Below French Lake Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve aquatic biota in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Canyon Creek below French Lake Reservoir Dam reach is 1.4 mi long and extends from the outlet at French Lake Dam (El. 6,560 ft) to Faucherie Lake (El. 6,360 ft). Channel gradient is 4.9 percent in the upper reach and 7.9 percent in the lower portion of the reach (Technical Memorandum 3-2). The watershed above French Lake Reservoir Dam is approximately 4.82 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 20.9 cfs. The existing year round minimum streamflow requirement in this reach is 2.5 cfs.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population surveys in this reach. Licensees sampled 67 potential fish habitat spots (accessed at RM 15.9) along a 582-ft section of stream starting approximately 0.9 mi downstream of French Lake Dam on October 23, 2008. Eleven rainbow trout of several age classes were caught.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

Although there were likely several age classes of rainbow trout present, only eleven fish were caught in a 582 ft section. This does indicate some breeding, but does not indicate a viable population in this reach. Therefore the Resource Agencies do not consider the fish in Canyon Creek below French Dam to be in good condition.

Discussion of Relevant Instream Flow Related Studies

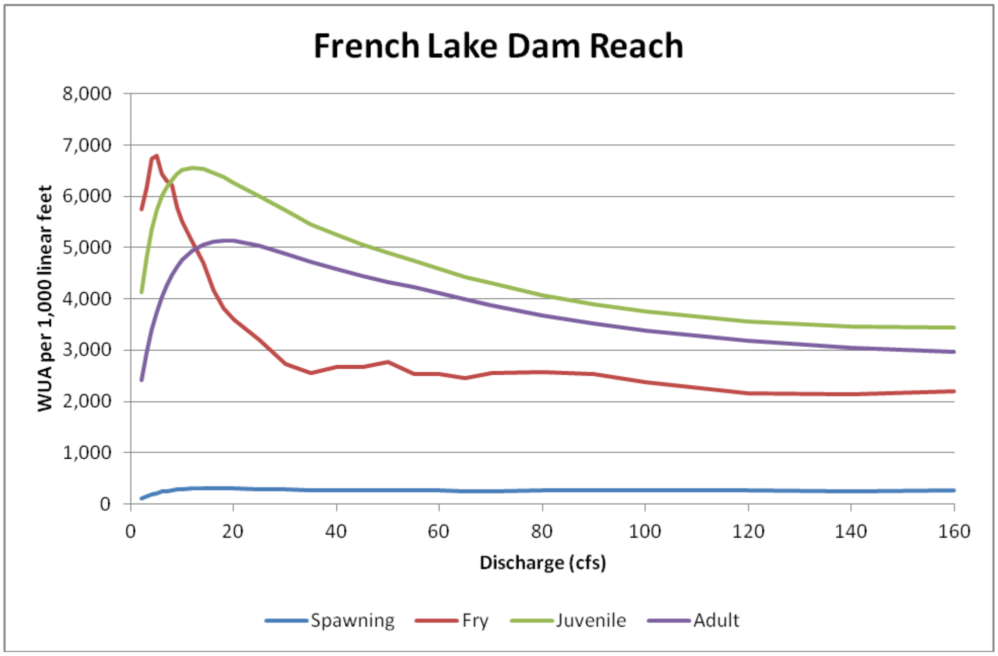
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are discussed below:

Mean unimpaired flows for Canyon Creek below French Lake Reservoir Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table CCFR-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table CCFR-1. Synthesized mean unimpaired flows for Canyon Creek below the French Lake Reservoir Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.3	2.1	5.0	2.7	6.0	12.0	30.7	24.4	5.1	0.7	0.7	0.7
Dry	0.5	1.4	3.4	3.5	6.7	20.7	46.7	46.2	10.2	0.9	0.3	0.3
Below Normal	1.0	13.9	30.4	10.0	11.5	25.4	47.8	84.4	31.6	2.1	0.3	0.3
Above Normal	1.8	5.3	11.6	13.2	18.6	32.6	55.0	107.8	54.1	9.6	0.6	0.6
Wet	4.2	10.3	11.7	31.2	30.3	31.7	48.5	94.2	88.3	27.4	2.0	1.0

Licensee conducted a PHABSIM-type instream flow study in the reach between Faucherie Reservoir and French Lake Reservoir dam. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table CCFR-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Canyon Creek below French Lake Dam

	80% Max WUA	100% Max WUA
Adult	6.5 cfs	18 cfs
Spawning	6.5 cfs	14 cfs
Juvenile	3.5 cfs	12 cfs

The PHABSIM results indicate that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of sufficient water focuses on the following study information in an effort to ensure that minimum streamflows substantially improve the condition of the fishery:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table CCF-2. The Resource Agencies used this, and current flow requirements, and determined minimum flows ranging from 5 cfs in CD water years to 18 cfs in Wet water years provide sufficient water during the months of August through February in accordance with SWE-1 and the rearing component of SWE-3. Due to reservoir level concerns, Licensee concerns about winter access, and the fact that the PHABSIM results indicated similar flows for spawning and adult maintenance, the Resource Agencies did not develop spawning flows.

Recommended minimum flows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

Table CCFR-3 presents the Resource Agencies' determination of minimum flows that Licensee should release from French Lake Dam to enhance the condition of the fishery and to ensure adequate protection of aquatic biota.

Table CCFR-3. Resource Agency initial minimum flow recommendations in Canyon Creek below French Lake Reservoir Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	5	5	5	5	5	5	5	5	5	5	5	5
Dry	6	6	6	6	6	6	6	6	6	6	6	6
Below Normal	9	9	9	9	9	9	9	9	9	9	9	9
Above Normal	14	14	14	14	14	14	14	14	14	14	14	14
Wet	18	18	18	18	18	18	18	18	18	18	18	18

Adjustment of Minimum Flows

The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process. Flows during October through January were reduced to the BN levels in AN and Wet years in response to the uncertainty of the actual water year type and needs for carryover storage.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	5	5	6	9	9	9
Nov	Adult	5	5	6	9	9	9
Dec	Adult	5	5	6	9	9	9
Jan	Adult	5	5	6	9	9	9
Feb	Adult	5	5	6	9	14	18
Mar	Adult	5	5	6	9	14	18
Apr	Spawn	5	5	6	9	14	18
May	Spawn	5	5	6	9	14	18
Jun	Spawn	5	5	6	9	14	18
Jul	Adult	5	5	6	9	14	18
Aug	Adult	5	5	6	9	14	18
Sep	Adult	5	5	6	9	14	18

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	73%	73%	78%	90%	90%	90%
Nov	Adult	73%	73%	78%	90%	90%	90%
Dec	Adult	73%	73%	78%	90%	90%	90%
Jan	Adult	73%	73%	78%	90%	90%	90%
Feb	Adult	73%	73%	78%	90%	98%	100%
Mar	Adult	73%	73%	78%	90%	98%	100%
Apr	Spawn	70%	70%	80%	94%	100%	100%
May	Spawn	70%	70%	80%	94%	100%	100%
Jun	Spawn	70%	70%	80%	94%	100%	100%
Jul	Adult	73%	73%	78%	90%	98%	100%
Aug	Adult	73%	73%	78%	90%	98%	100%
Sep	Adult	73%	73%	78%	90%	98%	100%

Monitoring of rainbow trout and benthic macroinvertebrate populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species and habitat quality.

Canyon Creek Below Faucherie Lake Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Canyon Creek below Faucherie Lake Reservoir Dam reach is approximately 1.8 mi long and extends from Sawmill Lake to Faucherie Lake Dam. The reach has an average elevation of 5,998 ft and a channel gradient of 3.3 percent (Technical Memorandum 3-2). The watershed above Faucherie Lake Reservoir Dam is approximately 9.29 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 28.1 cfs. The existing year round minimum streamflow requirement in this reach is 2.5 cfs.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population surveys in this reach. Licensees sampled 45 potential fish habitat spots (accessed at RM 15.9) along a 670-ft section of stream starting approximately 0.5 mi downstream of Faucherie Lake Dam on October 23, 2008. Only two very small rainbow trout and two brown trout were caught. Sampling efficiencies may have been affected by high flows and low conductivity.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

Only two small fish were caught in a 670 ft section sampled. Therefore the Resource Agencies do not consider the fish in Canyon Creek below Faucherie Dam to be in good condition.

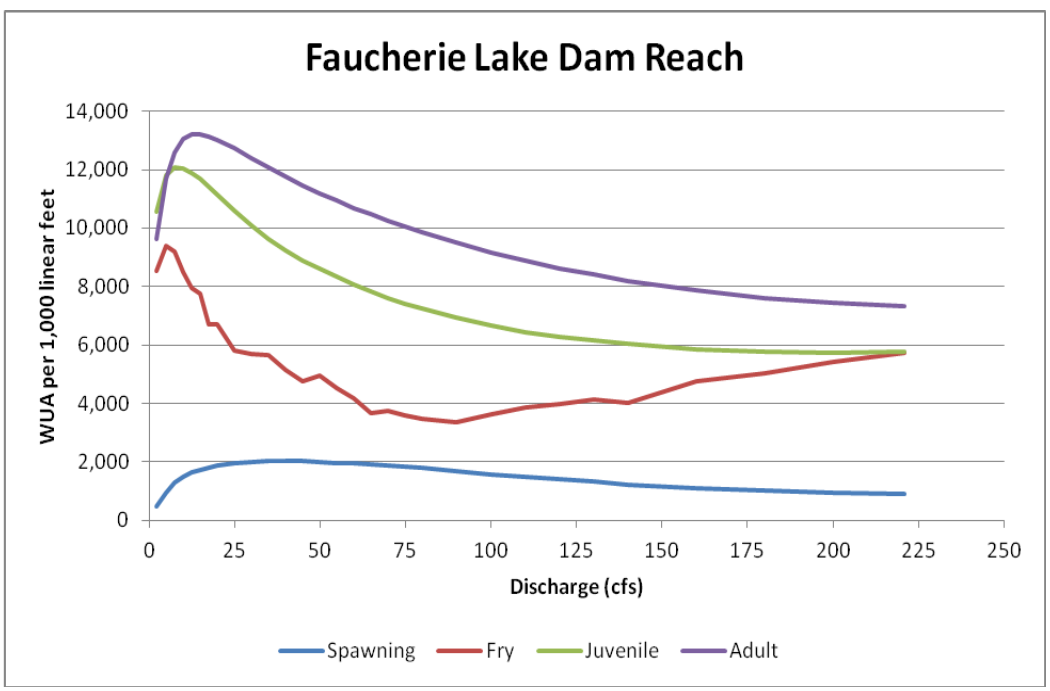
<u>Discussion of Relevant Instream Flow Related Studies</u>
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are discussed below:

Mean unimpaired flows for Canyon Creek below Faucherie Lake Reservoir Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table CCF-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table CCF-1. Synthesized mean unimpaired flows for Canyon Creek below the Faucherie Reservoir Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.6	4.1	9.9	5.4	11.6	23.5	59.5	45.9	9.3	1.2	1.4	1.3
Dry	1.0	2.8	6.7	6.9	13.1	40.5	90.7	87.2	18.9	1.6	0.5	0.5
Below Normal	2.0	27.5	60.0	19.7	22.7	50.0	93.4	159.8	58.5	3.7	0.6	0.6
Above Normal	3.4	10.3	22.7	26.1	36.9	64.8	108.6	204.6	99.2	17.0	1.2	1.2
Wet	8.1	20.3	23.3	61.7	59.9	62.9	95.1	179.4	164.2	49.2	3.7	2.0

Licensee conducted a PHABSIM-type instream flow study in the reach between Sawmill Reservoir and Faucherie Reservoir dam. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table CCF-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Canyon Creek below Faucherie Dam

	80% Max WUA	100% Max WUA
Adult	~3 cfs	15 cfs
Spawning	12 cfs	40 cfs
Juvenile	<2 cfs	7.5 cfs

The PHABSIM results indicate that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

<u>Determination of Minimum Streamflows</u>

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table CCF-2. The Resource Agencies used this, and current flow requirements, and determined minimum flows ranging from 3 cfs in CD water years to 15 cfs in Wet water years provide sufficient water during the months of August through February in accordance with SWE-1 and the rearing component of SWE-3. Due to Licensee concerns about winter access, the Resource Agencies did not develop spawning flows in this reach.

The Resource Agencies then took reservoir levels and water availability into consideration and recommended flows that are pass-through flows from the French Lake Dam reach.

Table CCF-3 presents the Resource Agencies' determination of flows that Licensee should release from Faucherie Lake Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table CCF-3. Resource Agency initial minimum flow recommendation in Canyon Creek below Faucherie Reservoir Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

Critically Dry	5	5	5	5	5	5	5	5	5	5	5	5
Dry	6	6	6	6	6	6	6	6	6	6	6	6
Below Normal	9	9	9	9	9	9	9	9	9	9	9	9
Above Normal	14	14	14	14	14	14	14	14	14	14	14	14
Wet	18	18	18	18	18	18	18	18	18	18	18	18

Adjustment of Minimum Streamflows

The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process. Flows during October through January were reduced to the BN levels in AN and Wet years in response to the uncertainty of the actual water year type and needs for carryover storage.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	5	5	6	9	9	9
Nov	Adult	5	5	6	9	9	9
Dec	Adult	5	5	6	9	9	9
Jan	Adult	5	5	6	9	9	9
Feb	Adult	5	5	6	9	14	18
Mar	Adult	5	5	6	9	14	18
Apr	Spawn	5	5	6	9	14	18
May	Spawn	5	5	6	9	14	18
Jun	Spawn	5	5	6	9	14	18
Jul	Adult	5	5	6	9	14	18
Aug	Adult	5	5	6	9	14	18
Sep	Adult	5	5	6	9	14	18

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	89%	89%	91%	88%	88%	88%
Nov	Adult	89%	89%	91%	88%	88%	88%
Dec	Adult	89%	89%	91%	88%	88%	88%
Jan	Adult	89%	89%	91%	88%	88%	88%
Feb	Adult	89%	89%	91%	88%	98%	99%
Mar	Adult	89%	89%	91%	88%	98%	99%
Apr	Spawn	47%	47%	54%	68%	84%	90%
May	Spawn	47%	47%	54%	68%	84%	90%
Jun	Spawn	47%	47%	54%	68%	84%	90%
Jul	Adult	89%	89%	91%	88%	98%	99%
Aug	Adult	89%	89%	91%	88%	98%	99%

Sep	Adult	89%	89%	91%	88%	98%	99%

Monitoring of rainbow trout and benthic macroinvertebrate populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species and habitat quality.

Canyon Creek Below Sawmill Lake Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Canyon Creek below Sawmill Lake Reservoir Dam reach is approximately 0.8 mi long and extends from Bowman Lake to Sawmill Lake Dam. The reach has an average elevation of 5,710 ft and a channel gradient of 6.9 percent (Technical Memorandum 3-2). The watershed above Sawmill Lake Reservoir Dam is approximately 17.0 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 52.8 cfs. The existing year round minimum streamflow requirement in this reach is 2.5 cfs.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population surveys in this reach. Licensees sampled 20 potential fish habitat spots (accessed at Bowman high water pool) along a 630-ft section of stream on October 23, 2008. Only four very small rainbow trout and four brown trout were caught. Two larger rainbow trout (~250 mm and ~350 mm) were observed in a deeper site that was snorkeled.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

Only four small rainbow trout were caught in a 630 ft section sampled. While the size may indicate the occurrence of breeding, these data do not indicate a viable population. Therefore the Resource Agencies do not consider the fish in Canyon Creek below Sawmill Dam to be in good condition.

Discussion of Relevant Instream Flow Related Studies

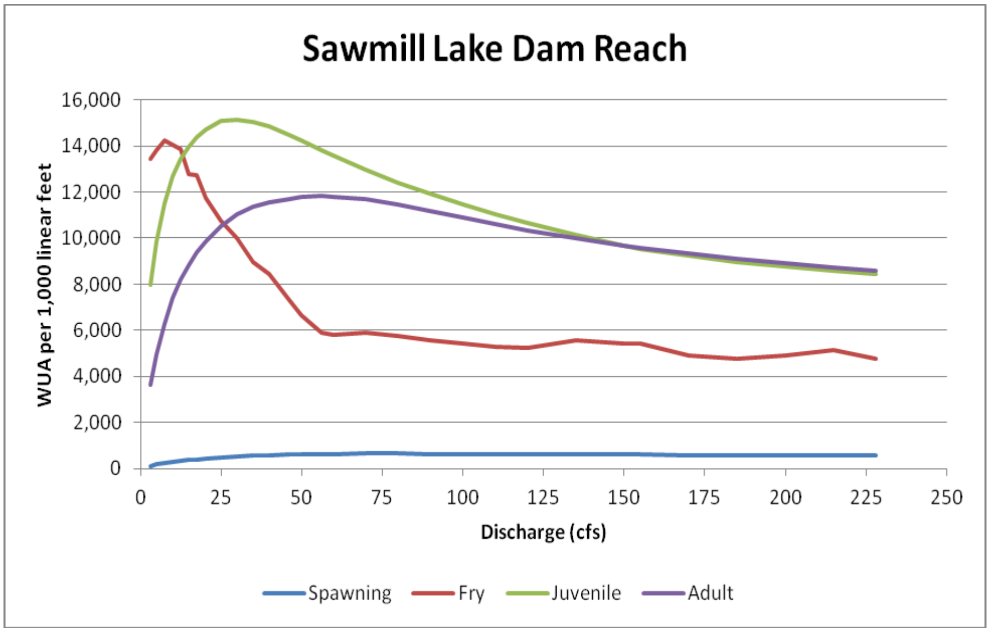
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are discussed below:

Mean unimpaired flows for Canyon Creek below Sawmill Lake Reservoir Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table CCF-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table CCS-1. Synthesized mean unimpaired flows for Canyon Creek below the Sawmill Reservoir Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.7	4.6	10.9	5.9	12.8	25.9	65.0	49.7	9.9	1.2	1.5	1.4
Dry	1.1	3.1	7.4	7.6	14.4	44.6	99.4	94.6	20.3	1.7	0.5	0.6
Below Normal	2.2	30.4	65.4	21.9	25.2	55.3	102.6	173.1	62.9	3.9	0.6	0.7
Above Normal	3.7	11.3	24.7	29.1	41.1	71.8	119.9	221.9	106.1	17.9	1.3	1.3
Wet	8.9	22.5	25.8	69.5	66.2	70.1	104.4	194.9	176.5	52.1	4.0	2.2

Licensee conducted a PHABSIM-type instream flow study in the reach between Bowman Reservoir and Sawmill Reservoir dam. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table CCS-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Canyon Creek below Sawmill Dam

	80% Max WUA	100% Max WUA
Adult	18 cfs	50 cfs
Spawning	27 cfs	70 cfs
Juvenile	8 cfs	30 cfs

The PHABSIM results indicate that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3).

Adult rainbow trout WUAs for this reach are presented in Table CCS-2. The Resource Agencies used this, and current flow requirements, and determined minimum flows ranging from 18 cfs in CD water years to 50 cfs in Wet water years provide sufficient water during the months of August through February in accordance with SWE-1 and the rearing component of SWE-3. Due to Licensee concerns about winter access, the Resource Agencies did not develop spawning flows in this reach.

The Resource Agencies then took reservoir levels and water availability into consideration and recommended flows that are pass-through flows from the French Lake Dam reach thence the Faucherie Lake Dam Reach.

Adjustment of Minimum Flows

The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process. There were no adjustments.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	5	5	6	9	14	18
Nov	Adult	5	5	6	9	14	18
Dec	Adult	5	5	6	9	14	18
Jan	Adult	5	5	6	9	14	18
Feb	Adult	5	5	6	9	14	18
Mar	Adult	5	5	6	9	14	18
Apr	Spawn	5	5	6	9	14	18
May	Spawn	5	5	6	9	14	18
Jun	Spawn	5	5	6	9	14	18
Jul	Adult	5	5	6	9	14	18
Aug	Adult	5	5	6	9	14	18
Sep	Adult	5	5	6	9	14	18

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	42%	42%	48%	60%	73%	80%
Nov	Adult	42%	42%	48%	60%	73%	80%
Dec	Adult	42%	42%	48%	60%	73%	80%
Jan	Adult	42%	42%	48%	60%	73%	80%
Feb	Adult	42%	42%	48%	60%	73%	80%
Mar	Adult	42%	42%	48%	60%	73%	80%
Apr	Spawn	28%	28%	32%	68%	60%	64%

May	Spawn	28%	28%	32%	68%	60%	64%
Jun	Spawn	28%	28%	32%	68%	60%	64%
Jul	Adult	42%	42%	48%	60%	73%	80%
Aug	Adult	42%	42%	48%	60%	73%	80%
Sep	Adult	42%	42%	48%	60%	73%	80%

Monitoring of rainbow trout and benthic macroinvertebrate populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species and habitat quality.

Canyon Creek Below Bowman Lake Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

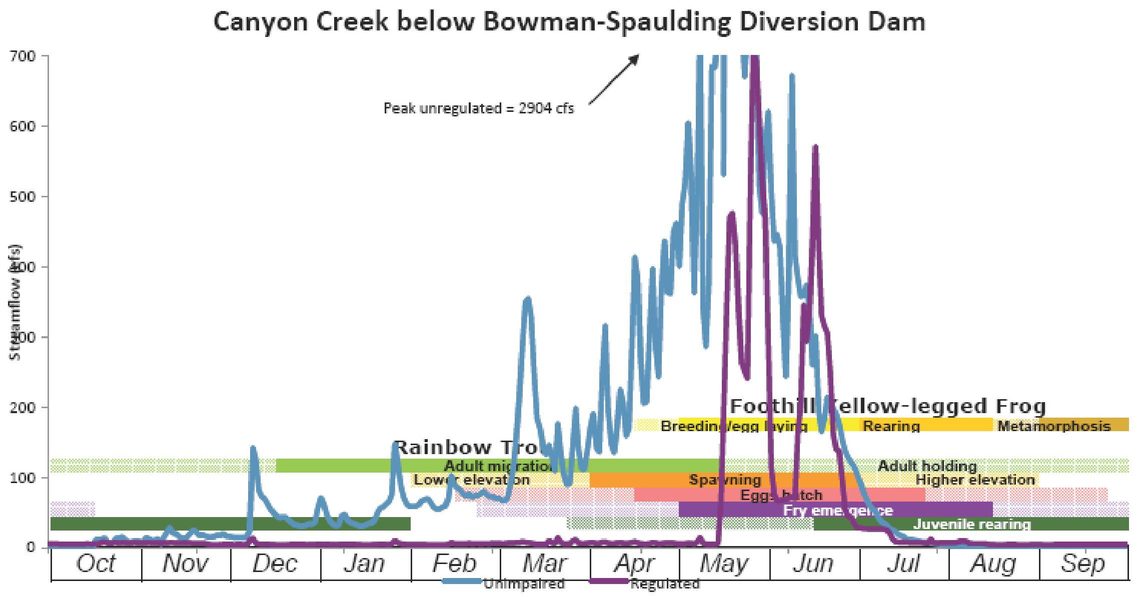
The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve biota in good condition, specifically including rainbow trout, foothill yellow-legged frogs, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Canyon Creek below Bowman Lake Reservoir Dam reach is 10.5 mi long and extends from Bowman Lake Diversion Dam outlet to the confluence with the South Yuba River. Average channel gradient is 4.2 percent (Technical Memorandum 3-2). The watershed above Bowman Reservoir Dam is approximately 27 square miles, it is a snowmelt driven system, and has an mean annual unimpaired flow is 124 cfs.

The existing minimum streamflow requirement in this reach is 3 cfs April through October and 2 cfs November through March. Figure CC-1 shows regulated releases for Bowman-Spaulding Diversion Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra Nevada.

Figure CC-1. Rainbow trout and yellow-legged frog lifestage periodicity and the regulated and synthesized unimpaired hydrographs for the Canyon Creek below the Bowman-Spaulding Diversion Dam



Rainbow trout life history timing adapted from Moyle, 2002. Foothill yellow-legged frog life history timing from A. Lind

Discussion of Fish Population Studies

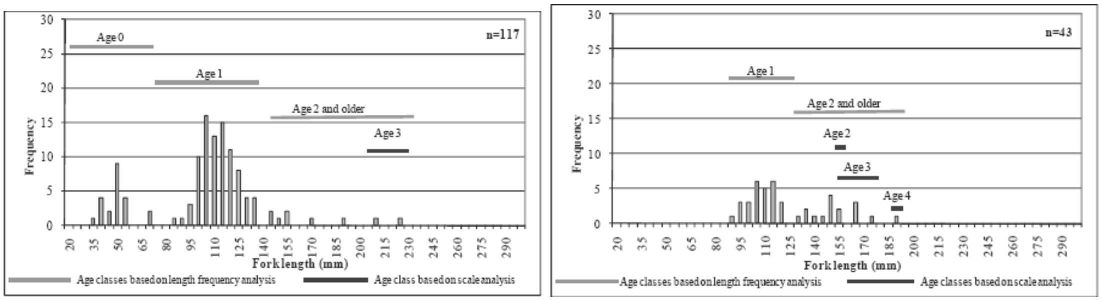
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the “Evaluation of Aquatic Biota Condition” section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed Level II fish population surveys at an Upper and Lower section in this reach; electrofishing and snorkeling according to standard fish population sampling protocols.

The Upper reach site, located 2.9 miles downstream of the Bowman-Spaulding Diversion Dam at an elevation of 4,750 ft, was sampled on August 13, 2008 and June 29, 2009. Rainbow trout and brown trout are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 2,201 and 843 in 2008 and 2009 respectively, rainbow trout biomass was 28.7 and 12.2 lbs/acre, and the Fulton’s condition factor averaged 1.18 and 1.25.

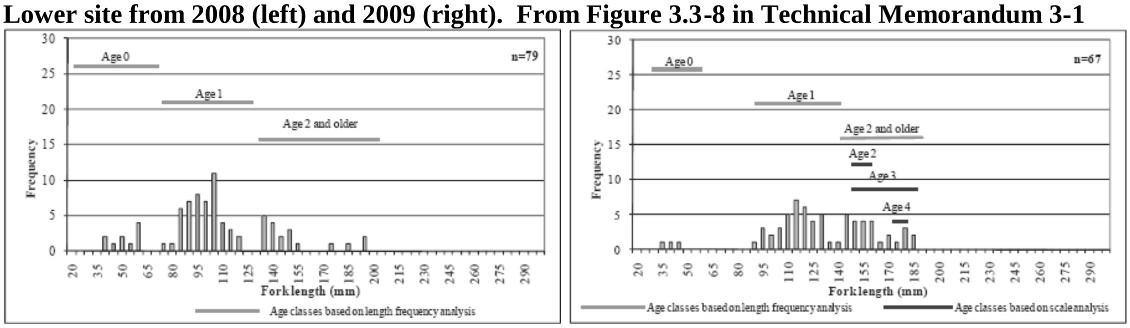
All age classes of rainbow trout were present in small numbers in 2008 and the population exhibited a somewhat typical age class structure. The age 0 class was missing in 2009, likely due in part to an earlier sampling date.

Rainbow trout length-frequency distribution and ages for the Bowman-Spaulding Diversion Dam Reach – Upper site from 2008 (left) and 2009 (right). From Figure 3.3-6 in Technical Memorandum 3-1



The Lower reach, located 7.5 miles downstream of the Bowman-Spaulding Diversion Dam at an elevation of 3,200 ft, was sampled on July 28, 2008 and June 30, 2009. Rainbow trout was the only species captured in this reach. Electrofishing survey estimates of rainbow trout per mile were 2,045 and 2,093 in 2008 and 2009 respectively, rainbow trout biomass was 16.1 and 33.6 lbs/acre, and the Fulton's condition factor averaged 1.10 and 1.11. As can be seen in the figures below, multiple age classes were present in both years, but the population did not exhibit a typical age class distribution in either year, partly due to low numbers of fish caught.

Rainbow trout length-frequency distribution and ages for the Bowman-Spaulding Diversion Dam Reach – Lower site from 2008 (left) and 2009 (right). From Figure 3.3-8 in Technical Memorandum 3-1

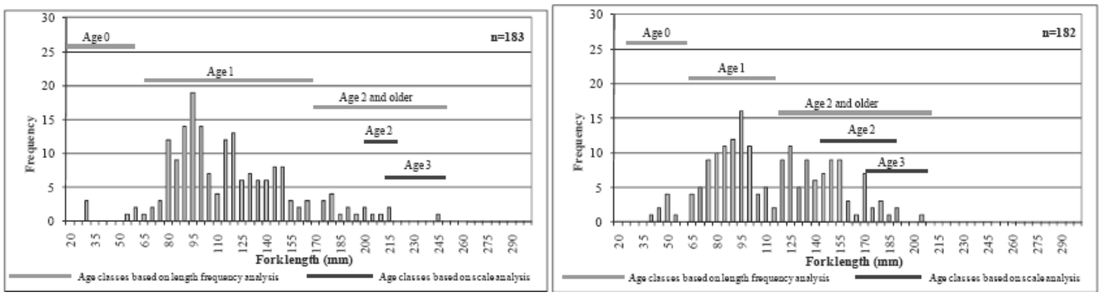


A 108.4 foot long deep pool was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 74 and 53 fish respectively. No other species were observed in this section.

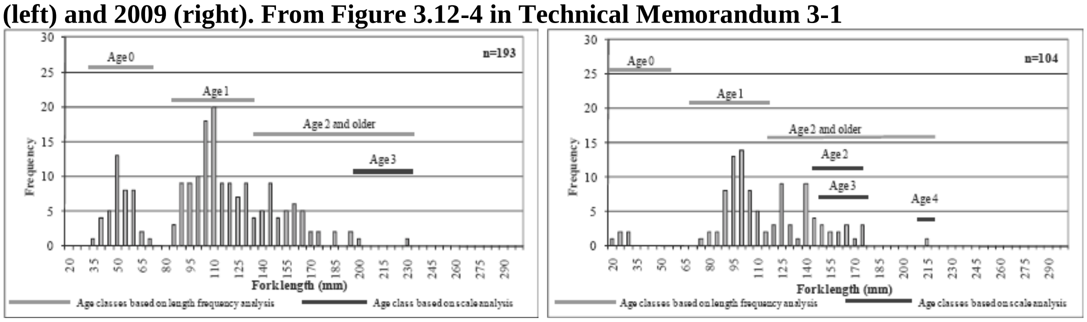
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5,350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates were sampled in the Upper section of this reach on June 29, 2009 and the Lower section on June 30, 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan. The benthic macroinvertebrate sites were co-located with the fish sites. IBI and MMI scores were 61 and 64 respectively in the Upper site, and 50 and 68 in the Lower site. The dominant substrate in the Upper site was small boulder, and in the lower was coarse gravel. The ecozone classification was montane for both sites.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Discussion of Foothill Yellow-legged Frog Studies

Three mainstem Canyon Creek sites and two tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and one site was resurveyed in 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). All life stages (egg masses, tadpoles, juveniles, and adults) were found in the reach with post-metamorphic lifestages (young of the year, juveniles, and adults) also found in one of the tributaries, however evidence of breeding (egg masses or tadpoles) was only found at one site (CC-1 Main). This site was over 9 miles downstream of Bowman Reservoir Dam; approximately 1.2 miles above the confluence of Canyon Creek and the South Yuba River. The number of egg masses was relatively low at CC-1, averaging 5 per km (2008/2009) and this density is on par with other regulated rivers and is less than 1/6th the number typically seen in unregulated rivers (Kupferberg et al. 2012). Frogs were not detected at sites CC-2 or CC-3 which were 4.4. and 3.7 miles downstream of the dam, respectively. One incidental sighting of an adult frog was made approximately 1.7 miles upstream of CC-1 in 2008.

FYLF detections from survey sites in Canyon Creek Below Bowman Reservoir Dam in 2008 and 2009; Table 3.4-5 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site 2008	Survey 1				Survey 2[1]				Survey 3[1]			
	Egg Mass[2]	Tadpole[2]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult
CC-1 Main	June 11, 2008				August 12, 2008				September 18, 2008			
	1 (G 2)	0	1	6	73 (G 37–41)	0	2	2	0	13	1	1
Tributary	0	0	3	8	0	0	4	3	0	0	0	1
CC-2 Main	July 9, 2008				None				None			
	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tributary	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CC-3 Main	July 9, 2008				None				None			
	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

2009 SURVEYS								
Reach/Site 2009	Survey 1[4]				Survey 2			
	Egg Mass[2]	Tadpole	Juvenile	Adult	Egg Mass[2]	Tadpole	Juvenile	Adult
CC-1 Main	June 10, 2009				June 19, 2009			
	1 (G 10)	0	1	8	8 (G 8–20)	0	0	6

[1] N/A indicates the survey was not conducted according to the study or because the tributary was dry
[2] "G" is developmental stage as described in Gosner (1960)
[3] "Young" indicates young-of-year
[4] Survey extended 1,050 ft upstream of survey boundary

Discussion of Western Pond Turtle Studies

Basking site surveys were conducted at two sites on Canyon Creek (Study and Technical Memorandum 3-14; Nevada Irrigation District and Pacific Gas and Electric Company 2010c) in 2010. No western pond turtles were found. No other incidental sightings were made of turtles in this reach. Conclusions about the status of this population cannot be made without additional quantitative surveys.

Determination of Aquatic Biota Conditions

Rainbow trout population and biomass estimates in the Canyon Creek below Bowman Reservoir Dam were substantially lower than the North Yuba unimpaired reference reaches. Biomass estimates were also substantially lower than the average North Sierra stream of this width (Gerstung, 1973). In the upper site, rainbow trout population exhibited a fairly typical age class structure in 2008, but 0+ fish were missing in 2009 and in the lower site the age class distribution was atypical. This indicates that, although there is breeding in some years, there may not be good quality habitat available for all life history stages throughout the reach.

The benthic macroinvertebrate IBI and MMI scores were higher than the mean of all project affected sites and comparable to the non-project site on the North Yuba River. These scores indicate that the habitat quality is relatively good.

For foothill yellow-legged frogs, egg mass counts were substantially lower than typical densities from unregulated rivers (Kupferberg et al. 2012). Based on the information described above and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists in pockets and foothill yellow-legged frogs occur at relatively low abundance along the lower reaches of Canyon Creek.

Due to the lack of quantitative data on western pond turtles and no incidental sightings, conclusions about the status of this population cannot be made.

Overall, in this reach, rainbow trout abundance is low, but benthic macroinvertebrates are relatively good condition. Foothill yellow-legged frogs egg mass densities (= index of adult female frogs) were relatively low. This information leads the Resource Agencies to conclude that the aquatic biota in this reach are not in good condition.

Discussion of Relevant InstreamFlow Studies

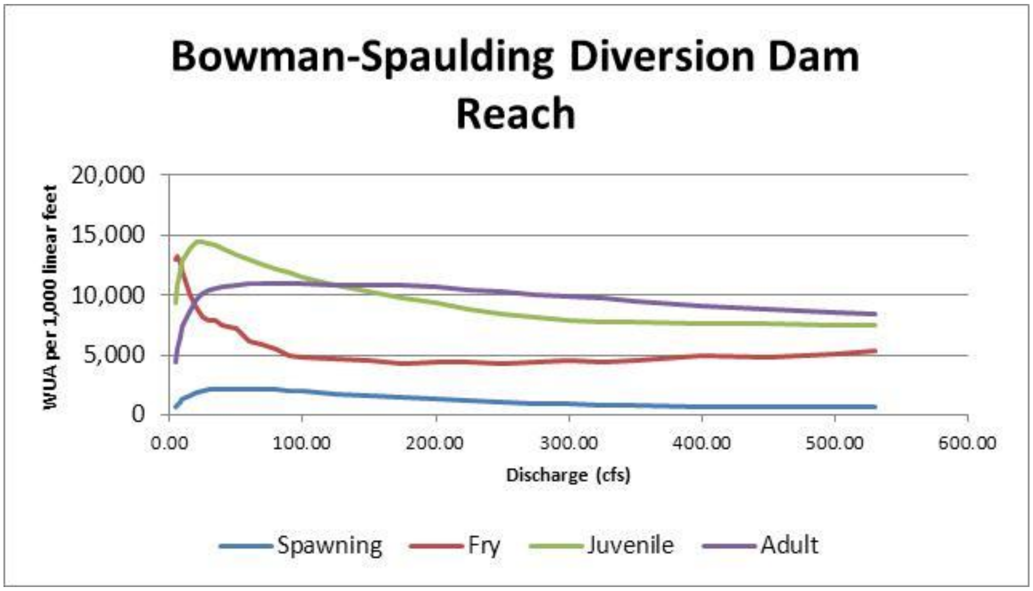
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) a water temperature modeling study. These studies are described below.

Mean unimpaired flows for the Canyon Creek below Bowman Reservoir were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The watershed area at the Bowman-Spaulding Diversion Dam is approximately 27 square miles. The mean annual unimpaired flow is 124 cfs. Table CC-1 (below) presents the average monthly unimpaired flows, by water year type, for the reach.

Table CC-1. Synthesized mean unimpaired flows for the Canyon Creek Below Bowman Reservoir Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	15	17	13	14	28	75	197	151	18	2	4	4
Dry	6	17	21	25	57	133	279	236	49	4	1	2
Below Normal	2	12	34	58	69	188	352	440	103	4	1	1
Above Normal	8	67	89	138	96	206	321	586	270	26	3	3
Wet	22	87	213	175	246	240	309	543	425	125	11	7

Licensee conducted a PHABSIM-type instream flow study in between Bowman Reservoir and the confluence of Canyon Creek with the South Yuba River. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for rainbow trout:



The most pertinent results of the PHABSIM study are presented in the Table CC-2 (below), including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table CC-2. Eighty percent and 100% of the Maximum WUA for rainbow trout in the Canyon Creek below Bowman Reservoir Dam. The percent of maximum weighted usable area is based on a local maximum for the rainbow trout adult lifestages.

	80% Max WUA	100% Max WUA
Adult	15 cfs	70 to 80 cfs
Spawning	12 cfs	40 to 50 cfs
Juvenile	7 cfs	20 to 25 cfs

PHABSIM indicates that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

<u>Determination of Minimum Streamflows</u>

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

The Resource Agencies used adult rainbow trout WUA, lifestage periodicity, water temperature and flow information, and determined minimum flows ranging from 15cfs, which represents 80 percent of the maximum WUA up to 70-80 cfs, which represents 100 percent of the maximum WUA, provides sufficient water during the months of June through February. Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph which results in a range of minimum flows from 12 cfs, which represents 80 percent of the maximum WUA to 40-50cfs, which represents 100 percent of the maximum WUA during March, April, and May for spawning, to address SWE-3.

Water temperatures were also evaluated due to foothill yellow-legged frog rearing concerns. A general rule of thumb is that daily average water temperatures of 17^{o}C or greater for July and August are required for successful rearing of tadpoles. We considered flows that would maintain these water temperatures in the reach. Based on water temperature modeling provided by Licensee, we determined that 20 cfs was the optimal flow for maintaining temperatures above 17^{o}C in the mid-late summer; flows in the 20-30 cfs range were marginal.

Table CC-3 presents the Resource Agencies determination of flows that Licensee should release below Bowman Spaulding Diversion Dam to enhance the condition of the fishery and protect and enhance other biological resources in this reach, including foothill yellow-legged frogs.

Table CC-3. Resource Agency initial minimum flow recommendation in Canyon Creek below Bowman-Spaulding Diversion Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	10	10	10	10	10	10	15	20	15	10	10	10
Dry	15	15	15	15	15	15	20	30	20	15	15	15
Below Normal	15	15	15	15	15	20	30	40	30	20	15	15
Above Normal	20	20	20	20	20	25	35	50	35	25	20	20
Wet	20	20	20	20	20	30	40	60	40	30	20	20

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Collaboratively agreed upon minimum streamflows by month and water year type (in cfs)

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	4	6	10	10	10	15
Nov	Adult	4	6	10	10	10	15
Dec	Adult	4	6	10	10	10	15
Jan	Adult	4	6	10	10	10	15 / 20*
Feb	Adult	4	6	10	15	20	25

Month	Life-Stage	EC	CD	D	BN	AN	W
Mar	Adult	4	6	10	15	20	25
Apr	Spawn	6	13	15	30	35	40
May	Spawn	6	15	20	40	50	60
Jun	Spawn	6	13	15	30	35	40
Jul	Adult	4	10	15	15	25	30
Aug	Adult	4	10	15	15	20	20
Sep	Adult	4	10	15	15	20	20

* See Measure No. 2/Condition No. 30 – Overwintering Minimum Streamflow Adjustments

The following table shows that in the spring and summer months of dry, below normal, above normal, and wet water years, rainbow trout WUA is near 80 percent. In most winter months and in extreme critical and critically dry years WUA values drop below this level.

Rainbow trout WUA for collaboratively agreed upon minimum streamflows by month and water year type (in cfs)

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	40%	50%	66%	66%	66%	79%
Nov	Adult	40%	50%	66%	66%	66%	79%
Dec	Adult	40%	50%	66%	66%	66%	79%
Jan	Adult	40%	50%	66%	66%	66%	79%/87%
Feb	Adult	40%	50%	66%	79%	87%	92%
Mar	Adult	40%	50%	66%	79%	87%	92%
Apr	Spawn	39%	68%	75%	97%	99%	100%
May	Spawn	39%	75%	86%	100%	100%	100%
Jun	Spawn	39%	68%	75%	97%	99%	100%
Jul	Adult	40%	66%	79%	79%	92%	95%
Aug	Adult	40%	66%	79%	79%	87%	87%
Sep	Adult	40%	66%	79%	79%	87%	87%

Other measures for this reach will provide additional flows and improve conditions for both fish and foothill yellow-legged frogs. The Canyon Creek below Bowman-Spaulding Diversion Dam spill cessation measure (see Measure No. 2/Condition No. 30 – Spill Cessation Measures) will provide a gradual reduction in flows for any spills after April 1 of each year. Flows will be gradually reduced over a three week period. This measure is intended to protect foothill yellow-legged frog egg masses that are laid at higher flow, but it may also provide improved rainbow trout spawning conditions when spills occur during the months of April, May or June. Monitoring of rainbow trout and foothill yellow-legged frog populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Jackson Creek Below Jackson Reservoir Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, including rainbow trout. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement and Rationale

The Jackson Lake Dam Reach is approximately three miles long and extends from Bowman Lake to Jackson Lake Dam. The average elevation through the reach is 6,082 feet, and the channel gradient is 6.9 percent. The watershed area is approximately 0.7 square miles and the mean annual unimpaired flow was 3 cfs.

Discussion of Fish Population Studies

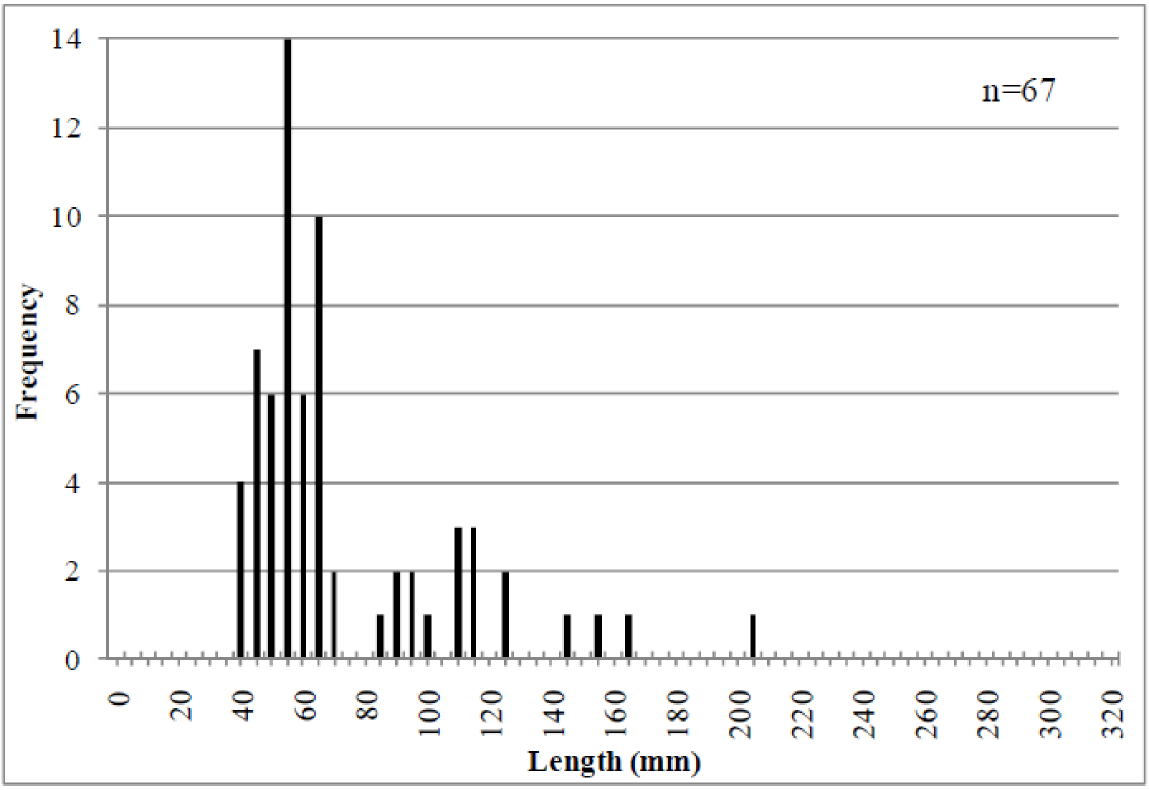
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), the Licensee performed a quantitative (Level I) representative fish population survey at two locations in the reach according to standard fish population sampling protocols, including the application of electrofishing techniques. Both sites were sampled using habitat spot check electrofishing.

The Jackson Lake Dam Reach was sampled at both an upper and a lower site on September 23, 2008. At the upper site, 25 potential fish habitat spots were sampled along a 300 ft section of stream starting approximately 2.1 miles upstream of Bowman Lake. Where access was possible, fish were present. Habitat was limited to small pockets of deeper water with cover. At the lower site, 64 potential fish habitat spots were sampled along a 582-ft section of stream starting approximately 0.45 mi upstream of Bowman Lake.

Five brown trout and three brook trout were collected in the upstream site, and two brown and 67 rainbow trout were collected at the lower site. Rainbow trout represented 87 percent of the catch. Additionally, there are anecdotal accounts of kokanee salmon (stocked by CDFG) migrating into this reach from Bowman Reservoir to spawn. Figure JA-1 displays length-frequency plot for rainbow trout.

Figure JA-1. Length frequency for rainbow trout collected in the Jackson Lake Dam Reach on September 23, 2008.



Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach.

Determination of Fish Condition

Notwithstanding the presence of brown trout and brook trout, the cold water fish population in Jackson Creek, although small, was surprisingly healthy considering the nature of the regulated releases from Jackson Lake Dam. Multiple age classes of rainbow trout were caught, indicating some breeding in this reach. Given this, the Resource Agencies believe that the rainbow trout populations are in relatively good condition.

Discussion of Relevant Instream Flow Related Studies

The Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) an assessment of Channel/Flow Response (CFR). Both studies are described below.

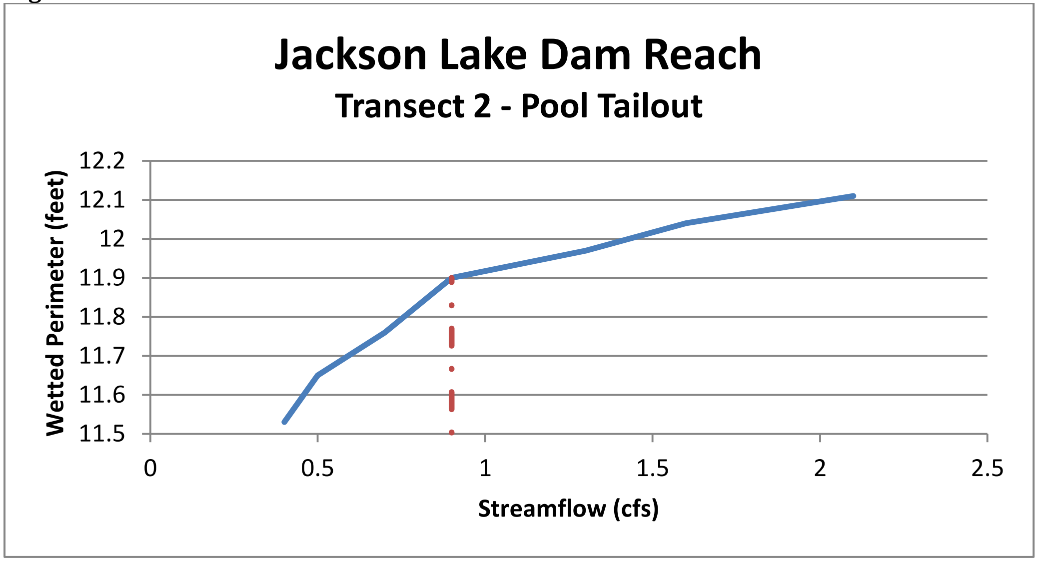
Mean unimpaired flows for Jackson Creek below Jackson Lake Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table JA-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table JA-1. Synthesized mean unimpaired flows for Jackson Creek below the Jackson Lake Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.4	0.4	0.3	0.3	0.6	1.7	4.8	4.0	0.5	0.1	0.1	0.1
Dry	0.1	0.4	0.5	0.6	1.3	3.1	6.9	6.2	1.4	0.1	0.0	0.0
Below Normal	0.0	0.3	0.8	1.3	1.5	4.3	8.6	11.5	2.9	0.1	0.0	0.0
Above Normal	0.2	1.5	2.0	3.0	2.1	4.6	7.7	15.2	7.8	0.8	0.1	0.1
Wet	0.5	1.9	4.8	3.9	5.4	5.4	7.6	14.1	11.8	3.8	0.3	0.2

Using the CFR hydraulic model, the Resource Agencies determined the relationship between flow and wetted perimeter at the pool tailout transect (transect 2) evaluated below Jackson Lake Dam. This relationship is depicted below:

Figure JA-2. Jackson Lake Dam Reach Wetted Perimeter



Note that the breakpoint in the flow versus wetted perimeter relationship occurs at approximately 0.9 cfs.

Determination of Minimum Streamflows

Because fish in this reach were determined to be in relatively good condition, the Resource Agencies considered available storage and unimpaired hydrology and collaboratively worked with the Licensees and other relicensing participants to develop the following flow regime.

Table JA-5.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.5	0.5	0.75	0.75	1.0	2.0
Nov	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Dec	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Jan	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Feb	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Mar	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Apr	Adult	0.5	0.5	0.75	0.75	0.75	0.75
May	Adult	0.5	0.5	0.75	0.75	0.75	0.75
Jun	Spawn	0.5	0.5	1.0	1.0	2.0	3.0
Jul	Adult	0.5	0.5	0.75	0.75	1.0	2.0
Aug	Adult	0.5	0.5	0.75	0.75	1.0	2.0
Sep	Adult	0.5	0.5	0.75	0.75	1.0	2.0

Monitoring of rainbow trout will occur in this reach and will inform our understanding of how the streamflow measure is affecting trout populations.

Texas Creek Below Bowman-Spaulding Conduit (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

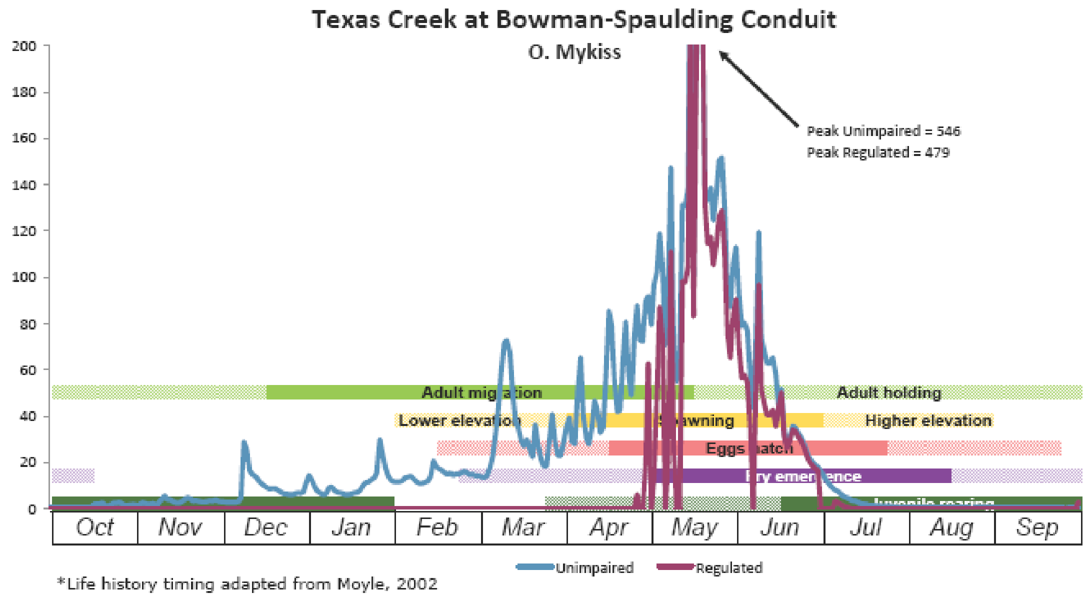
The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, achieve biota in good condition, specifically including rainbow trout, and benthic macroinvertebrates, and to restore consistent connectivity with and provide tributary flow to Canyon Creek. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Texas Creek below the Bowman-Spaulding Conduit is approximately 0.6 mi long and extends from Texas Creek's confluence with Canyon Creek (tributary to the South Yuba River) to the Bowman-Spaulding Conduit. The reach has an average elevation of 5,020 ft and a channel gradient of 24.2 percent (Technical Memorandum 3-2). The Texas Creek watershed above the Bowman-Spaulding Conduit is approximately 4.6 square miles and it is a snowmelt driven system with a mean annual unimpaired flow of 23.6 cfs. There is no existing minimum streamflow requirement in this reach in the current FERC license.

Figure TC-1 shows the synthesized unimpaired and simulated regulated flows for Texas Creek below the Bowman-Spaulding Conduit for 2005, which was an average water year with a typical hydrograph for the west slope of the Sierra Nevada range. Note that the stream is dry for much of the year under current project operations.

Figure TC-1. Rainbow trout lifestage periodicity and the synthesized unimpaired and simulated regulated hydrographs for Texas Creek below the Bowman-Spaulding Conduit for 2005.



Discussion of Fish Population Studies

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population surveys in this reach. Licensees attempted to sample potential fish habitat spots in September 2008 along this section of Texas Creek, but the accessible areas of the reach were dry (Technical Memo 3-1). Several large trout were observed in pools by CDFG and FS staff during the CFR calibration flow releases on July 28, 2009 (see DFA below). These likely came from the Bowman-Spaulding Conduit during a spill event.

Discussion of Benthic Macroinvertebrate Studies

Since accessible areas of the reach were dry in 2008 when fish sampling was attempted, benthic macroinvertebrate sites were not co-located with fish sites. IBI and MMI scores were 53 and 54 respectively. The site ecozone classification was montane and the dominant substrate was smooth bedrock.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were

sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Determination of Fish Condition

Based on the lack of fish collected during the Level I fish population survey, and since dewatering of historic habitat does not keep fish in good condition, the Resource Agencies do not consider aquatic biota in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted two studies that are relevant for determining instream flows for this reach. These studies include: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12), and 2) a Demonstration Flow Assessment/Channel Flow Response (DFA/CFR) instream flow study (Technical Memorandum 3-2, Instream Flow). The pertinent results of the studies are described below:

Mean unimpaired flows for Texas Creek below the Bowman-Spaulding Conduit were synthesized using a combination of gage proration and gage summation as described in Exhibit B, Section 3.6.2 of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table TC-1. Synthesized mean unimpaired flows for Texas Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	2.9	3.5	3.8	3.6	8.0	15.6	36.3	23.7	3.9	0.3	0.8	0.8
Dry	1.2	3.6	3.7	4.7	9.0	27.4	56.2	46.0	8.4	0.5	0.3	0.3
Below Normal	0.5	3.2	9.3	14.2	16.3	34.9	59.7	85.7	26.4	1.2	0.3	0.4
Above Normal	1.5	14.6	20.3	19.1	27.1	46.7	72.6	111.3	41.5	5.2	0.6	0.7
Wet	4.6	18.4	40.9	44.0	42.7	45.3	60.8	99.1	76.7	17.8	2.0	1.2

Resource Agency staff participated in several aspects of the DFA/CFR study, including selecting transects and observing stream conditions on July 28, 2009 during the 0.90 cfs, 5.12 cfs, and 12.30 cfs calibration flows (Technical Memorandum 3-2). Observations made during the site visit provided valuable insight regarding stream conditions at various flows.

During the DFA/CFR field study, Resource Agency staff noted at the low calibration flow (0.90 cfs) that a small amount of good refuge habitat existed in this reach. Deep pools were observed flowing and in the upper reach, connectivity was established between habitat types at this flow. At the bottom of this reach, a large cobble field is present at the junction with Canyon Creek. At the lowest flow, Resource Agency staff observed that all flow remained subsurface through the large cobble field, and there was no stream connectivity to Canyon Creek. When the mid flow was established, Resource Agency Staff revisited this location and noted that stream connectivity was established with Canyon Creek.

In addition to field observation, Resource Agency staff applied the standard setting Tennant Method to help determine flows that would provide sufficient habitat. The Tennant method uses percentages of the average annual flow (QAA) to get seasonally adjusted instream flow recommendations that have some hydrological relevance for maintaining natural habitat and geomorphological attributes of streams and rivers. This method applies various percentages of the QAA to two 6 month periods to obtain instream flow regimens. According to Annear et.al., "Because of its robustness, this method is a reasonable starting point for quantifying instream flow needs to which refinements can be made if needed." Field data and photographs can then be used to help refine site specific recommendations.

The following table is modified from Annear et.al.:

Description of flow[a]	Apr - Sept	Oct - Mar
Optimum range of flow	60-100%	60-100%
Outstanding habitat	60%	40%
Excellent habitat	50%	30%
Good habitat	40%	20%
Fair or degrading habitat	30%	10%
Poor or minimum habitat[b]	10%	10%
Severe degradation	<10%	<10%

[a] For fish, wildlife, recreation, and related environmental resources
[b] This is only for short-term survival in most cases.

The following table shows the minimum flow thresholds to maintain habitat quality based on the percentages listed above and the average annual unimpaired flow of 23.6 cfs for this reach:

Description of flow[a]	April – September cfs	October – March cfs
Optimum range of flow	14 - 24	14 - 24
Outstanding habitat	14	9
Excellent habitat	12	7
Good habitat	10	5
Fair or degrading habitat	7	2
Poor or minimum habitat[b]	2	2
Severe degradation	<2	<2

Figure TC-2 Photo of Texas Creek below the Bowman-Spaulding Conduit – DFA Transect 3, Pool at high calibration flow. Three orange tape lines on the left side of the picture indicate the location of water surface elevation at the three calibration flows.

Determination of Minimum Streamflows

Although there is no minimum flow requirement in this reach, the reach was dry for 0.2 miles up from the confluence with Canyon Creek, and stream flow was hyporheic at some BMI transects, the IBI score was above both the mean and the median for all project affected sites, and the MMI score was only slightly below the mean and median for all sites. Both scores are below the reference reach scores, suggesting that with additional water, the scores (i.e. the habitat conditions) could easily be improved. This also indicates that, with consistent connectivity, this reach could be a good food source for Canyon Creek.

While the upper half of the site is very steep with impassable fish barriers, there are several large pools throughout containing trout. In addition, with consistent connectivity to Canyon Creek, the lower half of this reach could provide additional fish habitat.

Because fish in this reach were determined not to be in good condition (see above), the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota in this reach:

As noted above, a flow equivalent to 30 percent to 40 percent of the mean annual flow throughout the summer provides fair to good habitat, respectively. This is equivalent to a flow of between 7 and 10 cfs. However, after observing the calibration flow releases, Resource Agency staff concluded that flows of between 10 percent and 20 percent of the mean annual flow should be sufficient to maintain a living stream at all times (SWE-1) in this short, mostly bedrock and boulder dominated reach. These flows will also ensure consistent connectivity with Canyon

Creek and potentially provide spawning and juvenile rearing habitat during the spring (SWE-3). However Resource Agency staff do not believe emulating the natural hydrograph (SWE-2) is necessary in this reach given its physical characteristics as described previously in this paragraph. In addition, the need for habitat maintenance flows should be reevaluated after project induced erosion has been remediated.

Based on the Resource Agencies' Tennant Method analysis and field observations made on July 28, 2009, a range of flows between 1 cfs and 5 cfs are sufficient to maintain fish in good condition in this reach.

Table TC-2 presents the Resource Agencies' determination of flows that should be released from the Bowman-Spaulding Conduit to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table TC-2. Resource Agency initial minimum flows recommendation to keep fish in good condition in Texas Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dry	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Below Normal	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Above Normal	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Wet	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation. The table below presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	EC	CD	D	BN	AN	W
Oct	0.6	1	1	2	3	3
Nov	0.6	1	1	2	3	3
Dec	0.6	1	1	2	3	3
Jan	0.6	1	1	2	3	3
Feb	0.6	1	1	2	3	3
Mar	0.6	1	1	2	3	3
Apr	0.6	1	1	2	3	3
May	0.6	1	1	2	3	3
Jun	0.6	1	1	2	3	3
Jul	0.6	1	1	2	3	3
Aug	0.6	1	1	2	3	3
Sep	0.6	1	1	2	3	3

Conclusion

While the resulting aquatic resource habitat associated with these minimum flows does not meet the optimal criteria described above (in ‘Determination of Minimum Streamflows’), other measures for this reach are expected to improve habitat conditions for the aquatic resources. Monitoring of rainbow trout populations in accordance with Measure No. 8/Condition No. 36 will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Fall Creek Below Bowman-Spaulding Canal (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

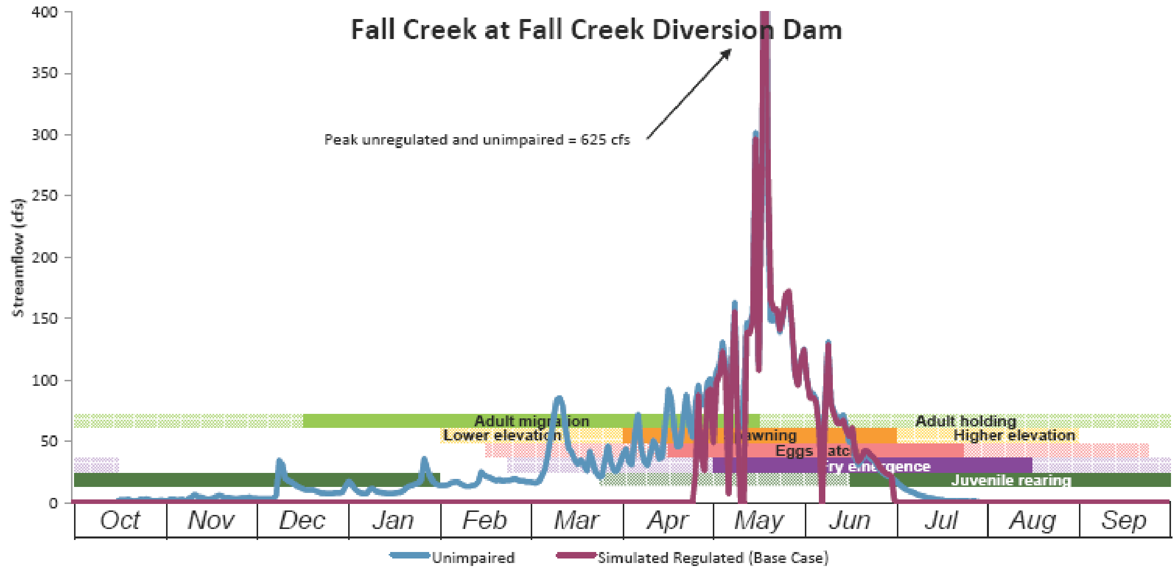
The Resource Agencies’ interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, achieve biota in good condition, specifically including rainbow trout and benthic macroinvertebrates, and to restore consistent connectivity with and provide tributary flow to the South Yuba River. The reach is designated as “cold freshwater habitat” in the Central Valley Regional Water Quality Control Board’s Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Fall Creek below the Bowman-Spaulding Conduit is approximately 2.0 mi long and extends from Fall Creek’s confluence with the South Yuba River (elevation 3,200 ft) to the Bowman-Spaulding Conduit (elevation 5,320 ft). The reach has an average elevation of 4,260 ft and a channel gradient of 20.9 percent (Technical Memorandum 3-2). The watershed area at the Fall Creek Diversion Dam is approximately 5.81 square miles. The mean annual unimpaired flow is 26.6 cfs. The Yuba-Bear Hydroelectric Project diverts water from Fall Creek directly into the Bowman-Spaulding Conduit. Entrainment into the Bowman-Spaulding Canal has not been quantified. There is no existing minimum streamflow requirement below the Bowman-Spaulding Conduit in the current FERC license.

Figure FC-1 shows the synthesized unimpaired and simulated regulated flows for Fall Creek below the Bowman-Spaulding Conduit for 2005, which was an average water year with a typical hydrograph for the west slope of the Sierra Nevada range. Note that the stream is dry for much of the year under current project operations.

Figure FC-1 Rainbow trout lifestage periodicity and the synthesized unimpaired and simulated regulated hydrographs for Fall Creek below the Bowman-Spaulding Conduit for 2005.



Rainbow trout life history timing adapted from Moyle, 2002.

Discussion of Fish Population Studies

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed both qualitative (Level I) and quantitative (Level II) representative fish population surveys in this reach. Both sites were sampled using backpack electrofishing techniques.

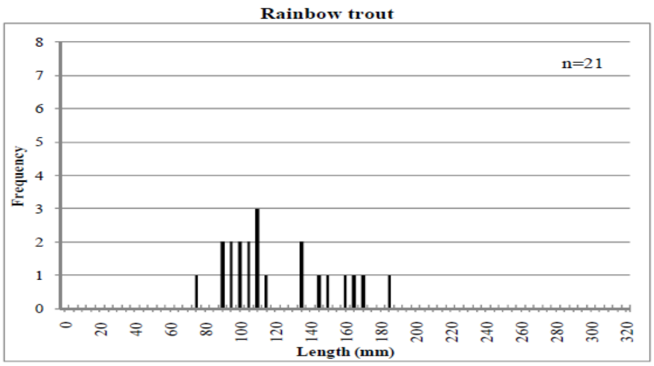
Much of the following information is presented in more detail in Technical Memorandum 3-1:

Fall Creek Diversion Dam Reach – Level I

Licensees sampled 40 potential fish habitat spots (accessed at RM 1.8) along an 850-ft section of stream starting approximately 1.7 mi upstream of the South Yuba River confluence on September 4, 2008. Reach characteristics were visually estimated. Channel substrate within the sampled reach was comprised of an even distribution of cobble and boulders. The stream channel averaged 7 ft in width and 1 ft in depth and habitat was characterized as riffle (10 percent) and pool (90 percent). Canopy covered 50 percent of the channel. In-stream cover was provided by surface turbulence (5 percent), in-stream objects (i.e., boulders or LWD) (80 percent), and overhanging vegetation (15 percent). Instantaneous water temperature was 15.4 ºC. Flows were less than 1 cfs and habitat was discontinuous. Long stretches of dry channel with hyporheic flow separated stream segments. Capture efficiencies were low due to a high degree of cover.

A total of 21 rainbow trout and six brown trout were collected. The average FL of the rainbow trout was 120 mm (range: 75 to 183 mm), while the brown trout averaged 143 mm (range: 115 to 185 mm).

Length frequency for rainbow trout collected in the Fall Creek Diversion Dam Reach below the Bowman-Spaulding Conduit, September 4, 2008.



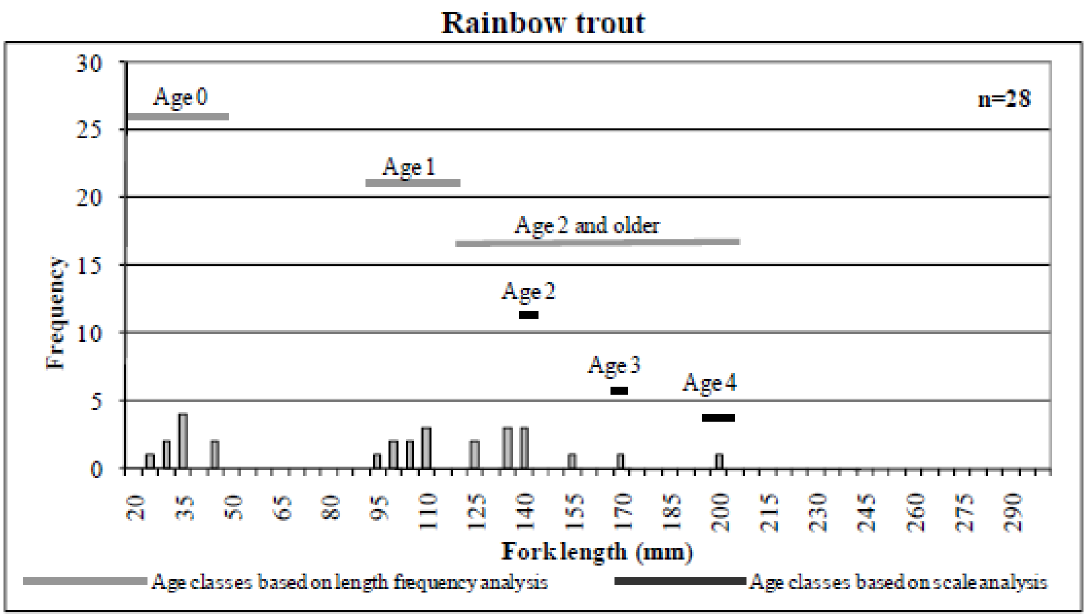
Few age-0 rainbow trout were collected in 2008.

Fall Creek Diversion Dam Reach – Level II

The Fall Creek Diversion Dam Reach (Fall Creek, RM 1.9) Level II quantitative site, located 3.9 miles downstream of Carr Lake Dam and 0.1 miles downstream of the Fall Creek Diversion Dam, at an elevation o380 ft, was sampled on July 27, 2009. The site was 371.0 ft (102.7 m) long in a medium-gradient channel (3.0 percent), and was comprised of two habitat types: high-gradient riffle and pool. Sampling was conducted by electrofishing. Maximum pool depth was 2.5 ft (0.7 m). The average channel width for the entire site was 8.0 ft (2.4 m). Streamflow was visually estimated as less than 1 cfs. Boulder was the dominant substrate and cobble was the subdominant substrate. The Fall Creek Diversion Dam located just upstream of the site presents a year-round barrier to upstream fish migration. No large woody debris or suitable salmonid spawning gravel was observed within the site. Water temperature was 17.2 °C, conductivity was 23.0 µS/cm; however, dissolved oxygen was not measured due to an equipment malfunction.

Estimates of rainbow trout per mile in 2009 were 413, rainbow trout biomass was 16.9 in 2009, and the Fulton’s condition factor averaged 1.01**.**

Rainbow trout length-frequency distribution and ages for Fall Creek below Bowman-Spaulding Conduit. From Figure 3.4-7 in Technical Memorandum 3-1.



The fish population data for Fall Creek indicated low numbers of adults. This reach is also lacking large woody debris and spawning gravels. The number of rainbow trout per mile collected in the Fall Creek Diversion Dam reach was significantly lower when compared to the Carr Lake Dam Reach immediately above the Bowman-Spaulding Conduit.

Determination of Fish Condition

Based on comparison of fish populations above and below the Bowman-Spaulding Conduit, and since dewatering of historic habitat does not keep fish in good condition, the Resource Agencies do not consider fish in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). The pertinent results of the studies are described below:

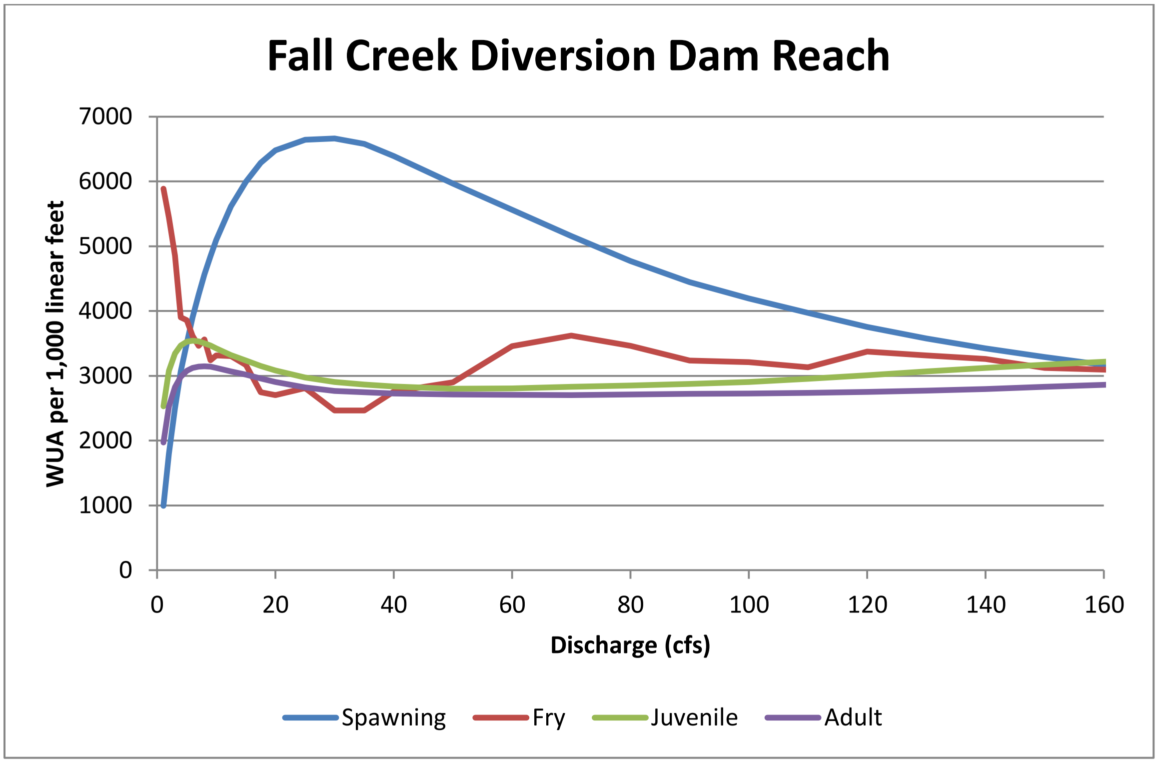
Mean unimpaired flows for Fall Creek below the Bowman-Spaulding Conduit were synthesized using a combination of gage proration and gage summation as described in Exhibit B, Section 3.6.2 of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table FC-1 Synthesized mean unimpaired flows for Fall Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	3.4	4.0	2.9	3.4	6.7	17.3	42.4	30.9	3.4	0.3	0.9	0.9
Dry	1.3	3.9	4.9	5.9	13.4	30.5	60.1	48.2	9.2	0.6	0.3	0.4

Below Normal	0.4	2.8	8.0	13.8	16.6	43.5	76.8	90.2	19.5	0.7	0.3	0.3
Above Normal	1.8	15.5	21.0	33.0	23.2	48.2	71.1	121.2	50.0	4.3	0.6	0.7
Wet	5.0	20.4	49.6	41.2	58.3	56.0	67.1	112.2	81.9	21.8	2.3	1.4

Licensee conducted one PHABSIM-type instream flow study between Fall Creek below the Bowman Spaulding Conduit and the South Yuba River. Resource Agency staff participated in many aspects of this study, including transects selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the two reaches:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

	80% Max WUA	100% Max WUA
Adult	2 cfs	7 to 9 cfs
Spawning	12 cfs	25 to 30 cfs
Juvenile	1.5 cfs	5 to 7 cfs

<u>Determination of Minimum Streamflows</u>

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows generally focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3).

Adult rainbow trout WUAs for this reach are presented in Table FC-2. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure FC-1, and determined minimum flows ranging from 2 cfs, which represents 80 percent of the maximum WUA, in critically dry and dry water years to 8 cfs, which represents 100 percent of the maximum WUA, in wet water years provide sufficient water during the months of August through February.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the natural hydrograph (Table FC-1) to determine a minimum flow of 30 cfs, which represent approximately 100 percent of the maximum WUA, should be applied during May in Above Normal and Wet water year types. The Resource Agencies determined that a flow of 12.5 cfs, which represents 84 percent maximum WUA in critically dry years would provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during March and April from the adult RBT values to the RBT spawning values. Similarly, during June and July, flows were stepped back down from the RBT spawning values to the adult RBT values.

Table FC-2 presents the Resource Agencies determination of flows that the licensee should release into Fall Creek below the Bowman-Spaulding Conduit to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table FC-2. Resource Agency initial minimum flow recommendation in Fall Creek below the Bowman-Spaulding Conduit

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	2.0	2.0	2.0	2.0	2.0	2.0	10.0	12.5	4.0	2.0	2.0	2.0
Dry	2.0	2.0	2.0	2.0	2.0	2.0	10.0	15.0	10.0	2.0	2.0	2.0
Below Normal	4.0	4.0	4.0	4.0	4.0	8.0	15.0	20.0	15.0	6.0	6.0	6.0
Above Normal	6.0	6.0	6.0	6.0	6.0	10.0	20.0	30.0	20.0	8.0	6.0	6.0
Wet	8.0	8.0	8.0	8.0	8.0	10.0	20.0	30.0	25.0	10.0	8.0	8.0

Adjustment of Minimum Streamflows

Once the minimum streamflows were evaluated using Operation models, adjustments were made to address Licensee water rights issues, and Resource Agency concerns regarding connectivity between upstream and downstream resources. To this end, the licensee will release the Resources Agency minimum streamflows or inflow from upstream, whichever is less. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	CD	D	BN	AN	W
Oct	Adult	2*	2*	2*	4*	6*
Nov	Adult	2*	2*	2*	4*	6*
Dec	Adult	2*	2*	2*	4*	6*
Jan	Adult	2*	2*	2*	4*	6*
Feb	Adult	2*	2*	2*	4*	6*
Mar	Spawn	2*	2*	2*	8*	10*
Apr	Spawn	10*	10*	10*	15*	20*
May	Spawn	12.5*	12.5*	15*	20*	30*
Jun	Spawn	4*	4*	10*	15*	20*
Jul	Adult	2*	2*	2*	6*	8*
Aug	Adult	2*	2*	2^{2}	6*	6*
Sep	Adult	2*	2*	2*	6*	6*

* Or Inflow, whichever is less.

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows. These weighted usable areas could be significantly less if inflow is less than the above flows.

Table FC-2 Adult rainbow trout WUA's

Month	Life-Stage	CD	D	BN	AN	W
Oct	Adult	80%	80%	95%	99%	100%
Nov	Adult	80%	80%	95%	99%	100%
Dec	Adult	80%	80%	95%	99%	100%
Jan	Adult	80%	80%	95%	99%	100%
Feb	Adult	80%	80%	95%	99%	100%
Mar	Spawn	27%	27%	68%	77%	77%
Apr	Spawn	77%	77%	90%	97%	97%
May	Spawn	84%	90%	97%	100%	100%
Jun	Spawn	46%	77%	90%	97%	100%
Jul	Adult	80%	80%	99%	100%	95%
Aug	Adult	80%	80%	99%	99%	100%
Sep	Adult	80%	80%	99%	99%	100%

Conclusion

Fish population data collected in 2008 indicated very low numbers of rainbow trout. The lack of an existing minimum streamflow for this reach is likely limiting overall production of rainbow trout populations. Entrainment of fish and aquatic resources into the Bowman-Spaulding Conduit, results in a net loss of aquatic resources from the affected stream reaches both upstream and downstream of the Fall Creek Diversion Dam. This limits or fragments the aquatic genetic diversity available within the watershed. Entrainment at this site has not been quantified.

While the upper half of the site is very steep with impassable fish barriers, there are several large pools throughout containing trout. In addition, with consistent connectivity to the South Yuba River, the lower half of this reach could provide additional trout habitat.

To mitigate for lost biomass into the Bowman-Spaulding Conduit from Fall Creek above Bowman-Spaulding Conduit the Resource Agencies have increased spawning flows identified during April, May and June in all water year types that will likely increase reproduction of rainbow trout populations. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Trap Creek Below Bowman-Spaulding Canal (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in Trap Creek below the Bowman-Spaulding Conduit is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Trap Creek Diversion Reach is approximately 1.2 mi long and extends from Trap Creek's confluence with Fall Creek to the Bowman-Spaulding Conduit. The reach has an average elevation of 4,480 ft and a channel gradient of 27.6 percent (Technical Memorandum 3-2). The Trap Creek watershed above the Bowman-Spaulding Conduit is approximately 0.6 square miles and it is a snowmelt driven system with a mean annual unimpaired flow of 2.6 cfs. There is no existing minimum streamflow requirement in this reach in the current FERC license, although Licensee does open up the radial waste gate off the Bowman-Spaulding canal and release water through this Creek during winter when the Bowman-Spaulding canal is near capacity. There is evidence of significant erosion likely due to spill events from the Bowman-Spaulding Conduit.

Discussion of Fish Population Studies

Licensees attempted to sample potential fish habitat spots along this section of Trap Creek in September 2008, but were unable to because the entire reach was dry.

Determination of Fish Condition

Based on the lack of fish collected during the Level I fish population survey, and since dewatering of historic habitat does not keep fish in good condition, the Resource Agencies do not consider the fish in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted two studies that are relevant for determining instream flows for this reach. These studies include: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12), and 2) a Demonstration Flow Assessment/Channel Flow Response (DFA/CFR) instream flow study (Technical Memorandum 3-2, Instream Flow). The pertinent results of the studies are described below:

Mean unimpaired flows for Trap Creek below the Bowman-Spaulding Conduit were synthesized using a combination of gage proration and gage summation as described in Exhibit B, Section 3.6.2 of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table TC-1. Synthesized mean unimpaired flows for Trap Creek below the Bowman-Spaulding Conduit

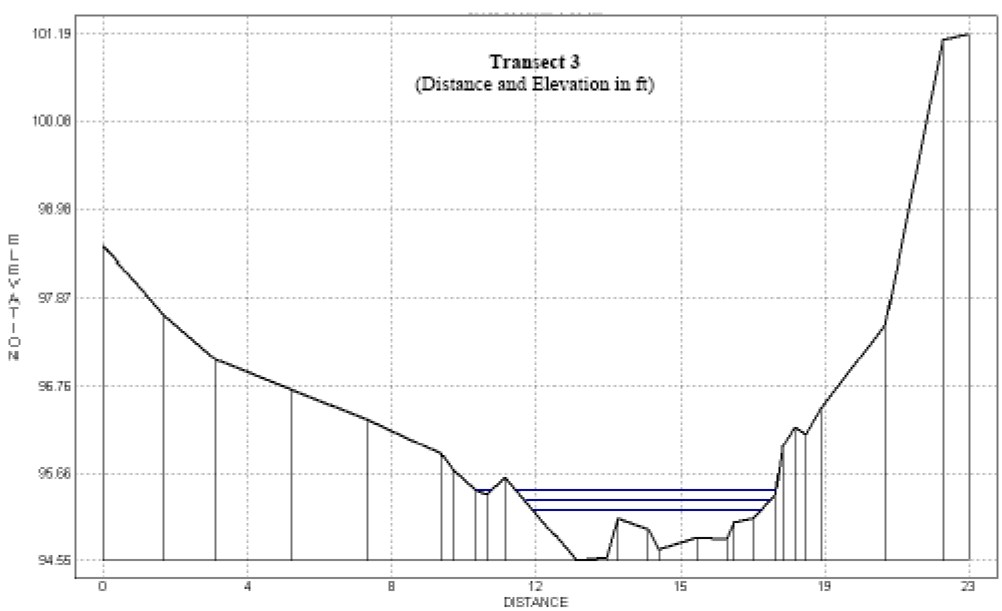
Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

Critically Dry	0.3	0.5	0.5	0.5	1.1	2.0	3.8	2.4	0.4	0.0	0.1	0.1
Dry	0.1	0.5	0.5	0.7	1.3	3.5	5.9	4.8	0.8	0.0	0.0	0.0
Below Normal	0.1	0.4	1.3	2.0	2.3	4.4	6.2	8.8	2.4	0.1	0.0	0.0
Above Normal	0.2	1.9	2.7	2.6	3.8	6.0	7.6	11.3	3.6	0.5	0.1	0.1
Wet	0.6	2.4	5.3	5.9	5.8	5.7	6.1	9.9	7.0	1.7	0.2	0.1

Resource Agency staff participated in several aspects of the DFA/CFR study, including selecting transects and observing stream conditions on July 27, 2009 during the 0.37 cfs, 1.28 cfs, and 3.05 cfs calibration flows (Technical Memorandum 3-2). Observations made during the site visit provided valuable insight regarding stream conditions at various flows.

During the DFA/CFR field study, Resource Agency staff noted that connectivity through the observable stream reach was established at the low flow, but side margin habitat was not well inundated. From photos collected during the field study and using the channel flow response interactive spreadsheet, Resource Agency staff estimated a bankfull flow of 10 cfs. In addition, Resource Agency staff noted significant erosion in the upper part of the reach, below the Bowman-Spaulding Canal, as shown in Figure TC-1 above.

Figure TC-2. Cross sectional profiles and water surface elevations at 0.37 cfs, 1.28 cfs, and 3.05 cfs at Trap Creek Diversion Reach Channel Flow Response Cross-Section 3 – riffle.



In addition to field observation, Resource Agency staff applied the standard setting Tennant Method to help determine flows that would provide sufficient habitat. The Tennant method uses percentages of the average annual flow (QAA) to get seasonally adjusted instream flow recommendations that have some hydrological relevance for maintaining natural habitat and geomorphological attributes of streams and rivers. This method applies various percentages of the QAA to two 6 month periods to obtain instream flow regimens. According to Annear et.al., "Because of its robustness, this method is a reasonable starting point for quantifying instream flow needs to which refinements can be made if needed." Field data and photographs can then be used to help refine site specific recommendations.

The following table is modified from Annear et.al.:

Description of flow[a]	Apr - Sept	Oct - Mar
Optimum range of flow	60-100%	60-100%
Outstanding habitat	60%	40%
Excellent habitat	50%	30%
Good habitat	40%	20%
Fair or degrading habitat	30%	10%
Poor or minimum habitat[b]	10%	10%
Severe degradation	<10%	<10%

[a] For fish, wildlife, recreation, and related environmental resources
[b] This is only for short-term survival in most cases.

The following table shows the minimum flow thresholds to maintain habitat quality based on the percentages listed above and the average annual unimpaired flow of 2.6 cfs for this reach:

Description of flow[a]	April – September cfs	October – March cfs
Optimum range of flow	1.6 – 2.6	1.6 – 2.6
Outstanding habitat	1.6	1.1
Excellent habitat	1.3	0.8
Good habitat	1.1	0.53
Fair or degrading habitat	0.79	0.26
Poor or minimum habitat[b]	0.26	0.26
Severe degradation	<0.26	<0.26

Figure TC-3 Photo of Trap Creek below the Bowman-Spaulding Conduit – DFA Transect 3, Riffle at high calibration flow. Three orange tape lines on the left and right side of the picture indicate the location of water surface elevation at the three calibration flows.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

As noted above, a flow equivalent to 30 percent to 40 percent of the mean annual flow throughout the summer provides fair to good habitat, respectively. This is equivalent to a flow of between 0.79 to 1.1 cfs. Based on the Resource Agencies' Tennant Method analysis and field observations made on July 27, 2009, a range of flows between 0.25 cfs and 10 cfs are sufficient to maintain fish in good condition in this reach.

Table TC-2 presents the Resource Agencies' determination of flows that should be released from the Bowman-Spaulding Conduit to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table TC-2. Resource Agency initial minimum flow recommendation in Trap Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.25	0.25	0.25	0.25	0.25	0.25	2.0	1.0	1.0	0.25	0.25	0.25
Dry	0.5	0.5	0.5	0.5	0.5	0.5	4.0	2.0	1.5	0.5	0.5	0.5
Below Normal	0.5	1.0	1.0	1.0	1.0	1.0	4.0	6.0	2.0	1.0	0.5	0.5
Above Normal	0.5	1.5	1.5	1.5	1.5	1.5	4.0	8.0	4.0	1.5	0.5	0.5
Wet	0.5	1.5	1.5	1.5	1.5	1.5	6.0	10.0	6.0	1.5	0.5	0.5

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the CFR and Operation models, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.25	0.25	0.5	0.5	1	1.5
Nov	Adult	0.25	0.25	0.5	0.5	1	1.5
Dec	Adult	0.25	0.25	0.5	0.5	1	1.5
Jan	Adult	0.25	0.25	0.5	0.5	1	1.5
Feb	Adult	0.25	0.25	0.5	0.5	1	1.5
Mar	Adult	0.25	0.25	0.5	1	1.5	1.5
Apr	Spawn	0.25	0.75	0.75	2	3	3
May	Spawn	0.25	0.75	0.75	3	3	3
Jun	Spawn	0.25	0.75	0.75	2	3	3
Jul	Adult	0.25	0.25	0.5	0.5	1	1.5
Aug	Adult	0.25	0.25	0.5	0.5	1	1.5
Sep	Adult	0.25	0.25	0.5	0.5	1	1.5

Conclusion

Fish population data could not be collected in 2008 because the entire reach was dry. Currently, there is not a minimum streamflow requirement for this reach. The Resource Agencies believe that the collaboratively developed minimum streamflows will substantially improve conditions for the aquatic biota. These flows shall be re-evaluated and potential new flows collaboratively agreed upon by the Resource Agencies and the Licensee after implementation of the Clear and Trap Creeks Channel Stabilization Plan (Yuba-Bear Amended Final License Application, Appendix E4). Monitoring of rainbow trout populations will occur in this reach and will inform our understanding of how the new streamflow measures are affecting these resources.

Clear Creek Below Bowman-Spaulding Canal (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in Clear Creek below the Bowman-Spaulding Conduit is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Clear Creek Diversion Reach is approximately 0.9 mi long and extends from Clear Creek's confluence with Fall Creek to the Bowman-Spaulding Conduit and the Clear Creek Diversion. The reach has an average elevation of 5,280 ft and a channel gradient of 3.7 percent (Technical Memorandum 3-2). The Clear Creek watershed above the Bowman-Spaulding Conduit is approximately 1.5 square miles and it is a snowmelt driven system with a mean annual unimpaired flow of 6.6 cfs. There is no existing minimum streamflow requirement in this reach in the current FERC license, although Licensee does open up the manual dump gate off the Bowman-Spaulding canal and release water through this Creek during winter when the Bowman-Spaulding canal is near capacity.

There is evidence of substantial erosion likely due to spill events from the Bowman-Spaulding Conduit.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1:

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees sampled 55 potential fish habitat spots (accessed at RM 0.9) along a 640-ft section of stream starting approximately 0.12 mi downstream of the Bowman-Spaulding Conduit on September 8, 2008. Reach characteristics were visually estimated. Channel substrate within the reach was comprised of gravel (5 percent), cobble (80 percent), and boulders (15 percent). The reach averaged 10 ft in width and 1 ft in depth and was characterized by an even distribution of riffle and glide habitats. Canopy covered 90 percent of the channel. In-stream cover was provided by surface turbulence (10 percent), in-stream objects (i.e., boulders or LWD) (50 percent), undercut banks (10 percent), and overhanging vegetation (70 percent). The instantaneous water temperature was measured at 15.5 ºC.

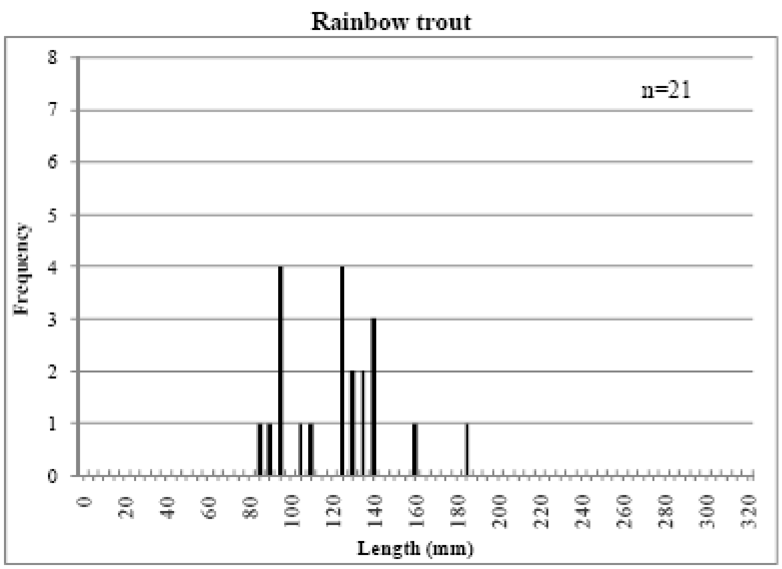
A total of 32 fish were collected, represented by two species, rainbow trout and brown trout. Rainbow trout were the most abundant species accounting for 66 percent of the total number of fish collected.

Table CC- 1. Species composition, relative abundance, and population statistics for rainbow and brown trout collected in Clear Creek Dam Reach, September 8, 2008.

Species	Length mm			By Species			By Reach	
	Average	Min	Max	Count	% of Total	Catch/Min[1]	Count	Catch/Min[1]
Rainbow trout	121	84	182	21	66%	1.8	32	2.8
Brown trout	127	42	204	11	34%	1.0		

[1] Time was based on the amount of time the electrofisher was "on" and not by the amount of time the surveyors were seeking habitat spots to sample.

Figure CC-1. Length frequency for rainbow trout collected in Clear Creek Reach, September 8, 2008.



Determination of Fish Condition

The rainbow trout population did not exhibit a typical age class distribution, in part due to the low number of fish caught. This indicates that, although there is at least some spawning in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of abundance or productivity. Therefore the Resource Agencies do not consider the fish in this reach to be in good condition.

<u>Discussion of Relevant Instream Flow Related Studies</u>

Licensee conducted two studies that are relevant for determining instream flows for this reach. These studies include: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12), and 2) a PHABSIM-type instream flow study (Technical Memorandum 3-2, Instream Flow). The pertinent results of the studies are described below:

Mean unimpaired flows for Clear Creek below the Bowman-Spaulding Conduit were synthesized using a combination of gage proration and gage summation as described in Exhibit B, Section 3.6.2 of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table CC-2. Synthesized mean unimpaired flows for Clear Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.9	1.1	1.3	1.2	2.8	4.9	9.4	6.0	0.9	0.1	0.2	0.2
Dry	0.4	1.2	1.3	1.6	3.1	8.6	14.8	11.9	2.0	0.1	0.1	0.1
Below Normal	0.2	1.1	3.2	4.9	5.8	11.0	15.7	22.1	6.1	0.3	0.1	0.1
Above Normal	0.4	4.7	6.7	6.6	9.5	14.8	19.1	28.5	9.2	1.1	0.2	0.2
Wet	1.4	6.0	13.3	14.7	14.5	14.1	15.3	24.8	17.6	4.2	0.5	0.3

<u>Habitat Study Results</u>

Licensee conducted a PHABSIM-type instream flow study in the reach between the Clear Creek Diversion Dam and the confluence with Fall Creek. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationship:

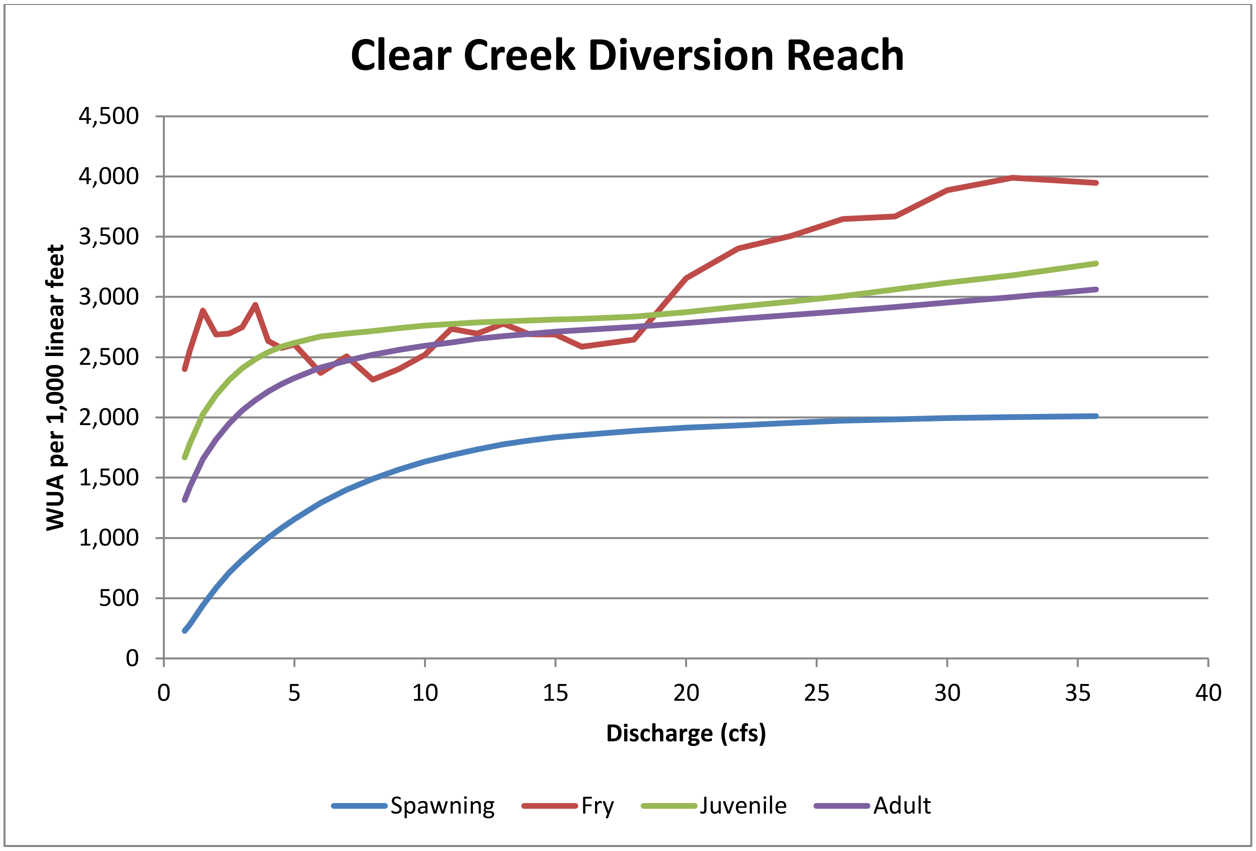


Figure CC-1. WUA for rainbow trout, Clear Creek Diversion Reach.

The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table CC-3. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in the Clear Creek Study Site.

	80% Max WUA	100% Max WUA
Adult	7	36*
Spawning	10	36*
Juvenile	6	36*

*36 cfs was the maximum modeled flow for this reach

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition (see above), the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

Because the WUA values for the life stages listed above were maximized at the highest modeled flow, the Resource Agencies staff did attempt to achieve flows consistent with 100 percent of the maximum weighted useable area. In the wet years, Resource agency staff recommended flows that would achieve 80 percent of the maximum WUA for the spawning months, and 85 percent of maximum weighted useable area for the adult life stage.

Table CC-4 presents the Resource Agencies' determination of flows that should be released from the Bowman-Spaulding Conduit to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table CC-4. Resource Agency initial minimum flow recommendation to keep fish in good condition in Clear Creek below the Bowman-Spaulding Conduit

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Dry	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Below Normal	4.0	4.0	4.0	4.0	4.0	4.0	6.0	6.0	6.0	4.0	4.0	4.0
Above Normal	6.0	6.0	6.0	6.0	6.0	6.0	8.0	8.0	8.0	6.0	6.0	6.0
Wet	6.0	6.0	6.0	6.0	6.0	6.0	10.0	10.0	10.0	6.0	6.0	6.0

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the CFR and Operation models, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	1	1	1	1	2	2
Nov	Adult	1	1	1	1	2	2
Dec	Adult	1	1	1	1	2	2
Jan	Adult	1	1	1	1	2	2
Feb	Adult	1	1	1	1	2	2
Mar	Adult	1	1	1	1	2	2
Apr	Adult	1	1	1	2	3	3
May	Spawn	1	1	1	2	4	6
Jun	Adult	1	1	1	2	3	3
Jul	Adult	1	1	1	1	2	2
Aug	Adult	1	1	1	1	2	2
Sep	Adult	1	1	1	1	2	2

Conclusion

Fish population data collected in 2008 indicated low densities in population levels. Currently, there is not a minimum streamflow requirement for this reach, which is likely limiting overall production of rainbow trout populations. The Resource Agencies believe that the collaboratively developed minimum streamflows will substantially improve conditions for the aquatic biota. These flows shall be re-evaluated and potential new flows collaboratively agreed upon by the Resource Agencies and NID after implementation of the Clear and Trap Creeks Channel Stabilization Plan (Yuba-Bear Amended Final License Application, Amended Appendix E4). Monitoring of rainbow trout populations will occur in this reach and will inform our understanding of how the new streamflow measures are affecting these resources.

Rucker Creek Below Bowman-Spaulding Canal (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient water is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. Ensure populations of native fish are viable with adequate habitat consistent with species needs. Maintain, enhance or restore all life stages of native aquatic species. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Rucker Creek Diversion Reach is approximately 1.2 mi long and extends from Rucker Creek's confluence with the South Yuba River (RM 0.0) to the Bowman-Spaulding Conduit (RM 1.2). The reach has an average elevation of 4,480 ft and a channel gradient of 26.1 percent (Technical Memorandum 3-2). The watershed area of Rucker Creek above this location is approximately 1.74 square miles. The mean annual unimpaired flow is 7.8 cfs. There is currently no existing minimum streamflow in this reach. In this reach, Licensee can spill water when the Bowman-Spaulding Canal is at capacity, Licensee can open up a spill gate out of the Canal and spill water through this reach.

Discussion of Fish Population Studies

Licensees were unable to sample potential fish habitat spots within Rucker Creek Diversion Reach below the Bowman-Spaulding Conduit as the entire reach was dry. Sampling was attempted in the reach on September 5, 2008. Habitat information was not collected, but the presence of a fish passage barrier was noted. The barrier divides the reach into upper and lower sections and prevents physical connection between the two.

Determination of Fish Condition

Due to the lack of fish collected during Level I fish population surveys, and since dewatering of historic habitat does not keep fish in good condition, the Resources Agencies do not consider fish in this reach to be in good condition.

<u>Discussion of Relevant Instream Flow Related Studies</u>

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) Demonstration Flow Analysis /Channel Flow Response (DFA/CFR). Both studies are described below.

Mean unimpaired flows for the Rucker Creek below the Bowman-Spaulding Canal were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table RC-1. Synthesized mean unimpaired flows for the Rucker Creek below above the Bowman-Spaulding Canal (at the upstream end of this reach).

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1.0	1.3	1.5	1.4	3.3	5.7	11.2	7.1	1.1	0.1	0.3	0.3
Dry	0.4	1.4	1.5	1.9	3.7	10.2	17.5	14.1	2.4	0.1	0.1	0.1
Below Normal	0.2	1.3	3.7	5.8	6.8	12.9	18.6	26.2	7.3	0.3	0.1	0.1
Above Normal	0.5	5.5	7.9	7.7	11.1	17.4	22.6	33.8	10.9	1.4	0.2	0.2
Wet	1.7	7.0	15.6	17.2	17.0	16.6	18.1	29.5	21.0	5.0	0.6	0.4

As part of the instream flow study, Licensee performed a Demonstration Flow Analysis (DFA) for this reach. Relicensing Participants joined Licensee's consultant to choose cross sections within the reach and observe the creek while Licensee released three test flows. In addition to the normal CFR data collected, photos and videos were taken at each of the test flows. As part of the DFA, the normal CFR data were collected at three cross sections below Rucker Creek Diversion. Discharges of 0.73 cfs, 4.3 cfs, and 8.4 cfs were all measured and observed on July 30, 2009. The photo of the "mid" flow, a cross sectional profile and wetted perimeter relationship for the riffle transect are shown below.

Figure RC-1. Riffle transect in Rucker Creek Diversion Dam Reach. Three orange tape lines on right side of pictures show water surface elevation at the three calibration flows. Additionally this image shows the large cobble size that is typical within this reach.

Figure RC-2. Cross sectional profiles and water surface elevations at 0.72 cfs, 4.3 cfs, and 8.4 cfs at Rucker Creek Diversion Reach Channel Flow Response Cross-Section 1 – riffle.

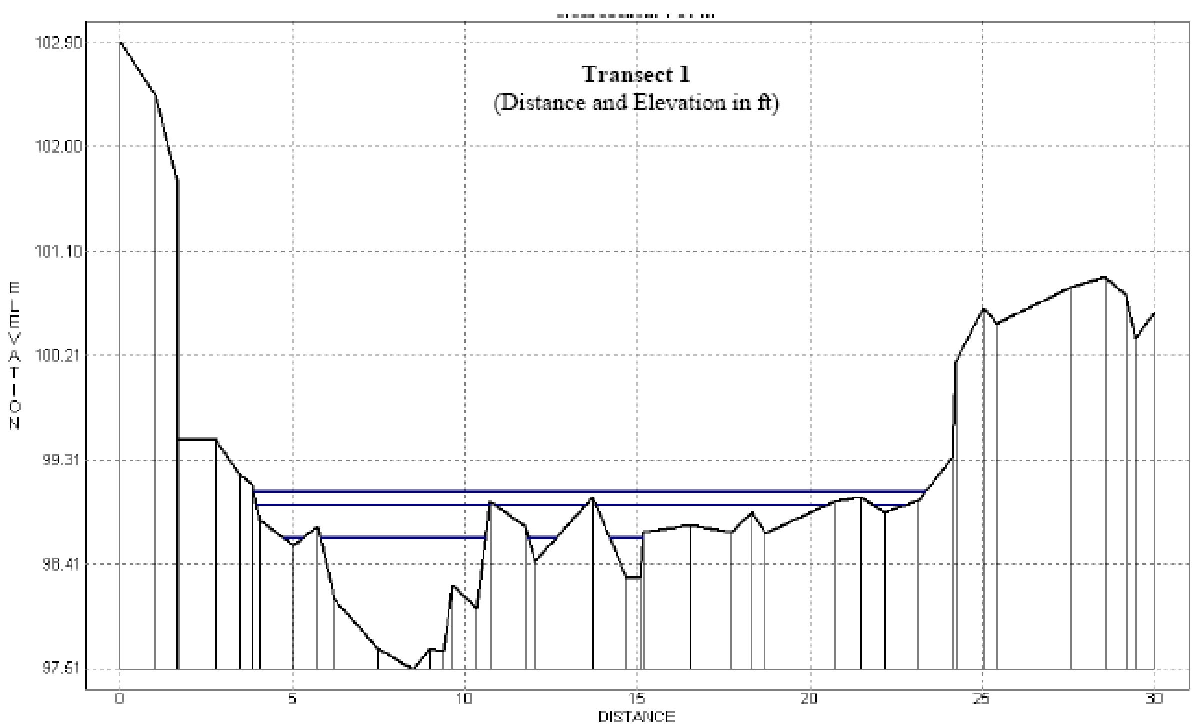
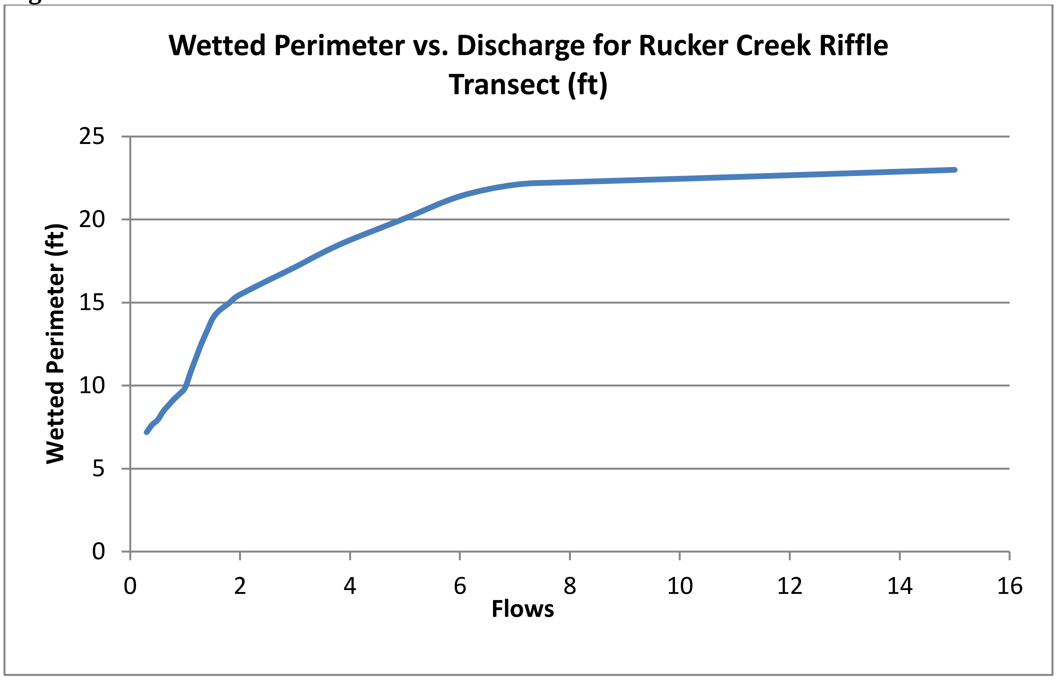


Figure RC-3. Wetted Perimeter at the DFA riffle transect.



Note that the breakpoint in the flow versus wetted perimeter analysis occurs at approximately 1.5 cfs. The wetted perimeter method is intended to establish a summer low-flow standard.

In addition to field observation, Resource Agency staff applied the standard setting Tennant Method to help determine flows that would provide sufficient habitat. The Tennant method uses percentages of the average annual flow (QAA) to get seasonally adjusted instream flow recommendations that have some hydrological relevance for maintaining natural habitat and geomorphological attributes of streams and rivers. This method applies various percentages of the QAA to two 6 month periods to obtain instream flow regimens. According to Annear et.al., "Because of its robustness, this method is a reasonable starting point for quantifying instream flow needs to which refinements can be made if needed." Field data and photographs can then be used to help refine site specific recommendations.

The following table is modified from Annear et.al.:

Description of flow[a]	**Apr - Sept**	**Oct - Mar**
Optimum range of flow	60-100%	60-100%
Outstanding habitat	60%	40%
Excellent habitat	50%	30%
Good habitat	40%	20%
Fair or degrading habitat	30%	10%
Poor or minimum habitat[b]	10%	10%
Severe degradation	<10%	<10%

[a] For fish, wildlife, recreation, and related environmental resources
[b] This is only for short-term survival in most cases.

The following table shows the minimum flow thresholds to maintain habitat quality based on the percentages listed above and the average annual unimpaired flow of 7.6 cfs for this reach:

Description of flow[a]	April – September cfs	October – March cfs
Optimum range of flow	4.6-7.6	4.6-7.6
Outstanding habitat	4.6	3.0
Excellent habitat	3.8	2.3
Good habitat	3.0	1.5
Fair or degrading habitat	2.3	0.76
Poor or minimum habitat[b]	0.76	0.76
Severe degradation	<0.76	<0.76

Determination of Minimum Streamflows

Because the fish in this reach were determined not to be in good condition the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance condition of the aquatic resources and provide connectivity with and tributary flow to the South Yuba River.

The Resource Agency staff evaluated the results of the studies on this reach. CFR/DFA studies provide data that show how much habitat is available at each of the calibration flows that would provide sufficient wetted perimeter habitat for rainbow trout and benthic macroinvertebrates production. In addition, during the DFA field study, the Resource Agency staff noted that even at the lowest calibration flow of 0.73 cfs, good connectivity was established through the large cobble substrate.

Licensee had initially proposed a year-round minimum flow of 0.3 cfs in this reach. Resource Agency staff determined that, in addition to flow proposed by Licensee, "pass through" flow volumes from the upstream Rucker Lake Dam reach would be sufficient to provide additional wetted perimeter in the Rucker Creek below the Bowman-Spaulding Canal reach. In May, flows were additionally increased to produce additional wetted perimeter during spawning months.

Table RC-2 presents the Resource Agencies' determination of flows that should be released from the Bowman-Spaulding Canal to enhance the condition of the aquatic biota.

Table RC-2. Resource Agency initial minimum flow recommendation in the Rucker Creek below the Bowman-Spaulding Canal.

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.75	0.30	0.30	0.30	0.30
Dry	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	0.5	0.5	0.5	0.5
Below Normal	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Above Normal	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0	2.0	2.0
Wet	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0	2.0	2.0	2.0	2.0

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the CFR and Operation models, no adjustments were made to the flows in this reach.

Conclusion

Observations of this Rucker Creek below the Bowman-Spaulding Conduit made by the Relicensing Participants during the Demonstration Flow Analysis lead Resource Agency staff to believe that this creek could have the potential for fish and benthic macroinvertebrate production, both in this creek and as a food-producing source for the South Yuba River. The Resource Agencies believe that the collaboratively developed minimum streamflows will substantially improve conditions for the aquatic biota and provide connectivity with and tributary flow to the South Yuba River. Monitoring of aquatic biota will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting these species.

Fordyce Creek Below Fordyce Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

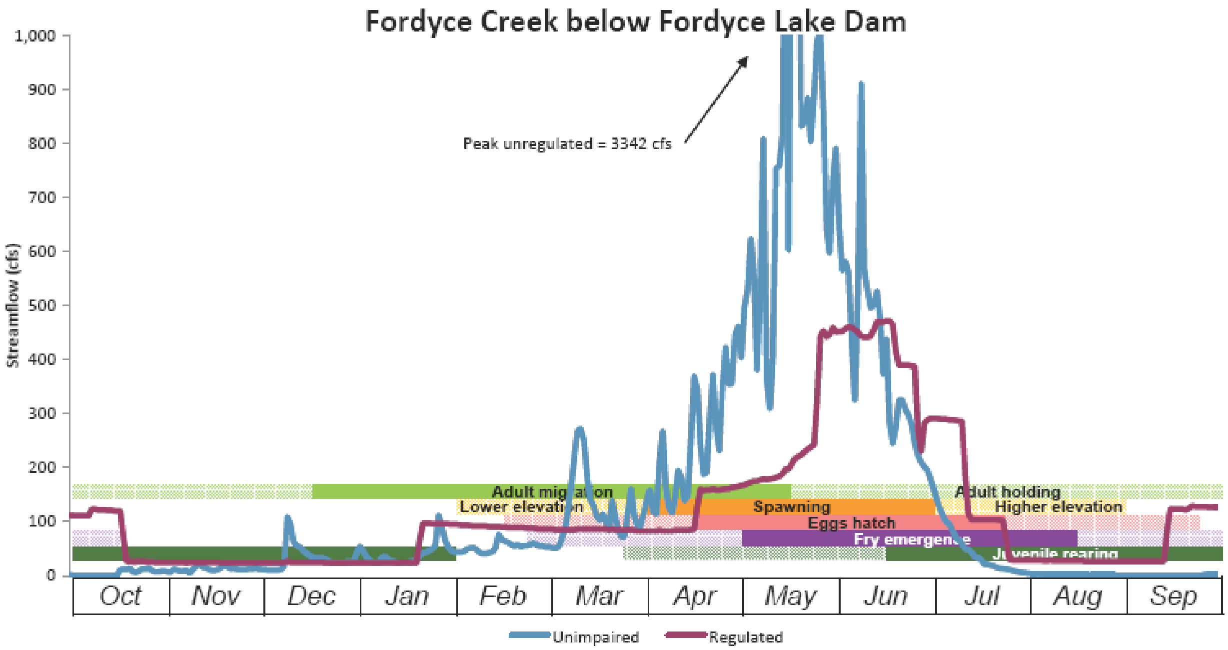
Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. Ensure populations of native fish are viable with adequate habitat consistent with species needs. Maintain, enhance or restore all life stages of native aquatic species. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The reach of Fordyce Creek below Fordyce Lake Dam is approximately 10.5 miles long, extending from immediately below Fordyce Dam (El. 6,200 ft), to the inlet Lake Spaulding (El. 5,020ft). The overall channel gradient is approximately 3.0 percent (Technical Memorandum 3-2). The watershed area at Fordyce Lake Dam is approximately 31.7 square miles and the mean annual unimpaired flow is 134 cfs. While the existing minimum streamflow is 5 cfs year-round this reach is used for water deliveries to Lake Spaulding and routinely experiences high aseasonal flows. Figure FC-1 shows regulated releases for the Fordyce Creek below Fordyce Reservoir for 2005, which was an average water year with a typical hydrograph for the west slope Sierra.

Figure FC-1. Rainbow trout lifestage periodicity and the regulated and synthesized unimpaired hydrographs for Fordyce Creek below the Fordyce Lake Dam.



Rainbow trout life history timing adapted from Moyle, 2002.

<u>Discussion of Fish Population Studies</u>

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

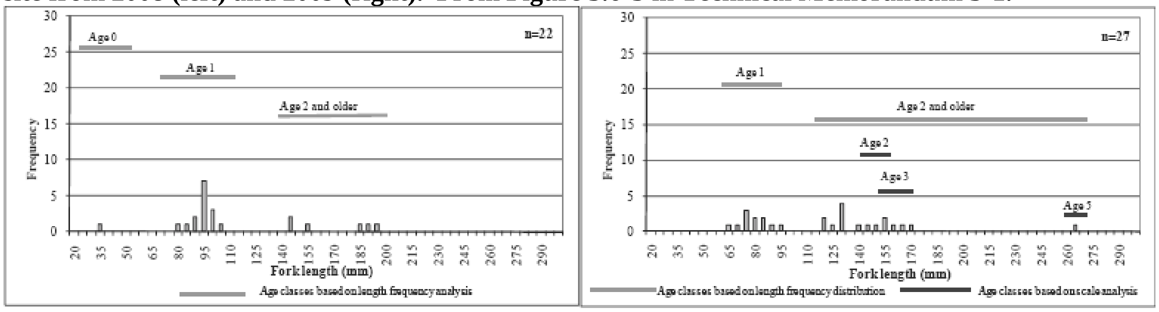
Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed three quantitative (Level II) representative fish population surveys at the Upper, Middle and Lower sections in this reach according to standard fish population sampling protocols. All three reaches were sampled using a combination of electrofishing and snorkeling.

Fordyce Creek Below Fordyce Lake - Upper Study Site

The Upper study site - located at RM 10.1 which is .4 miles downstream of the Fordyce Reservoir Dam at an elevation of approximately 6,200 was sampled on August 8, 2008 and August 6, 2009. Rainbow trout, brown trout, and Lahontan redside (a native species) were collected at this site in 2008, but only rainbow and brown trout were collected in 2009. Rainbow trout was the dominant fish species observed by both relative number and weight each year. Brown trout and Lahontan redside each constituted ≤ 10 percent of the fish collected in the electrofished section each year.

Estimates of rainbow trout per mile in 2008 and 2009 were 371and 484 respectively, rainbow trout biomass was 4.8 and 8.0 lbs/acre, and the Fulton's condition factor averaged 1.10 for both sampling years. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year due to the small sample size.

Rainbow trout length-frequency distribution and ages for Fordyce Creek below Fordyce Lake Dam– Upper site from 2008 (left) and 2009 (right). From Figure 3.6-5 in Technical Memorandum 3-1.



Few age-0 rainbow trout were collected in 2008 and they were absent in 2009.

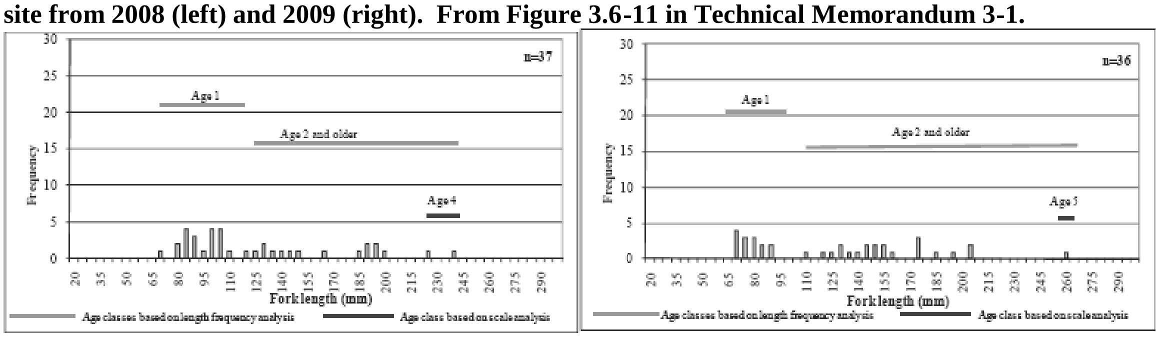
Fordyce Creek Below Fordyce Lake - Middle Study Site

The Fordyce Lake Dam Reach – Middle (Fordyce Creek, RM 6.2), located 4.3 miles downstream of Fordyce Lake Dam at an elevation of 5,700 ft, was sampled on August 12, 2008 and August 7, 2009. The site was 421.0 ft (128.3 m) long in a medium-gradient channel (3.0 percent), and was comprised of three habitat types: high-gradient riffle, run, and pools.

Rainbow and brown trout were the only species collected at this site and rainbow trout was the dominant species. Brown trout were only 5 percent of the fish collected in the electrofished riffle and run habitats in 2008 and 2009, but were approximately 20 percent of the fish biomass collected each year. No fish were observed in the snorkeled section in 2008, and only two fish (one brown trout and one rainbow trout) were observed in 2009. Insufficient sample sizes precluded RSD analyses for rainbow and brown trout observed in the snorkel section.

Estimates of rainbow trout per mile in 2008 and 2009 were 1,383and 1,312 respectively, rainbow trout biomass was 22.6 in 2008 and 22.4 lbs/acre in 2009, and the Fulton's condition factor averaged 1.10 in 2008 and 1.12 in 2009**.**

Rainbow trout length-frequency distribution and ages for Fordyce Creek below Fordyce Lake Dam– Middle site from 2008 (left) and 2009 (right). From Figure 3.6-11 in Technical Memorandum 3-1.



Fordyce Creek Below Fordyce Lake – Lower Study Site

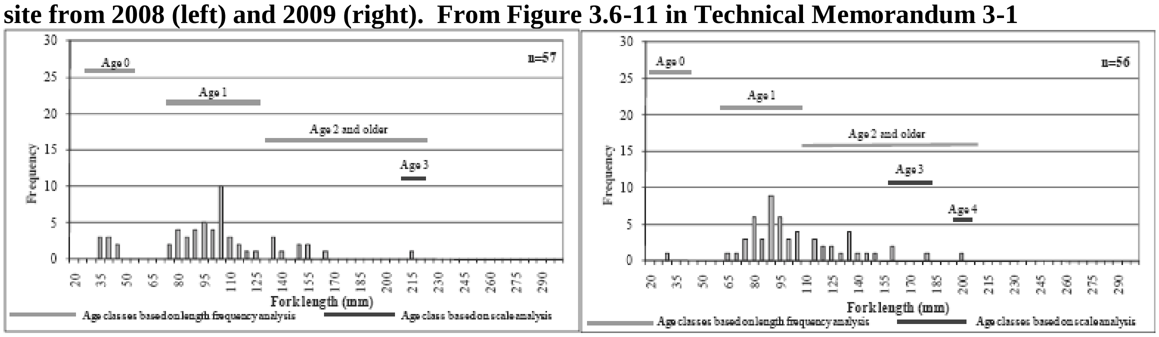
The Fordyce Lake Dam Reach – Lower (Fordyce Creek, RM 1.3), Level II quantitative site, located 9.2 miles downstream of Fordyce Lake Dam at an elevation of 5,450 ft, was sampled on

August 11, 2008 and August 5, 2009. Sampling was conducted by electrofishing the riffle and run portions of the site and snorkeling the single, 211 ft (76.5 m) long, deep pool.

Rainbow and brown trout were the only species collected at this site and rainbow trout was the dominant species each year. Brown trout were 12 percent of the fish collected in the electrofished section in 2008 and 8 percent in 2009; and were 30 percent of the biomass collected in 2008 and 41 percent in 2009.

Estimates of rainbow trout per mile in 2008 and 2009 were 866 and 896 respectively, rainbow trout biomass was 4.3 in 2008 and 5.3 lbs/acre in 2009, and the Fulton's condition factor averaged 1.13 in 2008 and 1.15 in 2009**.**

Rainbow trout length-frequency distribution and ages for Fordyce Creek below Fordyce Lake Dam– Lower site from 2008 (left) and 2009 (right). From Figure 3.6-11 in Technical Memorandum 3-1

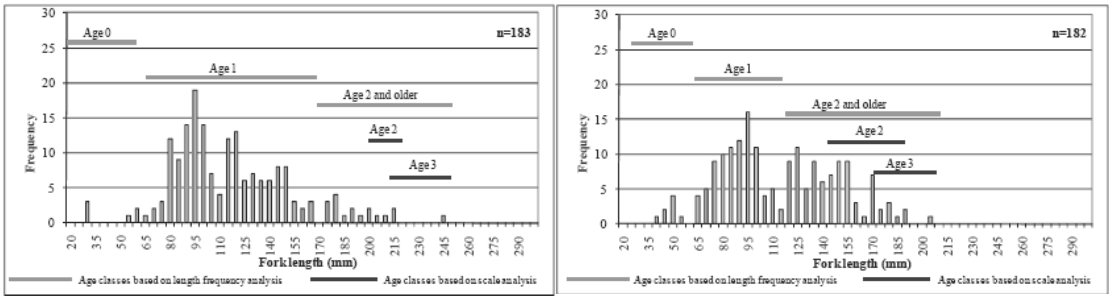


The fish population data for Fordyce Creek indicated low numbers of young of the year.

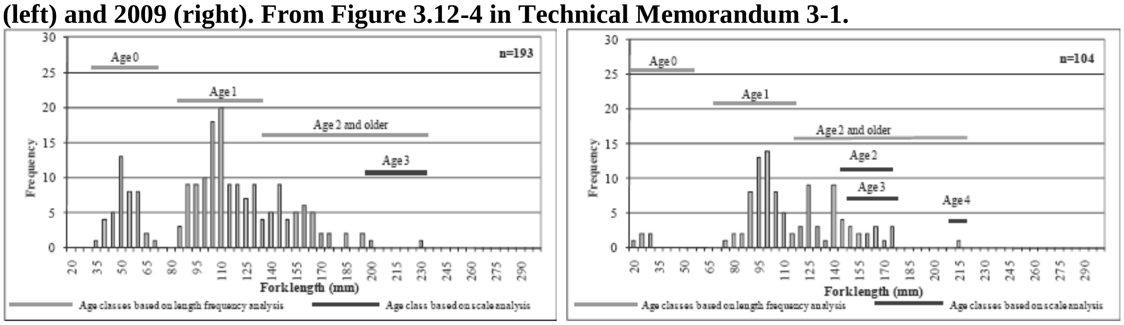
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1.



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at one site in August 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP)(see Technical Memorandum 3-10). The site was co-located with the Fordyce Lake Dam Reach - Middle Level II fish sampling site. IBI and MMI scores were 50 and 44 respectively. The site ecozone classification was montane and the dominant substrate was smooth bedrock.

<u>BMI Reference Information</u>

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were

sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Discussion of Foothill Yellow-legged Frog Studies

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

While the benthic macroinvertebrate IBI for this site was the median for all project affected sites, the MMI was somewhat lower. Both scores were well below those for the non-project affected reference reaches in the North Yuba River.

Rainbow trout population and biomass estimates for all three reaches in the Fordyce Creek site were substantially lower than the North Yuba unimpaired reference reaches. Biomass estimates were also substantially lower than the average North Sierra stream of this width (See Gerstung, 1973). Additionally, the rainbow trout population did not exhibit a robust age class structure. This indicates that, although there is at least some spawning in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a healthy population in terms of abundance or productivity.

Therefore the Resource Agencies do not consider the fish in the Fordyce Creek reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are described below:

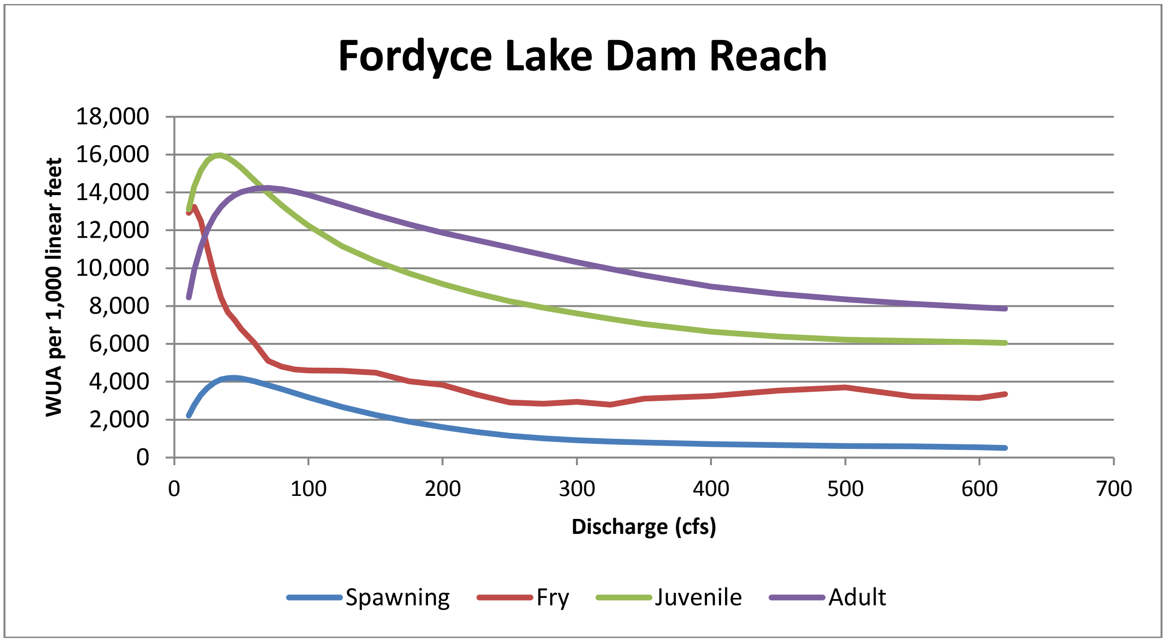
Mean unimpaired flows for the Fordyce Creek reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table FC-1 Synthesized mean unimpaired flows for the Fordyce Lake Dam Reach

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

Critically Dry	16	16	11	13	25	67	203	189	27	4	5	4
Dry	6	15	19	22	50	119	286	294	72	7	2	2
Below Normal	2	10	29	48	58	165	348	539	152	8	2	1
Above Normal	8	58	74	112	77	169	299	698	410	51	4	3
Wet	21	74	184	147	204	198	304	642	591	215	14	7

Licensee conducted one PHABSIM-type instream flow study in two subreaches between Fordyce Reservoir and Spaulding Reservoir. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the two reaches:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table FC-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Fordyce Lake Dam Reach.

	80% Max WUA	100% Max WUA
Fordyce Lake Dam Reach		
Adult	21 cfs	60 to 70 cfs
Spawning	20 cfs	40 to 45 cfs
Juvenile	< 11 cfs	30 to 35 cfs

<u>Determination of Minimum Streamflows</u>

Because biota in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows generally focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table FC-2. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure FC-1, and determined minimum flows ranging from 15 cfs, which represents 69 percent of the maximum WUA, in critically dry and dry water years to 25 cfs, which represents 85 percent of the maximum WUA, in above normal and wet water years provide sufficient water during the months of July through March.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the natural hydrograph (Table FC-1) to determine minimum flows ranging from 40 cfs to 45 cfs, which represents approximately 100 percent of the maximum WUA, should be applied during April and May. For the month of June, the Resource Agencies determined that flows ranging between 30 cfs, which represents 94 percent maximum WUA) in critically dry, dry, and below normal water years to 45 cfs in above normal and wet water years would provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during April, May and June from the adult RBT values to the RBT spawning values. Similarly, during July, flows were stepped back down from the RBT spawning values to the adult RBT values.

Table FC-3 presents the Resource Agencies determination of flows that Licensee should release from Fordyce Dam to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table FC-3. Resource Agency initial minimum flow recommendation in Fordyce Creek below Fordyce Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	20	15	15	15	15	20	40	40	30	25	20	20
Dry	20	15	15	15	15	20	40	40	30	25	20	20
Below Normal	25	20	20	20	20	25	40	40	30	25	25	25
Above Normal	25	25	25	25	25	25	45	45	45	30	25	25
Wet	25	25	25	25	25	25	45	45	45	30	25	25

<u>Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests</u>

Once the minimum streamflows were evaluated using the HEC-ResSim model, minor adjustments were made to the flows in individual months, particularly in April, and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	20	20	20	25	25	25
Nov	Adult	15	15	15	20	25	25
Dec	Adult	15	15	15	20	25	25
Jan	Adult	15	15	15	20	25	25
Feb	Adult	15	15	15	20	25	25
Mar	Adult	15	15	15	20	25	25
Apr	Adult	15	15	15	20	25	25
May	Spawn	40	40	40	40	45	45
Jun	Spawn	30	30	30	30	45	45
Jul	Adult	25	25	25	25	30	30
Aug	Adult	20	20	20	25	25	25
Sep	Adult	20	20	20	25	25	25

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	78%	78%	78%	85%	85%	85%
Nov	Adult	69%	69%	69%	78%	85%	85%
Dec	Adult	69%	69%	69%	78%	85%	85%
Jan	Adult	69%	69%	69%	78%	85%	85%
Feb	Adult	69%	69%	69%	78%	85%	85%
Mar	Adult	69%	69%	69%	78%	85%	85%
Apr	Adult	69%	69%	69%	78%	85%	85%
May	Spawn	100%	100%	100%	100%	100%	100%
Jun	Spawn	94%	94%	94%	94%	100%	100%
Jul	Adult	85%	85%	85%	85%	90%	90%
Aug	Adult	78%	78%	78%	85%	85%	85%
Sep	Adult	78%	78%	78%	85%	85%	85%

Conclusion

While the resulting rainbow trout WUA for these negotiated minimum flows does not quite meet the optimal criteria described above (in ‘Determination of Minimum Streamflows’), other measures for this reach are expected to improve habitat conditions for rainbow trout and other native fish. Under current conditions conveyance flows being delivered to Lake Spaulding are likely having an adverse affect on rainbow trout populations in this reach. The Fordyce Lake Drawdown measure is expected to result in higher spring and summer flows as Fordyce Reservoir is drawn down earlier in the season and in a more consistent manner than has occurred historically. In addition, monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species.

South Yuba River Below Kidd Lake Reservoir (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Kidd Lake Dam Reach is approximately 0.7 mi long and extends from the unnamed tributary's confluence with the South Yuba River (RM 0.0) to Kidd Lake Dam (RM 0.7). The reach has an average elevation of 6,340 ft and an overall channel gradient of 17 percent. The watershed area at the Kidd Lake Dam Reach is approximately 0.95 square miles, and the mean annual unimpaired flow is 2.3 cfs. There is currently no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population surveys in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees electrofished 20 potential fish habitat spots (accessed at RM 0.6) along a 300-ft section of the stream, starting approximately 0.1 mi downstream of Kidd Lake Dam on September 3, 2008. Access to the stream was limited in some places due to cover and steep gradient. Reach characteristics of the stream section were estimated visually. Channel substrate within the site was comprised almost entirely of bedrock (95 percent) with a limited amount of gravel (5 percent). The reach averaged 4.0 ft in width and 0.1 ft in depth and was characterized by an even distribution of shallow riffle (50 percent) and glide (50 percent) habitats. Canopy covered approximately 15 percent of the channel. In-stream cover was provided by in-stream objects (i.e., boulders or LWD) (10 percent) and overhanging vegetation (5 percent). Instantaneous water temperature was 19.4 ºC.

No fish were observed or collected.

Determination of Fish Condition

The fact that no fish were collected during the stream fish population study indicates that the population is extremely small or absent. Therefore the Resource Agencies do not consider the fish in the Kidd Lake Dam Reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

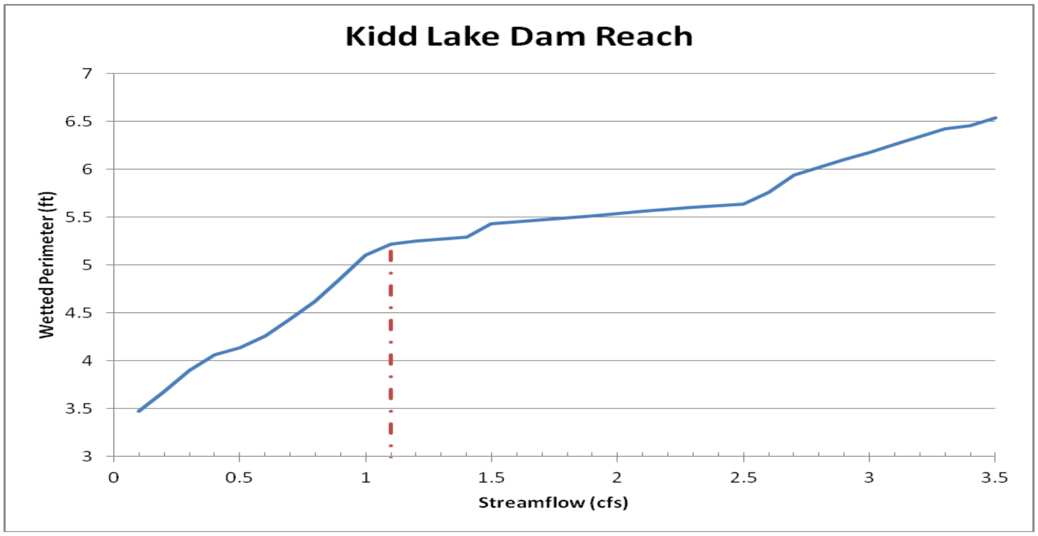
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) Channel Flow Response (CFR). Both studies are described below.

Mean unimpaired flows for the Kidd Lake Dam Reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table KL-1. Synthesized mean unimpaired flows for the Kidd Lake Dam Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.3	0.4	0.3	0.3	0.6	1.6	3.8	2.7	0.3	0.0	0.1	0.1
Dry	0.1	0.4	0.5	0.5	1.2	2.8	5.4	4.2	0.8	0.0	0.0	0.0
Below Normal	0.0	0.3	0.7	1.3	1.5	4.0	6.9	7.8	1.6	0.0	0.0	0.0
Above Normal	0.2	1.4	1.9	3.1	2.2	4.5	6.5	10.6	4.1	0.3	0.1	0.1
Wet	0.5	1.9	4.6	3.8	5.4	5.2	6.1	9.8	6.9	1.7	0.2	0.1

Using the CFR hydraulic model developed by Licensee, the Resource Agencies determined the relationship between flow and wetted perimeter at the one riffle transect evaluated below Kidd Lake. This relationship is depicted below:



Note that the breakpoint in the flow versus wetted perimeter analysis occurs at approximately 1.1 cfs. The application of the breakpoint is intended to establish a summer low-flow standard.

<u>Determination of Minimum Streamflows</u>

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum intream flows focuses on the following study information in an effort to enhance the condition of the fishery:

- The results of the wetted perimeter method presented above were used to establish a flow that maintains a living stream at all times (SWE-1);
- Emulating inter -annual flow variations to the extent feasible (SWE-2);

The following table presents the Resource Agencies determination of minimum streamflows that Licensee should release below Kidd Lake Dam to ensure that there is sufficient water to improve the condition of the fishery.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Nov	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Dec	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Jan	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Feb	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Mar	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Apr	Adult	0.5	0.5	0.5	0.5	0.5	0.5
May	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Jun	Spawn	0.5	0.5	0.5	0.75	1	1
Jul	Adult	0.5	0.5	0.5	0.5	0.5	0.5
Aug	Adult	0.5	0.5	0.5	0.5	0.5	0.5

Sep	Adult	0.5	0.5	0.5	0.5	0.5	0.5

Conclusion

Fish population data collected in 2008 indicated the absence of fish in this reach. Having a year round minimum streamflow requirement will keep the channel wetted and provide connectivity between Kidd Lake and South Yuba. Monitoring of fish populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting these species.

South Yuba River Below Lake Spaulding Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frogs, western pond turtles, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The South Yuba River below Spaulding Dam Reach flows from the Spaulding No 2 Powerhouse at RM 40.9 and elevation 4,550 ft to Englebright Reservoir at RM 0.0 and elevation 559 ft.

Among other things, this reach is affected by flows from tributaries to the South Yuba River, regulation of flows in Canyon Creek, and diversions at Lake Spaulding.

From Technical Memorandum 3-2:

> Downstream of Jordan Creek confluence to Englebright Reservoir is divided into six project-affected reaches, segmented primarily at major tributary junctions. PHABSIM was conducted in all six reaches with the consolidation of reaches one through three into one PHABSIM sub-reach. Names of the PHABSIM sub-reaches and respective project affected reach numbering are shown below.

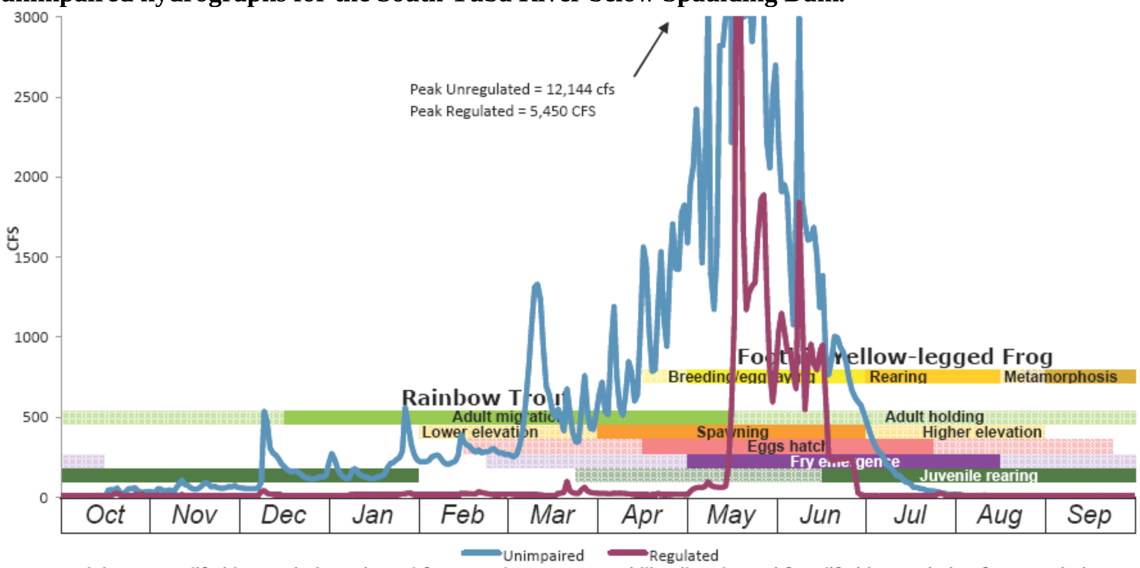
PHABSIM Sub-reach Name	Project Reach #	Upstream Boundary Rivermile	Length (miles)
Jordan Creek Sub-reach	Lower South Yuba Reach #s 1-3	40.2	7.8
Canyon Creek Sub-reach	Lower South Yuba Reach #4	32.4	4.4
Poorman Creek Sub-reach	Lower South Yuba Reach #5	28.0	8.6
Humbug Creek Sub-reach	Lower South Yuba Reach #6	19.5	19.5

Quantitative (Level II) fish surveys were conducted in Reaches # 1, 5 and 6 during 2008 and 2009. An additional Level II survey was conducted just below the Spaulding No. 2 Powerhouse during 2009.

The watershed area of the South Yuba River at Lake Spaulding is approximately 118 square miles and at Langs Crossing it is 120 square miles. It is a snowmelt driven system, with a mean annual unimpaired flow at Langs Crossing of 508 cfs.

The existing minimum streamflow requirement in this reach is 5 cfs. Figure SY-1 shows regulated and synthesized unimpaired releases for the South Yuba River below Spaulding Lake Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra Nevada.

Figure SY-1. Rainbow trout and yellow-legged frog lifestage periodicity and the regulated and synthesized unimpaired hydrographs for the South Yuba River below Spaulding Dam.



Rainbow trout life history timing adapted from Moyle, 2002. Foothill yellow-legged frog life history timing from A. Lind

*Hydrograph data from the South Yuba River below Langs Crossing

<u>Discussion of Fish Population Studies</u>

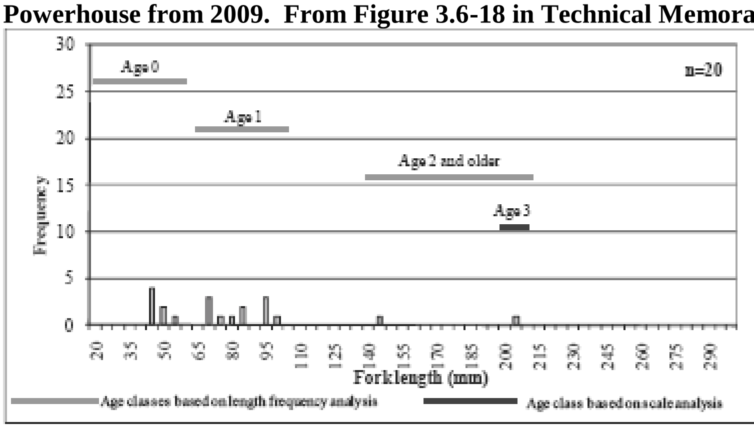
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed Level II fish population surveys in four sections in this reach; electrofishing and snorkeling according to standard fish population sampling protocols. A site located below the Spaulding #2 Powerhouse and above the confluence with Jordan Creek was sampled as a qualitative (Level I) site in 2008 and a quantitative (Level II) site in 2009.

The South Yuba River below Spaulding No. 2 Powerhouse Reach

The South Yuba River below Spaulding No. 2 Powerhouse Reach is 0.7 miles long and extends from the Spaulding No. 2 Powerhouse (RM 40.9) to the confluence with Jordan Creek (RM 40.2). The reach has a 5 percent average channel gradient and ranges from 4,680 ft at Spaulding No. 2 Powerhouse to 4,480 ft at Jordan Creek and was sampled on July 29, 2009. Rainbow and brown trout are present in this reach. The electrofishing survey estimates of rainbow trout per mile was 371, rainbow trout biomass was 3.3 lbs/acre, and the Fulton's condition factor averaged 1.19. As can be seen in the figure below, the population did not exhibit a typical age class distribution, in part due to the low numbers of fish caught.

Rainbow trout length-frequency distribution and ages for the South Yuba River below Spaulding No.2 Powerhouse from 2009. From Figure 3.6-18 in Technical Memorandum 3-1.

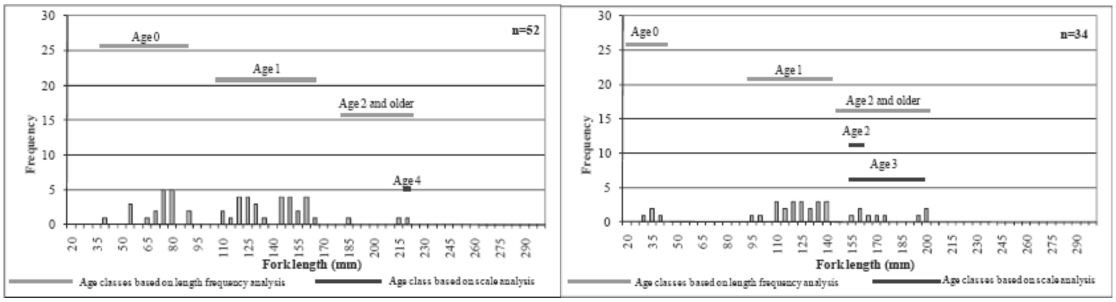


Two large pools in this reach (combined length 249.5 feet) were snorkeled because they were too deep to electroshock. The combined estimated section abundance of rainbow trout was 10 fish.

South Yuba Reach #1

The South Yuba Reach #1 (South Yuba River, RM 39.5) Level II quantitative site, located 1.5 miles downstream of Lake Spaulding at an elevation of 4,300 ft, was sampled on August 18, 2008 and July 24, 2009. Rainbow trout and brown trout are present in this reach – brown trout were only collected in 2009. Electrofishing survey estimates of rainbow trout per mile were 1392 and 862 in 2008 and 2009 respectively, rainbow trout biomass was 23.9 and 14.9 lbs/acre, and the Fulton's condition factor averaged 1.2 and 1.07. Multiple age classes of rainbow trout were present in small numbers in 2008 and 2009, although as can be seen in the figures below the population did not exhibit a typical age class distribution in either year.

Rainbow trout length-frequency distribution and ages for the South Yuba River Reach #1 from 2008 (left) and 2009 (right). From Figure 3.6-22 in Technical Memorandum 3-1

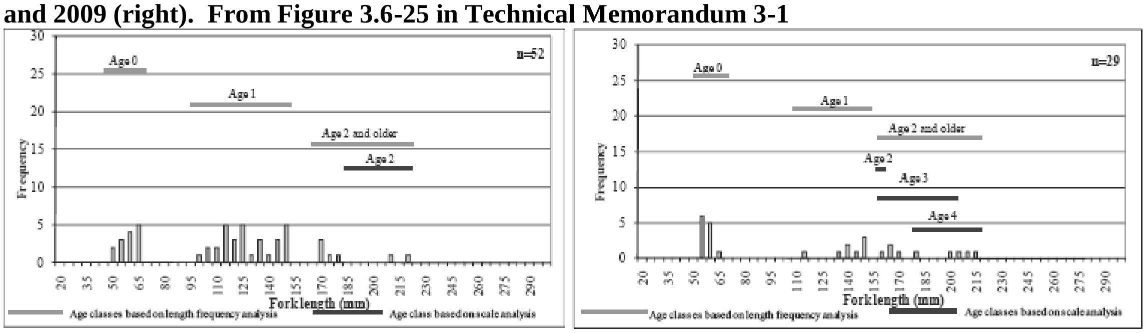


A 298 ft long, deep pool in a bedrock canyon located 0.3 miles upstream of the electrofished section was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 74 and 109 fish respectively.

South Yuba Reach #5

The South Yuba Reach #5 Level II quantitative site was located 13.4 miles downstream of Lake Spaulding at an elevation of 2,500 ft and was sampled on August 6, 2008 and July 15, 2009. Rainbow trout and Sacramento sucker (a native species) are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 1,310 and 935 in 2008 and 2009 respectively, rainbow trout biomass was 14 and 12 lbs/acre, and the Fulton's condition factor averaged 1.18 and 1.09. Electrofishing estimates of Sacramento sucker per mile were 83 and 478 for 2008 and 2009. As can be seen in the figures below, although multiple age classes of rainbow trout were present in both years, the population did not exhibit a typical age class distribution in either year.

Rainbow trout length-frequency distribution and ages for the South Yuba River Reach #5 from 2008 (left) and 2009 (right). From Figure 3.6-25 in Technical Memorandum 3-1



A 135 foot long, deep pool was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 98 and 108 fish respectively, while the estimated section abundance of Sacramento sucker was 1 and 226.

South Yuba Reach #6

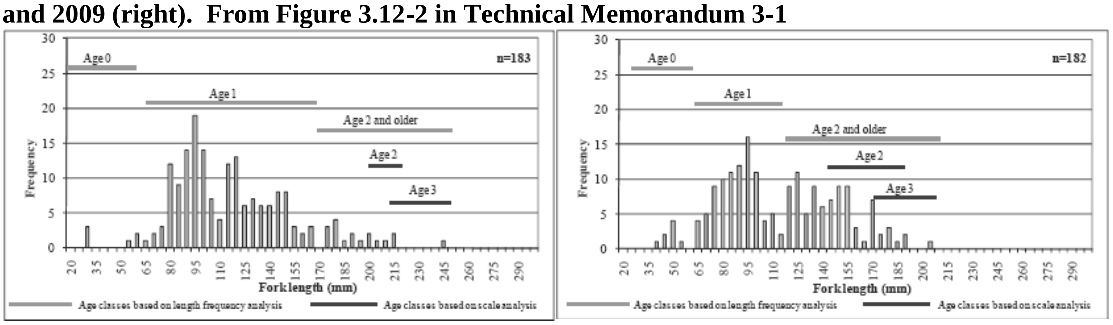
The South Yuba Reach #6 Level II quantitative site was located 25.1 miles downstream of Lake Spaulding at an elevation of 1,900 ft, was sampled on August 7, 2008
and July 16, 2009. This 305.0 ft long site was too deep to electrofish, so it was sampled by snorkeling only. Rainbow trout, Sacramento sucker and Sacramento pikeminnow (all native species) are present in this reach. The estimated site abundance of rainbow trout was 20 and 17

fish in 2008 and 2009 respectively, Sacramento sucker was 2 and 22, and Sacramento pikeminnow was 82 and 5.

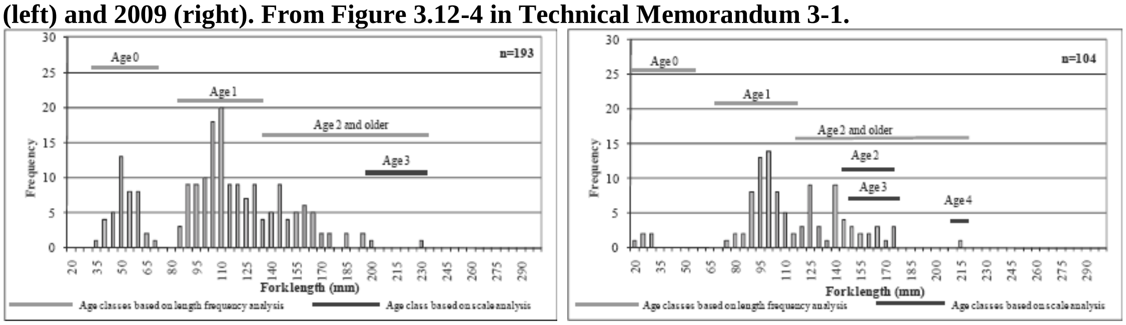
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years. The species and estimated site abundances in each year were:

Rainbow Trout		Sacramento Sucker		Sacramento Pikeminnow	
2008	2009	2008	2009	2008	2009
193	144	54	257	269	44

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

Discussion of Foothill Yellow-legged Frog Studies

Ten mainstem South Yuba River sites and seven tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and four were resurveyed in 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). All life stages (egg masses, tadpoles, juveniles, and adults) were found in the reach with post-metamorphic lifestages (young of the year, juveniles, and adults) also found in the tributary surveys. One tadpole was also found in a tributary survey of Poorman Creek. Incidental sightings of all lifestages were also made throughout the South Yuba River, both within and outside of the Study 3-6 survey site boundaries in 2008 and 2009. Across all survey sites, the number of egg masses found during surveys was relatively low, averaging less than 2 per km in 2008 and approximately 5 per km in 2009. This number is low compared to other regulated rivers, and very low compared to unregulated rivers (Kupferberg et al. 2012). In 2009, 15 egg masses were found at the site (SY-4) near the confluence with Poorman Creek suggesting that the population may be quite variable in this reach.

FYLF detections from survey sites in South Yuba River below Spaulding Reservoir Dam in 2008 and 2009; Table 3.4-7 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site	Survey 1				Survey 2[1]				Survey 3[1]			
	Egg Mass[2]	Tadpole[2]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult
South Yuba Reach #1 (Jordan Creek Confluence Reach)												
SY-10 Main	July 3, 2008				July 15, 2008				September 10, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	0	0	0	0	0	0	0	0	0
South Yuba Reach #3 (Fall Creek Confluence Reach)												
SY-7 Main	June 5, 2008				None				None			
	4 (G 9-14)	0	3	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SY-11A Main	July 7, 2008				None				None			
	0	5 (G U)	12	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SY-8 Main	June 16, 2008				None				None			
	4 (G 20–22)	0	0	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tributary	0	0	6	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
South Yuba Reach #4 (Canyon Creek Confluence Reach)												
SY-5 Main	June 12 and 13, 2008				None				August 26, 2008			
	1 (G 17–18)	60 (G 23–25)	1	2	N/A	N/A	N/A	N/A	4 (G 42–44)	24	0	3
Tributary	0	0	0	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SY-6 Main	June 14, 2008				None				August 26, 2008			
	1 (G 13–20)	340 (G 20–24)	0	6	N/A	N/A	N/A	N/A	2 (G 42–44)	22	3	0
South Yuba Reach #5 (Poorman Creek Confluence Reach)												
SY-4 Main	June 11, 2008				July 11, 2008				August 26, 2008			
	0	0	0	2	0	0	0	1	0	13	0	1
Tributary	0	0	1	7	1 (G 25–28)	0	5	9	0	2	0	2
South Yuba Reach #6 (Humbug Creek Confluence Reach)												
SY-2 Main	May 20, 2008				June 10, 2008				August 27, 2008			
	1 (G 9+)	0	8	15	2 (G U) EM = 2 (G 21)	0	3	15	2 (G U)	82	2	11
Tributary	0	0	3	12	0	0	2	6	N/A	N/A	N/A	N/A
SY-9A Main	June 20, 2009				July 8, 2008				September 9, 2009			
	0	310 (G 25)	5	12	29 (G 25)	0	2	7	1 (G 38)	52	1	15
Tributary	0	0	3	29	0	0	3	33	0	0	1	42
SY-3 Main	June 4, 2008				June 23, 2008				September 16, 2008			
	6 (G 18–23)	0	3	3	22 (G 25)	0	2	5	2 (G 43)	194	5	7
Tributary	0	0	2	14	0	0	7	41	0	66	9	32

2009 SURVEYS												
Reach/Site	Survey 1				Survey 2				Survey 3			
	Egg Mass[2]	Tadpole[2]	Juvenile	Adult	Egg Mass[2]	Tadpole[2]	Juvenile	Adult	Egg Mass[2]	Tadpole[2]	Juvenile	Adult
South Yuba Reach #1 (Jordan Creek Confluence Reach)												
SY-10 Main	June 18, 2009				June 22, 2009				None			
	0	0	0	0	0	0	0	0	N/A	N/A	N/A	N/A
South Yuba Reach #3 (Fall Creek Confluence Reach)												
SY-7 Main	June 9, 2009				June 23, 2009				None			
	0	0	4	8	6 (G 17–20)	0	2	11	N/A	N/A	N/A	N/A
South Yuba Reach #5 (Poorman Creek Confluence Reach)												
SY-4 Main	June 8, 2009				None				None			
	15 (G 10–20)	0	0	19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
South Yuba Reach #6 (Humbug Creek Confluence Reach)												
SY-3 Main	June 3, 2009				June 12, 2009				June 17, 2009			
	4 (G 2–15)	0	1	11	16 (G 2–22)	150 (G 26)	5	12	6 (G 19–21)	1,295 (G 23–26)	3	2

[1] N/A indicates survey not conducted according to study proposal or because tributary was dry.
[2] "G" is developmental stage as described in Gosner (1960); U = undetermined stage; EM = egg mass
[3] "Young" indicates young-of-year.

Discussion of Western Pond Turtle Studies

Basking site surveys were conducted at ten sites on the South Yuba River in 2010 (Study and Technical Memorandum 3-14; Nevada Irrigation District and Pacific Gas and Electric Company 2010c). Western pond turtles were found at the two sites farthest downstream from Spaulding Reservoir Dam (over 41 miles) which is just upstream of Englebright Reservoir (U.S. Army Corps of Engineers Project). A sub-adult was seen at one of the sites and 2 adults and 2 sub-adults were seen at the other. No other incidental sightings of turtles were made in this reach however, several adults were seen in the upper South Yuba River, above Spaulding Reservoir (Study and Technical Memorandum 3-9; Nevada Irrigation District and Pacific Gas and Electric Company 2010b). Conclusions about the status of this population cannot be made without additional quantitative surveys.

Discussion of Benthic Macroinvertebrate Studies

The following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP). Samples were co-located with the Stream Fish Population sampling sites and sampled on the same dates in July of 2009.

	South Yuba River Below Spaulding No. 2 Powerhouse	South Yuba River Reach #1	South Yuba River Reach #5	South Yuba River Reach #6
IBI Score	76	17	44	40
MMI Score	68	22	58	56
Dominant Substrate	Coarse gravel	Rough Bedrock	Small boulder	Rough Bedrock
Ecozone Classification	Montane	Montane	Montane	Foothill

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Determination of Aquatic Biota Condition

Benthic Macroinvertebrates

The benthic macroinvertebrate IBI and MMI scores in Reaches #5 and #6, lower down in the system were the same or slightly lower than the median and mean for the all project affected sites and considerably lower than those of the reference sites. The scores below Spaulding No. 2 Powerhouse were higher than the mean and median scores for project affected sites and, with the exception of the mean MMI score, higher than the scores for the North Yuba River reference sites. However, less than a mile downstream – immediately downstream of the Jordan Creek confluence near Lang Crossing in Reach #1, the scores were the lowest of all the study sites. This was likely in part due to the dominant substrate of rough bedrock. The scores were brought down by a high percent tolerant species, and a low EPT (Ephemeroptera-Plecoptera-Trichoptera) (generally intolerant orders) index. These scores indicate that the habitat quality is generally low in the South Yuba River, and especially low in South Yuba River Reach #1.

Foothill Yellow-legged Frogs

Suitable breeding habitat exists and foothill yellow-legged frogs occur at low abundance compared to other regulated rivers and very low abundance compared to unregulated rivers. The population appears to be variable throughout the reach. Note in Figure SY-1 that regulated flows in this reach can drop abruptly during key breeding/egg laying periods for FYLF. This flow regime potentially desiccates egg masses and strands tadpoles.

Fish

Multiple age classes were present in Spaulding No. 2 Powerhouse Reach indicating some breeding had occurred. However, fish population and biomass estimates in this reach were well below those of Lavezzola Creek, and biomass was well below the average for a North Sierra stream of this width (see Gerstung 1973).

Fish population and biomass estimates in Reach #1 were well below those of the unimpaired reference reaches, however biomass estimates during 2008 were about average for a North Sierra stream of this width.

Similarly, fish population and biomass estimates for Reach #5 were well below those of the unimpaired reference reaches, however biomass estimates were about average for a North Sierra stream of this width.

A native assemblage of rainbow trout, Sacramento sucker and Sacramento pikeminnow occurred in Reach #6. The numbers of all species were relatively low compared to the North Yuba River – Lower site, which was also a long, deep pool at a similar elevation even when adjusted for differences in reach length.

As can be seen in Figure SY-1, flows in the South Yuba River below Spaulding Dam are in general far lower than the natural hydrograph, and in the spring, can drop abruptly to 5 cfs during critical spawning, egg hatching and fry emergence. This likely desiccates redds and strands fry and juvenile fish.

Determination

Taking the above benthic macroinvertebrate, FYLF, and rainbow trout information into account, the Resource Agencies do not consider the biota in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

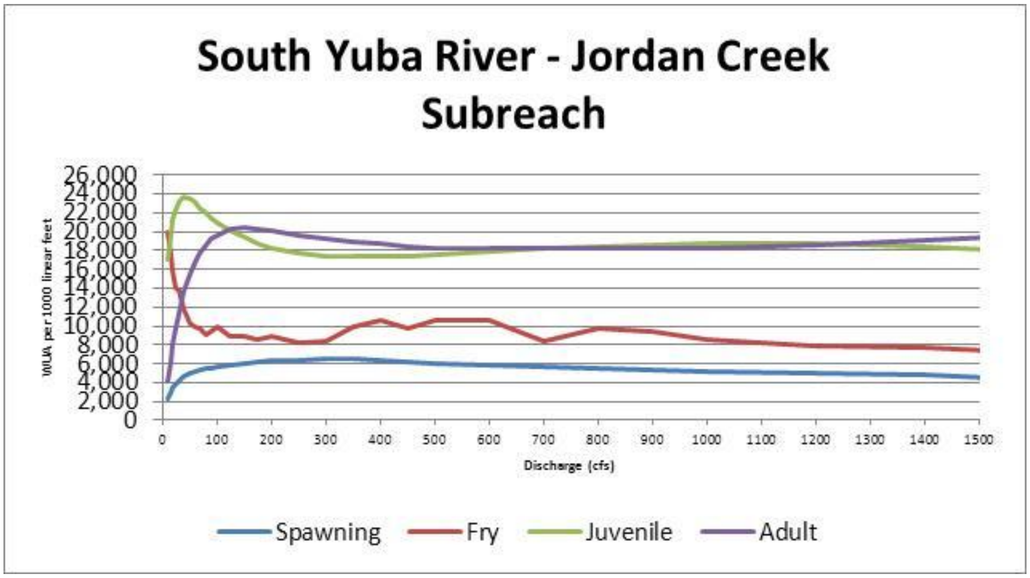
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) a water temperature modeling study. These studies are described below:

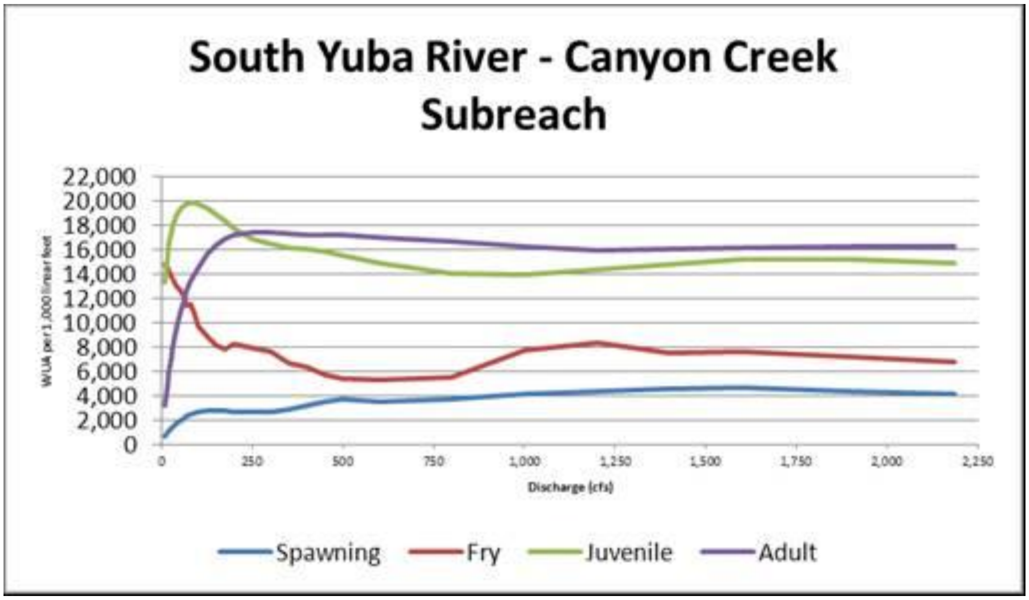
Mean unimpaired flows for the South Yuba River below Spaulding Reservoir Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA.

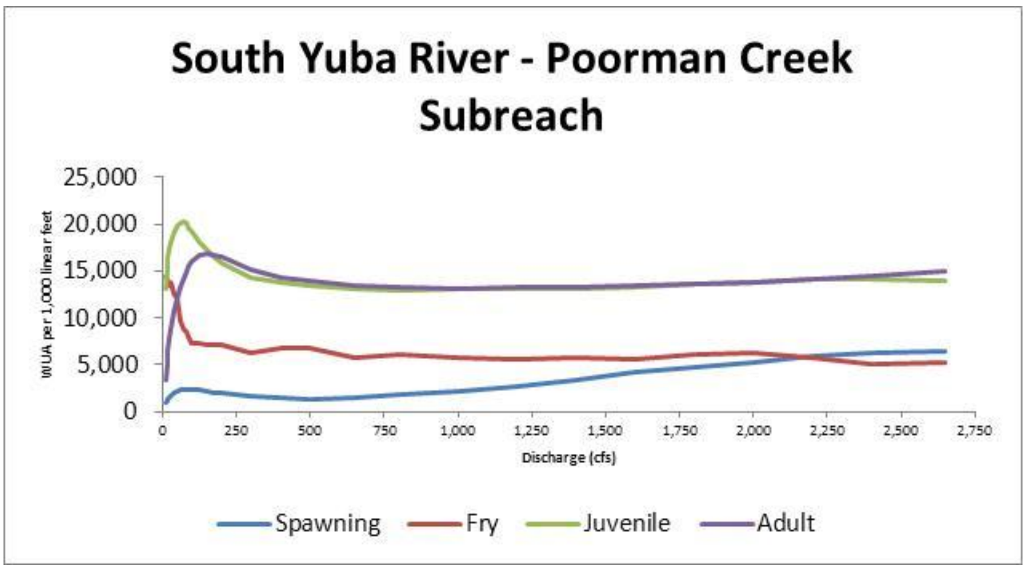
Table SY-1. Synthesized Mean Annual Flow in the South Yuba River at Langs Crossing

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	63	68	49	56	112	293	784	654	85	12	17	17
Dry	25	66	83	99	224	517	1109	1017	226	19	6	8
Below Normal	7	46	133	225	271	729	1382	1883	477	22	6	5
Above Normal	32	258	341	530	371	781	1233	2477	1264	142	13	13
Wet	88	334	823	676	951	911	1208	2283	1907	626	48	27

Licensee conducted a PHABSIM-type instream flow study in three subreaches between the Spaulding Dam and Englebright Reservoir. The reaches are designated as the Jordan Creek subreach, the Canyon Creek subreach, and the Poorman Creek subreach. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships.







Licensee has more "control" over flows in the Jordan Creek subreach, and therefore this is the section that Licensee minimum flows and other releases/spills directly affects, so the most pertinent results of the PHABSIM study are presented in the table below. This includes flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table SY-2. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in the South Yuba River, Jordan Subreach

	80% Max WUA	100% Max WUA
Adult	57 cfs	150 cfs
Spawning	58 cfs	300 cfs
Juvenile	14 cfs	40 cfs

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table SY-2 above. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure SY-1, and determined minimum flows ranging from 57 cfs in CD water years to 150 cfs in Wet water years provide sufficient water during the months of August through February in accordance with SWE-1 and the rearing component of SWE-3.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph (Table SY-1) to determine minimum flows ranging from 58 cfs in CD water years to 300 cfs in Wet water years during May provide sufficient water for spawning in accordance with SWE-3. Recommended minimum flows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during February, March and April from the adult RBT values to the RBT spawning values. Similarly, during June and July, flows were stepped back down from the RBT spawning values to the adult RBT values.

The Resource Agencies then took into account the synthesized mean unimpaired flows, water temperatures that may adversely affect frogs lower down in the drainage and tributary inflows and reduced the flows accordingly.

Table SY-3 presents the Resource Agencies determination of flows that Licensee should release below Spaulding Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table SY-3. Resource Agency initial minimum flow recommendation in the South Yuba River below Spaulding Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Critically Dry	20	20	20	20	25	25	35	55	30	25	20

Dry	23	23	23	23	25	30	65	100	50	30	23
Below Normal	25	25	25	25	35	40	100	150	80	35	25
Above Normal	28	28	28	28	40	55	115	175	90	40	28
Wet	30	30	30	30	50	75	130	200	100	40	30

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. In particular, flows were reduced to a maximum of 90 cfs in regard for Licensee concerns about maximum safe release after upgrading facilities at Spaulding Dam. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	10|20*	20	20	25	25	30
Nov	Adult	10|20*	20	20	25	25	30
Dec	Adult	10|20*	20	20	25	25	30
Jan	Adult	10|20*	20	20	25	25	30
Feb	Adult	10|20*	25	25	35	40	50
Mar	Adult	10|20*	25	30	40	55	75
Apr	Spawn	10|20*	30	40	60	80	90
May	Spawn	10|20*	40	60	90	90	90
Jun	Spawn	10|20*	35	40	50	90	90
Jul	Adult	10|20*	25	30	35	40	40
Aug	Adult	10|20*	20	23	25	40	40
Sep (1-15)	Adult	10|20*	20	23	25	40	40
Sep (16-30)	Adult	10|20*	20	20	25	28	30

*Except in the case where an EC or CD water year is followed by an EC water year (as determined above in "Water Year Types"), the EC minimum streamflow shall be 20 cfs in all months. In the case where an EC or CD water year is followed by an EC water year, the minimum streamflow shall be 10 cfs from September 1 to June 14, and the minimum streamflow shall be 20 cfs from June 15 to August 31.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	20|40%	40%	40%	48%	48%	55%
Nov	Adult	20|40%	40%	40%	48%	48%	55%
Dec	Adult	20|40%	40%	40%	48%	48%	55%
Jan	Adult	20|40%	40%	40%	48%	48%	55%
Feb	Adult	20|40%	48%	48%	61%	67%	76%
Mar	Adult	20|40%	48%	55%	67%	79%	89%
Apr	Spawn	35|53%	64%	71%	81%	85%	86%

May	Spawn	35|53%	71%	81%	86%	86%	86%
Jun	Spawn	35|53%	67%	71%	77%	86%	86%
Jul	Adult	20|40%	48%	55%	61%	67%	67%
Aug	Adult	20|40%	40%	45%	48%	67%	67%
Sep (1-15)	Adult	20|40%	40%	45%	48%	67%	67%
Sep (16-30)	Adult	20|40%	40%	40%	48%	52%	55%

Conclusion

While the resulting rainbow trout WUA for these negotiated minimum flows does not meet the optimal criteria described above (in 'Determination of Minimum Streamflows'), other measures for this reach are expected to improve habitat conditions for rainbow trout, other native fish, foothill yellow-legged frogs, and western pond turtles. Measure No. 2/Condition No. 30 – Spill Cessation and Minimization of Flow Fluctuations at South Yuba River will provide a gradual reduction in flows for any spills after May 2nd each year. Flows will be gradually reduced over a three week period. This measure is intended to protect foothill yellow-legged frog egg masses that are laid at higher flow, but it may also provide improved rainbow trout spawning conditions when spills occur during the months of May or June. This will also protect rainbow trout during critical breeding and rearing months. Increasing large woody debris in the reach (Measure No. 27/Condition No. 37 – Large Woody Debris) could help create additional habitat complexity. Monitoring of rainbow trout, foothill yellow-legged frog populations and benthic macroinvertebrates will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

South Fork Deer Creek Below Deer Creek Powerhouse (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. Although it is not specifically called out in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin, the Resource Agencies believe that this reach should be designated as "cold freshwater habitat" consistent with sources to Englebright Reservoir.

Existing Conditions, Problem Statement, and Rationale

The Deer Creek Powerhouse Reach is approximately 0.1 mi long and extends from Cascade Canal Diversion Dam to Deer Creek Powerhouse. The reach has an elevation of 3,360 ft and a channel gradient of 3.0 percent. Consumptive use deliveries from Spaulding Reservoir through the South Yuba Canal and the Chalk Bluff Canal are discharged through the Deer Creek Powerhouse to South Fork Deer Creek for rediversion at NID's Cascade Diversion Dam.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees sampled 25 potential fish habitat spots along a 192-ft section of stream starting approximately 0.05 mi downstream of Deer Creek Powerhouse on September 22, 2008. Reach characteristics were visually estimated. The channel substrate of the South Fork Deer Creek was comprised of cobble (80 percent) and boulders (20 percent). The sampled reach averaged 57.0 ft in width and 1.0 ft in depth and was primarily riffle habitat. Canopy covered 10 percent of the stream channel. Within the channel, in-stream cover was provided by surface turbulence (80 percent), in-stream objects (i.e., boulders or LWD) (10 percent), undercut banks (5 percent), and overhanging vegetation (5 percent). Instantaneous water temperature was 15.2 ºC.

No fish were either collected or observed in this reach. There was a (visually estimated) high flow of approximately 50 cfs through the entire site so the Licensee sampled above the Powerhouse also. Similarly, no fish were either collected or observed.

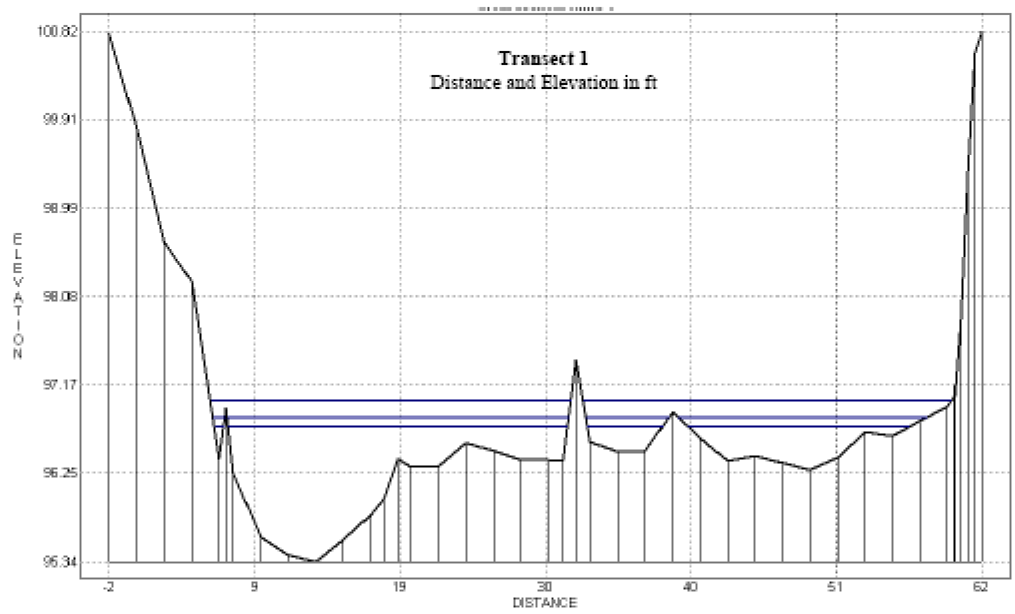
Determination of Fish Condition

No fish were collected during the stream fish population study; this indicates the population is extremely small. Tahoe National Forest indicate that rainbow and brown trout were historically present at this site. Due to the absence of fish in the Licensee surveys, the Resource Agencies do not consider the fish in the Deer Creek Powerhouse Reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

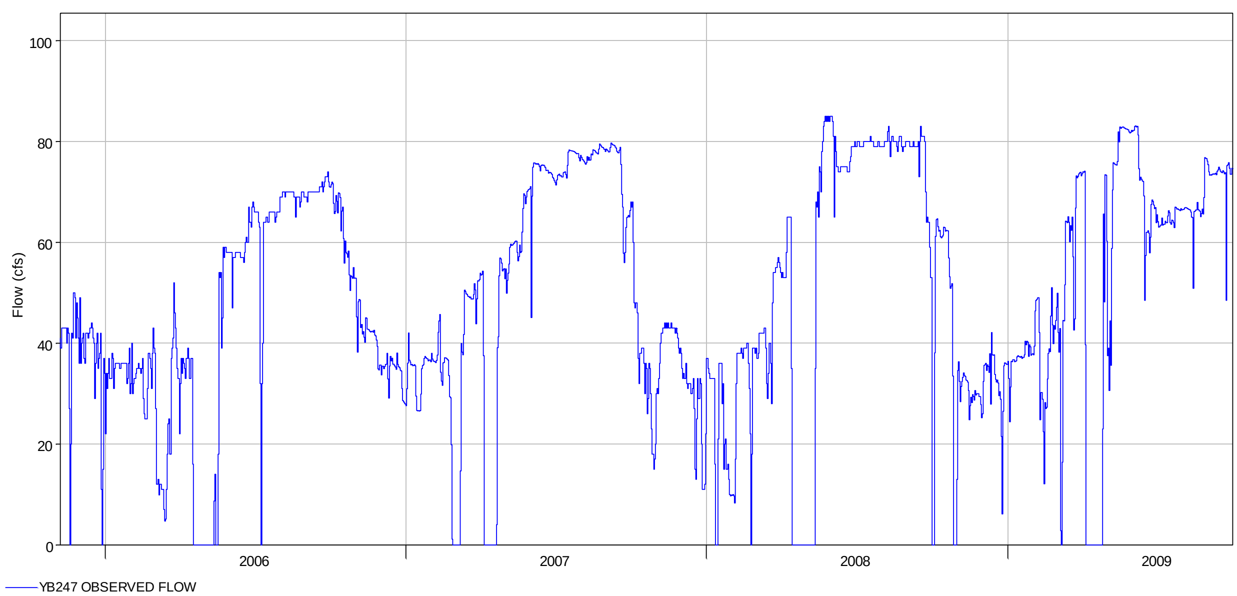
The Licensee conducted a Channel Flow Response (CFR) study. Unfortunately, the CFR hydraulic model developed by Licensee was not useful for looking at minimum streamflows for this reach, because calibration flows were much higher than the instream flow proposed by the Licensee (5 cfs). The Licensee is always delivering water through this reach for water deliveries to NID's Cascade Diversion Dam. The calibration flows for this study were 35.0 cfs, 48 cfs, and 80.9 cfs. The CFR interactive spreadsheet only calculated flows down to 14 cfs. Therefore the proposed instream flow could not be evaluated with this tool.

Figure DC-1: Cross sectional profiles and water surface elevations at 35.0, 48.0 cfs and 80.9 cfs at Deer Creek Powerhouse Reach Channel Flow Response Cross-Section 2 – Riffle.



Minimum streamflows through this short reach would only be in place when water is not being moved through PG&E's Deer Creek Powerhouse.

Figure DC-2: Measured flows at location YB-247 through PG&E's Deer Creek Powerhouse. Typically flows are significantly larger than the proposed minimum streamflow.



Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the need to maintain some water in the channel when the Licensee stops delivering water through their powerhouse to the Cascade diversion.

When there is not a call for water at NID's Cascade diversion, the Licensee is still responsible for maintaining some flow in this reach.

The following table presents flows determination of minimum streamflows below Deer Creek Powerhouse Dam that were collaboratively agreed to by the Resource Agencies, the Licensee, and other relicensing participants through the collaborative process. These flows should enhance the condition of the fishery and ensure some protection of the aquatic biota in this reach.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	5	5	5	5	5	5
Nov	Adult	5	5	5	5	5	5
Dec	Adult	5	5	5	5	5	5
Jan	Adult	5	5	5	5	5	5
Feb	Adult	5	5	5	5	5	5
Mar	Adult	5	5	5	5	5	5
Apr	Adult	5	5	5	5	5	5
May	Adult	5	5	5	5	5	5
Jun	Adult	5	5	5	5	5	5
Jul	Adult	5	5	5	5	5	5
Aug	Adult	5	5	5	5	5	5
Sep	Adult	5	5	5	5	5	5

The Licensee is exempted from the minimum streamflow requirements when the South Yuba Canal or Chalk Bluff Canal is out of service. Typically these outages occur for approximately 2 weeks in late March to early April. Although the Licensee did not calculate unimpaired hydrology for the South Fork of Deer Creek, during these early spring months some upstream flow should exist in the river.

Conclusion

Fish population data collected in 2008 indicated the absence of rainbow trout. Having a year-round minimum streamflow requirement will keep the channel wetted and provide connectivity between Deer Creek Powerhouse and Cascade Canal and Diversion Dam. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting these species.

Bear River Below Drum Canal Spill Gate (Reach No. 1) (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Bear River Reach No. 1 (inflow from Drum Canal spill gate as measured by gage YB-137 (RM 35.3) downstream to the inflow from South Yuba Canal spill gate as measured by gage YB-139 (RM 35.0)) is approximately 0.3 miles long. Average elevation for this reach is 4,700 ft. and average channel gradient is 13.1 percent (Technical Memorandum 3-2). The watershed area of the Bear River Valley below YB-139 is approximately 0.78 square miles. The release point from the Drum Canal to the Bear River at YB-137 is near the top of the Bear River watershed. The mean annual unimpaired flow is approximately 2.2 cfs. The Licensee does not divert from this reach, but periodically releases flows from the Drum Canal through YB-137 through the reach for delivery to Drum Afterbay.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach (September 4, 2008) according to standard fish population sampling protocols. The reach was sampled by using electrofishing.

Licensees sampled 50 potential fish habitat spots (accessed at RM 35.1) along a 375-ft section of stream from Bowman Lake Road through a high gradient riffle to the first instream fish barrier upstream of the road on September 4, 2008. Reach characteristics were visually estimated. Channel substrate within the sampled reach was comprised of an even distribution of cobble and boulders. The reach averaged 17.0 ft. in width and 1.2 ft. in depth and was characterized as riffle (30 percent), shallow pools (30 percent), and glide (40 percent) habitat. Canopy covered approximately 70 percent of the stream. In-stream cover was provided by surface turbulence (20 percent), in-stream objects (70 percent), and undercut banks (25 percent). Instantaneous water temperature was 15.2 ºC.

A total of 47 rainbow trout were collected. Table 3.7-4 summarizes the species composition, relative abundance, and population statistics for collected rainbow trout. The FL ranged from 48 to 164 mm with an average of 105 mm (Table 3.7-4). Figure 3.7-1 a displays length-frequency plot for collected rainbow trout. Larger fish were observed by field crews, but were not collected due to low water conductivity and complex habitat that made electrofishing challenging.

Table 3.7-4. Species composition, relative abundance, and population statistics for rainbow trout collected in the Bear River Reach #1 on September 4, 2008.

Species	Length mm			By Species			By Reach	
	Average	Min	Max	Count	% of Total	Catch/Min[1]	Count	Catch/Min[1]
Rainbow trout	105	48	164	47	100	5.2	47	5.2

[1] Time was based on the amount of time the electrofisher was 'on' and not by the amount of time the surveyors were seeking habitat spots to sample.

Rainbow trout length-frequency distribution and ages for Bear Reach No. 1 – From 2008. From Figure 3.7-1 in Technical Memorandum 3-1.

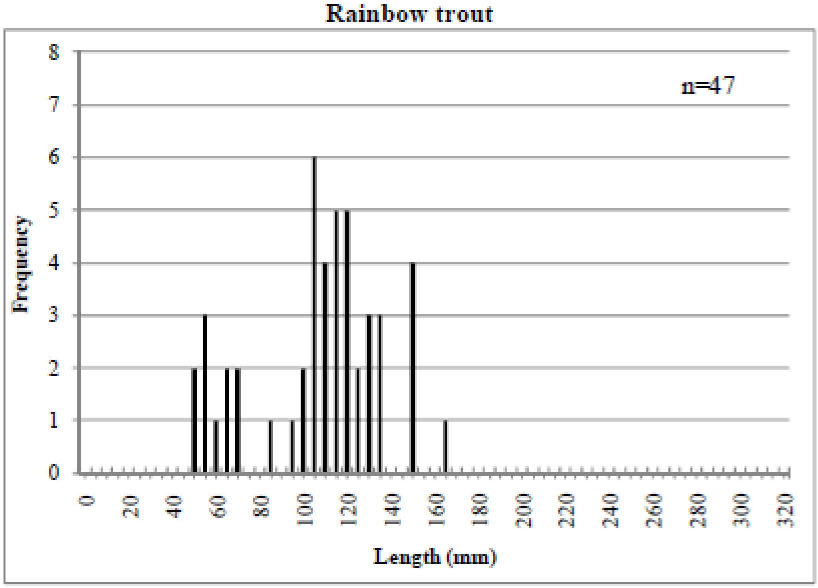


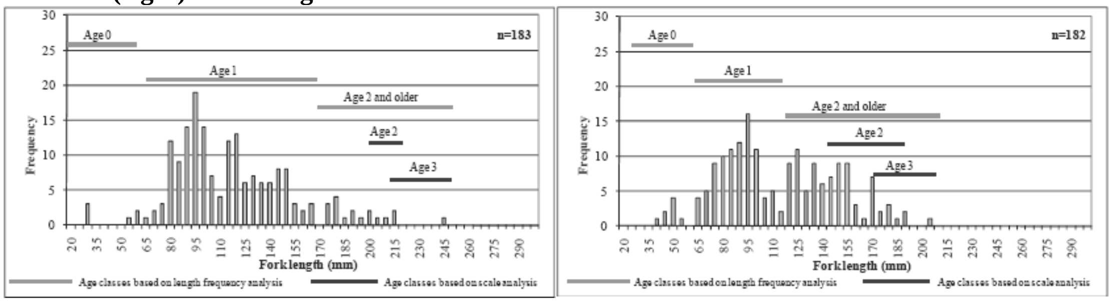
Figure 3.7-1. Length frequency for rainbow trout collected by electrofishing in Bear River Reach #1, September 4, 2008.

Multiple age classes of rainbow trout were collected in 2008 but did not include any age-0 rainbow trout in 2008.

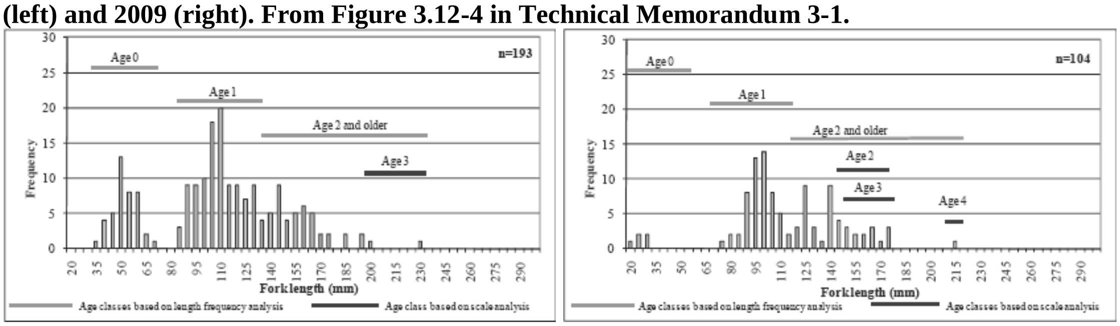
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft.) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft.) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



The fish population data for Bear River No. 1 reach indicate low numbers of young of the year. This reach is also lacking large woody debris and spawning gravels.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at one site in August 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP) (see Technical Memorandum 3-10). The site was not co-located with the Bear Reach No. 1- Level I fish sampling site.

The Bear River Reach No. 1 aquatic macroinvertebrate sampling site was approximately 0.1 mi. downstream of the Drum Canal inflow, and 7.74 miles upstream of Drum Afterbay. The elevation at this montane ecozone site was 4,711 feet. The 150-meter-long site had an average depth of 13 cm, average wetted width of 5.36 m, and average gradient of 4.2 percent (range 2.0 - 6.5 percent). The average canopy cover was 74 percent. This site consisted primarily of riffle and cascade habitat types. The average water velocity was 0.42 ft/s, and discharge was 5.05 cfs. Small boulder was the dominant substrate type, cobble was subdominant, and cobble embeddedness averaged 42 percent. This site received optimal habitat characterization scores for epifaunal substrate/cover and sediment deposition (16 and 19, respectively), and a suboptimal score (15) for channel alteration. The channel alteration score was influenced by the presence of the Drum Canal inflow upstream of the site, and a small concrete check dam just upstream of the downstream site boundary.

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

IBI and MMI scores were for the Bear River No. 1 reach were 74 and 84 respectively which are higher than the scores for the reference site and the average of all project affected sites. This indicates a relatively good water quality index.

Determination of Fish Condition

Rainbow trout population and biomass estimates for this site in the Bear River No. 1 reach could not be determined due to the qualitative Level I sampling methodology that was used. However, the rainbow trout population did not exhibit a robust age class structure (missing age class 0). This indicates that, although there is at least some spawning in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of diversity and spatial structure of age classes or productivity.

Therefore the Resource Agencies do not consider the fish in the Bear River No. 1 reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are described below:

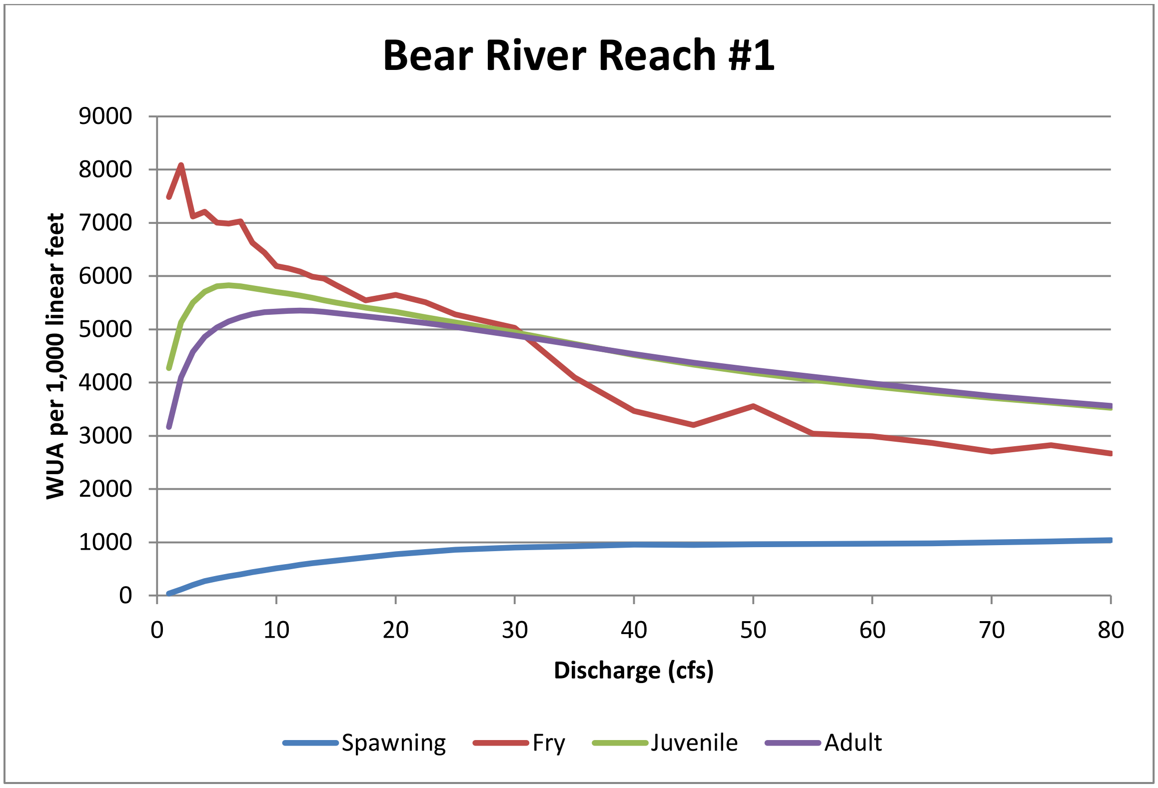
Mean unimpaired flows for the Bear Valley No. 1 reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table BR No. 1-1. Synthesized mean unimpaired flows for the Bear River No. 1 Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.3	0.4	0.3	0.4	0.7	1.7	3.2	2.3	0.2	0.0	0.1	0.1
Dry	0.1	0.4	0.5	0.6	1.4	2.9	4.6	3.6	0.6	0.1	0.0	0.0
Below Normal	0.0	0.3	0.8	1.5	1.8	4.2	6.0	6.7	1.3	0.1	0.0	0.0
Above	0.2	1.5	2.1	3.5	2.6	4.7	5.6	9.0	3.1	0.3	0.1	0.1

Normal												
Wet	**0.5**	**2.0**	**4.9**	**4.3**	**6.2**	**5.5**	**5.2**	**8.2**	**5.3**	**1.4**	**0.2**	**0.1**

Licensee conducted one PHABSIM-type instream flow study between gage YB-137 (RM 35.3) and gage YB-139 (RM 35.0). Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table BR No. 1-2 Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Bear River No. 1 Reach.

	80% Max WUA	100% Max WUA
Adult	**2.3 cfs**	**10 cfs**
Spawning	**n/a***	**n/a***
Juvenile	**1.2 cfs**	**5 to 7 cfs**

* Because the flow vs. WUA relationship continues to increase at the last simulated discharge, the last simulated discharge does not represent the maximum WUA and, therefore, the percent of maximum WUA cannot be appropriately calculated.

The PHABSIM study results suggest that these flows would provide sufficient habitat for rainbow trout adult maintenance.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition (see above), the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the fishery:

- PHABSIM study results between 80% and 100% Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80% and 100% Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table BR No. 1-2. The Resource Agencies used this and the lifestage periodicity and flow information, and determined minimum streamflows of 2 cfs, which represents 80% of the maximum adult WUA in extreme critically dry, critically dry and dry water years to 10 cfs, which represents 100% of the maximum adult WUA, in below normal, above normal and wet water years to provide sufficient water to address SWE-1 and the rearing component of SWE-3.

However, these flows were deemed to be inconsistent with the unimpaired hydrology (see Table BR No. 1-1), and flows were reduced accordingly. Specifically, the Resource Agencies recognized that the 100% WUA for adult rainbow trout was above, in most months, the synthesized mean unimpaired flows for the Bear River No. 1 reach.

Table BR No. 1-3 presents the Resource Agencies' determination of flows that should be released from the Drum Canal at YB-137 to enhance the condition of the fishery and ensure adequate protection of the aquatic biota. These minimum streamflows were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Table BR No. 1-3. Minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	1	1	1	2	2	2
Nov	Adult	1	1	1	2	2	2
Dec	Adult	1	1	1	2	2	2
Jan	Adult	1	1	1	2	2	2
Feb	Adult	1	1	1	2	2	2
Mar	Adult	1	1	1	2	2	2

Apr	Adult	1	1	1	2	2	2
May	Adult	1	1	1	2	2	2
Jun	Adult	1	1	1	2	2	2
Jul	Adult	1	1	1	2	2	2
Aug	Adult	1	1	1	2	2	2
Sep	Adult	1	1	1	2	2	2

The table below presents the adult rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Table BR No. 1-4. Trout WUA associated with the minimum streamflow agreed to by the Resource Agencies, Licensees, and other relicensing participants.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	59%	59%	59%	77%	77%	77%
Nov	Adult	59%	59%	59%	77%	77%	77%
Dec	Adult	59%	59%	59%	77%	77%	77%
Jan	Adult	59%	59%	59%	77%	77%	77%
Feb	Adult	59%	59%	59%	77%	77%	77%
Mar	Adult	59%	59%	59%	77%	77%	77%
Apr	Adult	59%	59%	59%	77%	77%	77%
May	Adult	59%	59%	59%	77%	77%	77%
Jun	Adult	59%	59%	59%	77%	77%	77%
Jul	Adult	59%	59%	59%	77%	77%	77%
Aug	Adult	59%	59%	59%	77%	77%	77%
Sep	Adult	59%	59%	59%	77%	77%	77%

Conclusion

Fish population data collected in 2008 indicated the absence of age class 0 rainbow trout in Bear River No. 1 reach. There is no existing minimum streamflow for this reach which is likely limiting overall production of rainbow trout populations. While the resulting rainbow trout WUA for these negotiated minimum streamflows does not meet the optimal criteria described above (in 'Determination of Minimum Streamflows'), monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of the health of the rainbow trout populations in the reach and whether the prescribed flows will improve existing populations.

The Licensee has agreed to install two 1 cfs orifices in the canal to deliver the agreed upon minimum streamflows.

Bear River Below South Yuba Canal Waste Gate (Reach No. 2) (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Bear River Reach No. 2 is 9.9 miles long (2.3 miles in the Meadow Sub-reach and 7.6 miles in the Boardman Sub-reach) and extends from the inflow from Drum Canal at YB-139 (RM 35.0) down to the Drum Afterbay (RM 27.4). Average elevation for this reach is approximately 3,900 ft. and average channel gradient is 3.2 percent (Technical Memorandum 3-2). The watershed area at the Highway 20 gage (USGS 11421710) is 0.76 square miles. The watershed area of the Bear River Valley above the Drum Afterbay is approximately 11.9 square miles. The mean annual unimpaired flow is approximately 2.5 cfs at YB-139 and 5.0 cfs at the Highway 20 gage. The project minimum streamflow requirement is 5 cfs below Highway 20 in the Bear River.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed three quantitative (Level II) representative fish population surveys in this reach according to standard fish population sampling protocols. All three reaches were sampled by using multi-pass electrofishing.

Upper Bear River Reach No. 2

Upper Bear River Reach No. 2 (Bear River, RM 32.9) Level II quantitative site, located 5.7 miles upstream of Drum Powerhouse at an elevation of 4,500 ft., was sampled on July 22, 2008 and July 1, 2009. The site was 281.0 ft. (85.6 m) long in a low-gradient channel (1.0 percent), and was comprised of four habitat types: low-gradient riffle, run, glide, and pool. Maximum pool depth was 3.5 ft. (1.1 m) and average channel width for the entire site was 20.1 ft. (6.1 m). Streamflow at the time of sampling was measured as 8 cfs at YB-198 in both years. Gravel was the dominant substrate and sand was the sub-dominant substrate. No large woody debris or impediments to fish passage were observed in either year. In 2008, 159 sq. ft. of suitable spawning gravel was observed and 53 sq. ft. of suitable gravel was observed in 2009. This site was located in a large meadow, which made it unique among the other fish monitoring sites in the reach. Emergent aquatic vegetation, consisting mostly of a reed grass (Phalaris spp.) and dense submerged mats of Elodea spp. in the deeper portions of the channel, provided an abundance of fish cover at this site.

A total of two rainbow trout were collected in the Upper Bear River Reach No. 2, one each in year 2008 and 2009. Rainbow trout per mile were estimated to be 19 fish per mile for both sampling years, with biomass estimates of 1.6 lbs/acre in 2008 and 0 lbs/acre in 2009. The mean Fulton's condition factor for rainbow trout was calculated to be 0.91 in 2008 and 0.95 in 2009. An average of 177 brown trout were collected in the Upper Bear River Reach No. 2 for years 2008 (162 fish) and 2009 (191 fish). The estimated brown trout abundance was 172 in 2008 and 216 in 2009. Brown trout numbers were estimated to be 3,232 fish per mile in 2008 and 4,059 fish per mile in 2009, with biomass estimates of 65.8 lbs/acre in 2008 and 77.2 lbs/acre in 2009. The mean Fulton's condition factor for brown trout was calculated to be 1.12 in 2008 and 1.08 in 2009 (Table 3.7-6) which was less than the region-wide average in 2008 and close to the region-wide average in 2009.

Table BR No. 2-1 Rainbow trout and brown trout length-frequency distribution and ages for Upper Bear River Reach No. 2 – From 2008 and 2009. From Table Figure 3.7-6 in Technical Memorandum 3-1.

Table 3.7-6. Summary of fish population information for the Bear River Reach #2 – Upper (Bear River, RM 32.9) Level II quantitative site.

Species		Rainbow trout		Brown trout	
Year		2008	2009	2008	2009
SITE LENGTH – 281.0 FEET (85.7 METERS)					
Abundance	no. collected by pass (total)	0-0-1 (1)	1-0-0 (1)	103-43-16 (162)	110-53-28 (191)
	% of fish collected	1	1	99	99
	estimated site abundance	1	1	172	216
	95% confidence interval	-	-	162-182	196-236
	fish/100m	1	1	201	252
	fish/mi	19	19	3,232	4,059
Fork length mm	mean (range)	218	54	110 (42-242)	107 (37-235)
Biomass	total weight (g)	94.5	1.5	3,639.2	4,007.6
	mean weight (g) (range)	94.5	1.5	22.5 (0.8-167.7)	21.0 (0.5-129.9)
	estimated site biomass (g)	95	2	3,864	4,533
	g/100m	110	2	4,512	5,292
	lbs/ac	1.6	0.0	65.8	77.2
	kg/ha	1.8	0.0	73.8	86.5
Condition factor	mean relative (range)	0.83	0.89	0.82 (0.45-1.33)	1.01 (0.52-1.60)
	mean Fulton's (range)	0.91	0.95	1.12 (0.60-1.93)	1.08 (0.55-1.71)
Size distribution	RSD (% of population > 152 mm FL)	-[1]	-[1]	12	18
Age class frequency in fish/100m (% of total)	0	0 (0%)	1 (100%)	64 (32%)	81 (32%)
	1	0 (0%)	0 (0%)	119 (59%)	149 (59%)
	2 and older	1 (100%)	0 (0%)	18 (9%)	22 (9%)

[1] Insufficient sample sizes (n≤20) to compute a meaningful RSD.

Figure BR No. 2–2 Rainbow trout and brown trout length-frequency distribution and ages for Upper Bear River Reach No. 2 – From 2008 and 2009. From Figure 3.7-3 in Technical Memorandum 3-1.

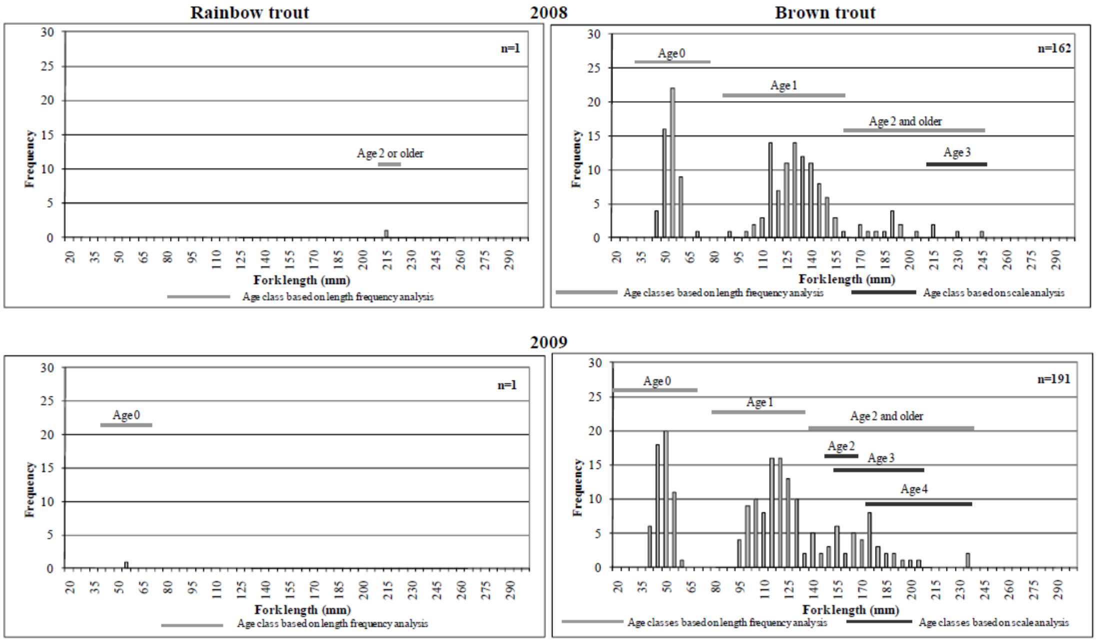


Figure 3.7-3. Length-frequency distributions and ages of rainbow and brown trout collected by electrofishing within the 281.0 ft (85.7 m) Bear River Reach #2 – Upper (Bear River, RM 32.9) Level II quantitative site, July 22, 2008 and July 1, 2009 ("n" is the total number of fish collected during multi-pass electrofishing).

Middle Bear River Reach No. 2

Middle Bear River Reach No. 2 (Bear River, RM 30.7) Level II quantitative site, located 3.5 miles upstream of Drum Powerhouse at an elevation of 4,050 ft., was sampled on July 22, 2008 and July 17, 2009. The site was 164.0 ft. (50.0 m) long in a low-gradient channel (2.5 percent), and was classified into three habitat types in 2008 (low-gradient riffle, run, and pool) and four types (low and high-gradient riffle, run, and pool) in 2009 . Maximum pool depth was 3.1 ft. (0.9 m) in 2008 and 3.3 ft. (1.0 m) in 2009. The average channel width for the entire site was 28.5 ft. (8.7 m) in 2008 and 26.0 ft. (7.9 m) in 2009. Streamflow at the time of sampling was measured as 8 and 9 cfs at YB-198 in 2008 and 2009, respectively. Bedrock/boulder was the dominant substrate and cobble was the subdominant substrate. Two square feet of suitable salmonid spawning gravel was observed in 2008; none was observed in 2009. No impediments to fish passage were present, and one piece of large woody debris was observed in 2009.

An average of 55 rainbow trout were collected in the Upper Bear River Reach No. 2 sampling site, 56 fish in year 2008 and 54 fish 2009. The estimated rainbow trout abundance was 58 fish in 2008 and 67 fish in 2009. Rainbow trout per mile were estimated to be 1,867 fish per mile for 2008 and 2,144 fish per mile in 2009, with biomass estimates of 29.2 lbs/acre in 2008 and 32.0 lbs/acre in 2009. The mean Fulton's condition factor for rainbow trout was calculated to be 1.21 in 2008 and 1.14 in 2009. An average of 18 brown trout were collected at the Middle Bear River Reach No. 2 sampling site for years 2008 (16 fish) and 2009 (19 fish). The estimated brown trout abundance was 16 fish in 2008 and 19 fish in 2009. Brown trout numbers were estimated to be 515 fish per mile in 2008 and 608 fish per mile in 2009, with biomass estimates of 17.9 lbs/acre in 2008 and 23.1 lbs/acre in 2009. The mean Fulton's condition factor was calculated to be 1.21 in 2008 and 1.13 in 2009 (Table BRNo. 2-2) which was less than the region-wide average in 2008 and close to the region-wide average in 2009.

Table BR No. 2-2 Rainbow trout and brown trout length-frequency distribution and ages for Middle Bear River Reach No. 2 – From 2008 and 2009. From Table Figure 3.7-8 in Technical Memorandum 3-1.

Table 3.7-8. Summary of fish population information for the Bear River Reach #2 – Middle (Bear River, RM 30.7) Level II quantitative site.

Species		Rainbow trout		Brown trout	
Year		2008	2009	2008	2009
SITE LENGTH – 164.0 FEET (50.0 METERS) IN 2008 AND 165.0 FEET (50.3 METERS) IN 2009					
Abundance	no. collected by pass (total)	33-10-11-2 (56)	23-12-12-7 (54)	7-6-2-1 (16)	12-4-2-1 (19)
	% of fish collected	78	74	22	26
	estimated site abundance	58	67	16	19
	95% confidence interval	56-62	54-86	16-18	19-21
	fish/100m	116	133	32	38
	fish/mi	1,867	2,144	515	608
Fork length mm	mean (range)	115 (36-258)	103 (25-224)	146 (64-310)	160 (61-232)
Biomass	total weight (g)	1,374.5	1,153.1	870.4	1,034.8
	mean weight (g) (range)	24.5 (0.5-194.4)	21.4 (0.2-110.7)	54.4 (3.6-300.0)	54.5 (2.7-135.5)
	estimated site biomass (g)	1,424	1,431	870	1,035
	g/100m	2,848	2,846	1,741	2,058
	lbs/ac	29.2	32.0	17.9	23.1
	kg/ha	32.8	35.9	20.0	25.9
Condition factor	mean relative (range)	1.02 (0.74-1.57)	0.99 (0.42-1.52)	0.91 (0.81-1.06)	1.05 (0.95-1.13)
	mean Fulton's (range)	1.21 (0.88-2.00)	1.14 (0.43-1.56)	1.21 (1.01-1.40)	1.13 (1.02-1.22)
Size distribution	RSD (% of population > 152 mm FL)	14	13	-[1]	-[1]
Age class frequency in fish/100m (% of total)	0	17 (15%)	40 (30%)	6 (19%)	7 (19%)
	1	73 (63%)	49 (37%)	20 (62%)	24 (63%)
	2 and older	26 (22%)	44 (33%)	6 (19%)	7 (18%)

[1] Insufficient sample sizes (n≤20) to compute a meaningful RSD.

Fig. BR No. 2-3 Rainbow trout and brown trout length-frequency distribution and ages for Middle Bear River Reach No. 2 – From 2008 and 2009. From Figure 3.7-5 in Technical Memorandum 3-1.

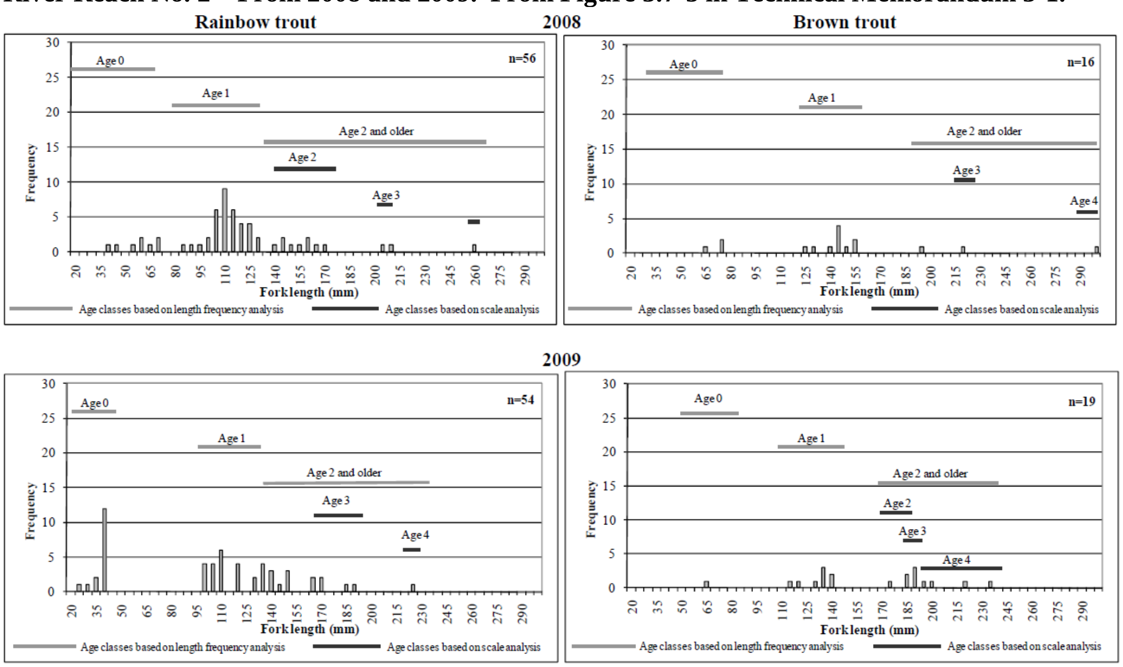


Figure 3.7-5. Length-frequency distributions and ages of rainbow and brown trout collected by electrofishing within the 164 ft (50.0 m) Bear River Reach #2 – Middle (Bear River, RM 30.7) Level II quantitative site, July 22, 2008 and July 17, 2009 ("n" is the total number of fish collected during multi-pass electrofishing). Site length was 165.0 ft (50.3 m) in 2009.

Lower Bear River Reach No. 2

Lower Bear River Reach No. 2 (Bear River, RM 28.5) Level II quantitative site, located 1.3 miles upstream of Drum Powerhouse at an elevation of 3,600 ft., was sampled on July 30, 2008 and July 2, 2009. The site was 60.0 ft. long in a medium-gradient channel (3.0 percent), and was comprised of 3 habitat types: high-gradient riffle, run, and pool. Sampling was conducted by electrofishing. Maximum pool depth was 3.8 ft. (1.2 m) both years. The average channel width for the entire site was 21.0 ft. (6.4 m) in 2008 and 20.4 ft. (6.2 m) in 2009. Streamflow at the time of sampling was measured as 7 and 8 cfs at YB-198 in 2008 and 2009, respectively. Boulder was the dominant substrate and bedrock and cobbles were the subdominant substrates. No suitable salmonid spawning gravel or fish passage impediments were observed either year, and one piece of large woody debris was observed in 2008.

An average of 50 rainbow trout were collected in the Lower Bear River Reach No. 2 Level II sampling site, 62 fish in year 2008 and 37 fish 2009. The estimated rainbow trout abundance was 70 fish in 2008 and 40 fish in 2009. Rainbow trout per mile were estimated to be 1,422 fish per mile for 2008 and 812 fish per mile in 2009, with biomass estimates of 27.0 lbs/acre in 2008 and 19.4 lbs/acre in 2009. The mean Fulton's condition factor for rainbow trout was calculated to be 1.25 in 2008 and 1.12 in 2009. An average of 11 brown trout were collected at the Middle Bear River Reach No. 2 sampling site for years 2008 (16 fish) and 2009 (6 fish). The estimated brown trout abundance was 16 fish in 2008 and 6 fish in 2009. Brown trout numbers were estimated to be 325fish per mile in 2008 and 122 fish per mile in 2009, with biomass estimates of 13.6 lbs/acre in 2008 and 4.9 lbs/acre in 2009. The mean Fulton's condition factor was calculated to be 1.33 in 2008 and 1.12 in 2009 (Table BR No. 2-3) which was less than the region-wide average in 2008 and close to the region-wide average in 2009.

Table BR No. 2-3 Rainbow trout and brown trout length-frequency distribution and ages for Lower Bear River Reach No. 2 – From 2008 and 2009. From Table Figure 3.7-10 in Technical Memorandum 3-1.

Table 3.7-10. Summary of fish population information for the Bear River Reach #2 – Lower (Bear River, RM 28.5) Level II quantitative site.

Species		Rainbow trout		Brown trout	
Year		2008	2009	2008	2009
SITE LENGTH – 260.0 FEET (79.3 METERS)					
Abundance	no. collected by pass (total)	34-20-8 (62)	20-13-4 (37)	11-5-0 (16)	3-2-1 (6)
	% of fish collected	79	86	21	14
	estimated site abundance	70	40	16	6
	95% confidence interval	62-82	37-47	16-17	6-9
	fish/100m	88	50	20	8
	fish/mi	1,422	812	325	122
Fork length mm	mean (range)	110 (35-213)	122 (26-190)	101 (37-345)	155 (124-184)
Biomass	total weight (g)	1,364.6	993.3	774.0	269.2
	mean weight (g) (range)	22.0 (0.5-124.5)	26.8 (0.1-81.6)	48.4 (0.9-595.0)	44.9 (21.5-70.3)
	estimated site biomass (g)	1,539	1,074	774	269
	g/100m	1,942	1,355	977	340
	lbs/ac	27.0	19.4	13.6	4.9
	kg/ha	30.3	21.8	15.2	5.5
Condition factor	mean relative (range)	1.04 (0.59-2.12)	0.94 (0.59-1.16)	0.96 (0.52-1.51)	1.05 (0.97-1.15)
	mean Fulton's (range)	1.25 (0.78-2.69)	1.12 (0.57-1.42)	1.33 (0.73-2.13)	1.12 (1.05-1.23)
Size distribution	RSD (% of population > 152 mm FL)	15	16	-[1]	-[1]
Age class frequency in fish/100m (% of total)	0	20 (23%)	7 (14%)	13 (63%)	5 (62%)
	1	47 (53%)	22 (43%)	6 (31%)	3 (32%)
	2 and older	21 (4%)	22 (43%)	1 (6%)	0 (6%)

[1] Insufficient sample sizes (n≤20) to compute a meaningful RSD.

Figure BRNo. 2-4 Rainbow trout and brown trout length-frequency distribution and ages for Lower Bear River Reach No. 2 – From 2008 and 2009. From Figure 3.7-7 in Technical Memorandum 3-1.

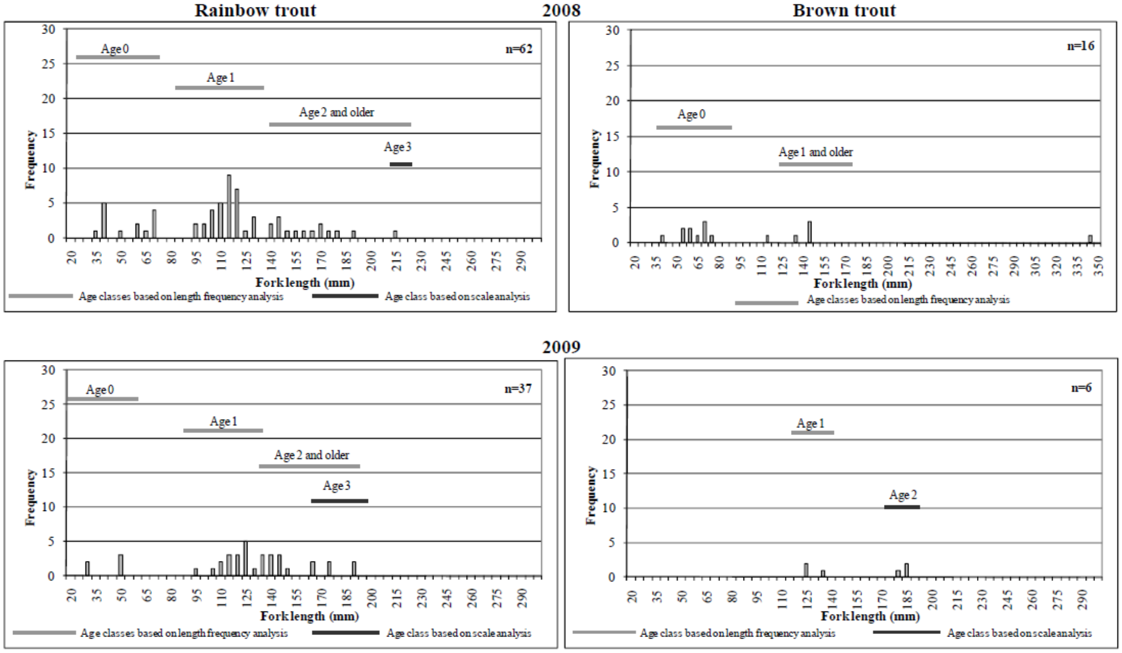
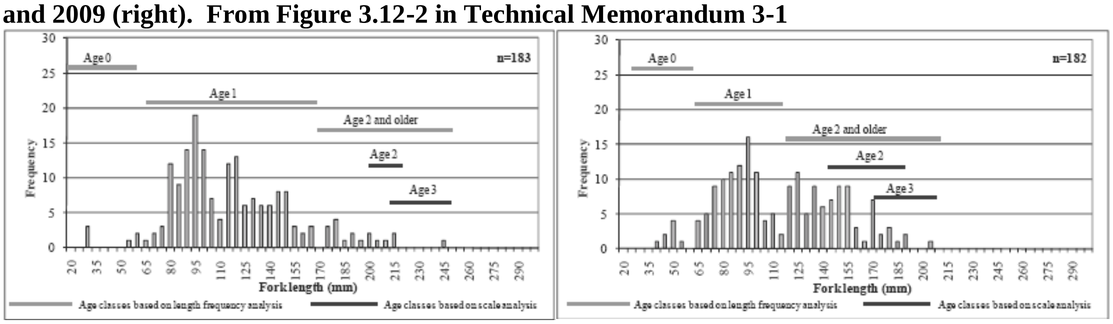


Figure 3.7-7. Length-frequency distributions and ages of rainbow and brown trout collected by electrofishing within the 260.0 ft (79.3 m) Bear River Reach #2 – Lower (Bear River, RM 28.5) Level II quantitative site, July 30, 2008 and July 2, 2009 ("n" is the total number of fish collected during multi-pass electrofishing). Note different X-axis scale for 2008 brown trout length-frequency distribution.

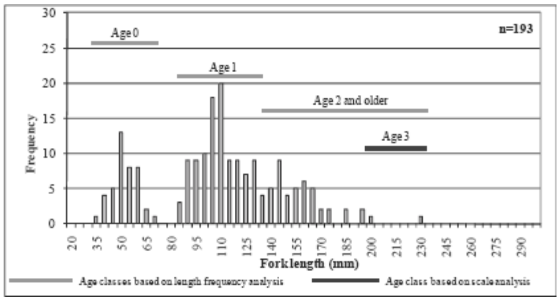
Reference Reach Information

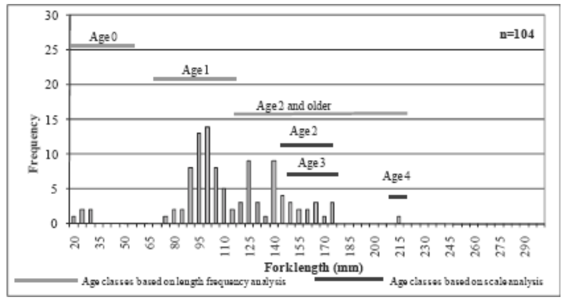
Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft.) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft.) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following figures:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.





The lower N. Yuba River site was sampled on August 21, 2008 and July 22, 2009. The sample elevation was 2,150 ft and the water temperature was 18.2°C for this site in in 2008. The fish species consisted of rainbow trout, Sacramento pikeminnow and Sacramento Sucker. Since the elevation of this reach was lower than that of the three Bear River sampling sites (4,500 ft, 4,050 ft and 3,600 ft), temperatures were considerably warmer and a transitional mixed fishery was present it was determined that only the upper and middle N. Yuba River sampling sites would be used as a comparison for the three Bear River Reach No. 2 sample sites.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at one site in August 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP) (see Technical Memorandum 3-10). The site was co-located with the Bear Reach No. 2- Level I fish sampling site.

The Bear River Reach No. 2 aquatic macroinvertebrate sampling site was approximately 2.25 mi. downstream of the Drum Canal inflow and 5.67 RM upstream of Drum Afterbay. The elevation at this montane ecozone site was 4,498 feet. The 150-meter-long site had an average depth of 31 cm, average wetted width of 5.36 m, and average gradient of 1.2 percent (range 2.0 - 6.5 percent). The average canopy cover was 37 percent. In this reach, the Bear River flowed through a large meadow, at an average water velocity of 0.59 ft/s and discharge of 8.11 cfs. Rangeland was the primary land use at this site. This site consisted primarily of run and pool habitats and is probably is not representative of the Lower Boardman Bear River No. 2 reach due to differences in gradient and geomorphology. Coarse gravel was the dominant substrate type, fine gravel was subdominant, and cobble embeddedness averaged 42 percent. This site received optimal habitat characterization scores for epifaunal substrate/cover, sediment deposition, and channel alteration (18, 17, and 19, respectively). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were

sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009).

Determination of Fish Condition

IBI and MMI scores for the Bear River Reach No. 2 were 60 and 80 respectively which are equal to or higher than the scores for the reference site and the average of all project affected sites. This indicates a relative good water quality index.

Brown trout was the dominant species in the Upper Bear River Reach No. 2 site. Only one rainbow trout was sampled in each year in this reach. There were 3,645 brown trout per mi in this reach as compared to an average of 4,532 rainbow trout for the two upper sites in the reference reach. All age classes of brown trout were present in the sample. Due to the difference in microhabitat requirements between these species, these numbers are not comparable between rivers. The same holds true for the number of pounds per acre for each river and the mean Fulton's condition factor. The probable reason for the dominance of brown trout in the upper Bear River No. 2 site is the planting of brown trout in the past by the CDFG and fall delivery of water through this reach which would favor brown trout spawning. The Resource Agencies are not managing for non-native trout species in this Project.

Rainbow trout were the dominant species in the middle (4,050 ft) and lower (3,600 ft) Bear River reach No. 2 sites with 2,005 fish and 1,117 fish sampled respectively as compared to 4,333 fish and 4,731 fish in the upper (5,350 ft) and middle (4,300 ft) N. Yuba River reaches. All age classes of rainbow trout were present in the samples. The biomass estimates of 31 lbs/ac. and 23 lbs/ac. in the middle and lower Bear River reach No. 2 were almost half of that observed in the upper and middle N. Yuba River samples. The mean Fulton's condition factor of 1.18 for rainbow trout in the middle Bear River Reach No. 2 and 1.19 for rainbow trout in the lower middle Bear River Reach No. 2 was judged to be close to the metric of >1.20 that is generally representative of a salmonid in good condition. The population numbers in the middle and lower Bear No. 2 reaches were substantially lower as compared to the unimpaired reaches in the upper and middle N. Yuba River. This indicates that, although there is at least some spawning in all years, there may not be good quality habitat to support robust populations of rainbow trout. This does not indicate a viable population in terms of productivity for the middle and lower subreaches of Bear River Reach No. 2 as compared to the unimpaired sampled reaches.

In consideration of the rainbow trout populations in the three subreaches, the Resource Agencies do not consider the fish in the Bear River No. 2 reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12) ;2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); and 3) water temperature monitoring. These studies are described below:

Mean unimpaired flows for the Bear Valley Reach No. 2 reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following tables present the average monthly unimpaired flows, by water year type, for three locations throughout the reach.

Table BR No. 2-4. Synthesized mean unimpaired flow for the Bear River No. 2 Reach at the Highway 20 gage.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.9	1.0	0.9	1.0	1.8	3.6	5.1	3.6	0.6	0.2	0.2	0.2
Dry	0.6	1.2	1.4	1.6	3.1	5.9	8.2	5.8	1.4	0.4	0.2	0.3
Below Normal	0.4	0.9	2.1	3.2	4.6	9.2	10.8	10.7	2.5	0.6	0.4	0.3
Above Normal	0.6	3.2	5.2	9.5	8.0	12.0	11.8	14.9	5.3	1.1	0.6	0.5
Wet	1.2	3.9	10.6	12.8	18.1	15.3	13.9	16.6	9.1	2.9	0.9	0.8

Table BR No. 2-5. Synthesized mean unimpaired flow for the Bear River No. 2 Reach above Boardman Diversion.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	2.2	2.4	2.2	2.5	4.3	8.4	11.7	8.2	1.5	0.5	0.6	0.6
Dry	1.5	3.0	3.3	3.8	7.3	13.9	19.0	13.4	3.3	1.0	0.6	0.6
Below Normal	0.9	2.1	5.0	7.6	11.0	21.7	25.3	24.7	5.8	1.4	0.9	0.8
Above Normal	1.6	7.6	12.3	22.7	19.2	28.6	27.8	34.4	12.4	2.7	1.5	1.4
Wet	2.8	9.2	25.1	30.9	43.6	36.9	33.5	39.1	21.1	6.9	2.3	1.9

Table BRNo. 2-6. Synthesized mean unimpaired flow for the Bear RiverNo. 2 Reach above Drum Afterbay.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	7	7	7	8	12	22	24	17	5	2	2	2
Dry	5	9	10	11	19	36	44	29	9	4	2	2
Below Normal	3	6	14	20	32	58	60	52	14	5	3	3
Above Normal	5	20	35	67	59	82	73	75	28	9	5	5
Wet	8	23	67	94	132	110	99	100	47	18	8	7

The Licensee conducted a PHABSIM study in two subreaches between the Drum Canal at YB-139 (RM 35.0) and Drum Afterbay (RM 27.4)._Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:

Figure BR No. 2-7. Rainbow trout WUA Plot for the Meadow Bear RiverNo. 2 sub-reach.

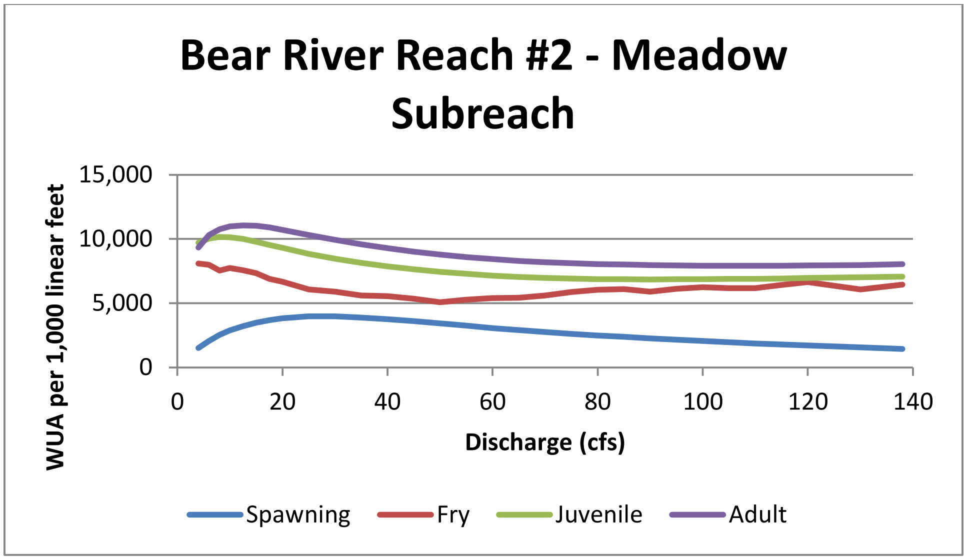
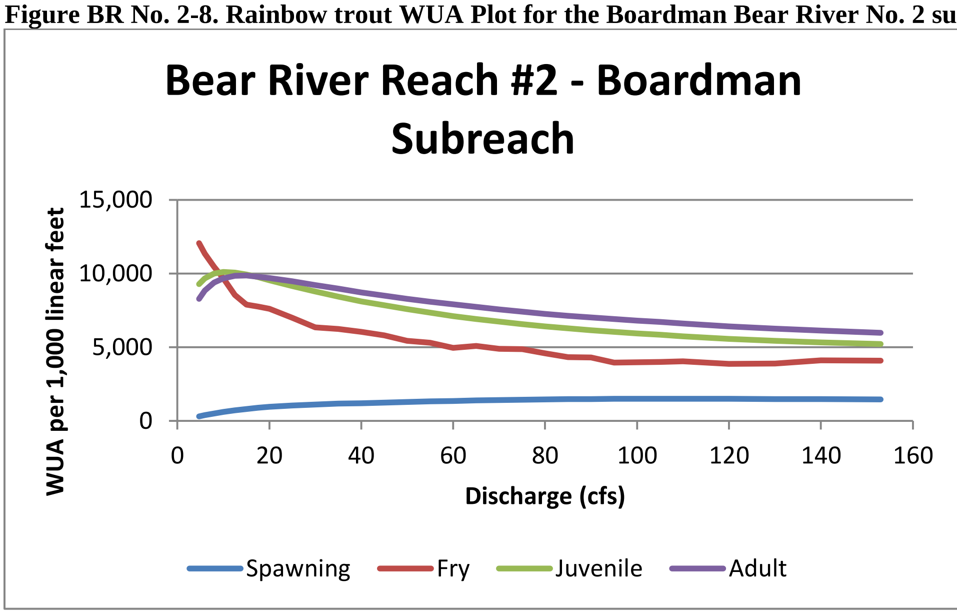


Figure BR No. 2-8. Rainbow trout WUA Plot for the Boardman Bear River No. 2 sub-reach.



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table BR No. 2-7. Results of Bear River No. 2 PHABSIM study.

	80% Max WUA	100% Max WUA
Meadow Subreach		
Adult	< 4 cfs	12.5cfs
Spawning	12.5 cfs	25 cfs
Juvenile	< 4 cfs	8 cfs
Boardman Subreach		
Adult	< 4.7 cfs	12.5 cfs

Spawning	n/a*	n/a*
Juvenile	< 4.7 cfs	10 cfs

* Because the flow vs. WUA relationship continues to increase at the last simulated discharge, the last simulated discharge does not represent the maximum WUA and, therefore, the percent of maximum WUA cannot be appropriately calculated.

The PHABSIM study suggests that these flows would provide sufficient habitat for rainbow trout adult maintenance. However, Resource Agency staff believe that there are also other factors influencing the poor condition of the fishery in this reach. Flows in the Bear River reach No. 2 do not appear from the historical flow records to approximate the timing, magnitude and duration of the unimpaired snowmelt hydrograph due to domestic water supply delivery and hydropower generation project requirements. The spring snowmelt flows are greatly reduced over that of natural conditions and the fall low flow conditions have been greatly exceeded in the past.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table BR No. 2-7. The Resource Agencies used these flows and determined appropriate minimum streamflows (Table BR No. 2-8) of between 5 cfs (80 percent of the maximum adult WUA) in critically dry, and dry water years non-spawning months, and 25 cfs (100 percent of maximum spawning WUA) in the spawning months of wet water years would provide sufficient minimum streamflows to address SWE-1, SWE-2 and the rearing component of SWE-3.

Table BR No, 2-8 presents the Resource Agencies' determination of flows that the Licensee should release into Bear River Reach No. 2, as measured at YB-198 to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table BR No. 2-8 Resource Agency initial minimum streamflow recommendation in Bear River Reach No. 2.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	5	5	5	5	5	7	13	13	13	5	5	5
Dry	5	5	5	5	5	7	13	13	13	5	5	5
Below Normal	5	5	5	5	5	10	15	15	15	5	5	5
Above Normal	5	5	5	5	5	15	20	20	20	5	5	5

Wet	5	5	5	5	5	20	25	25	25	5	5	5

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Table BR No. 2-9. Minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants for the Bear River No. 2 reach.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	5	5	5	5	5	5
Nov	Adult	5	5	5	5	5	5
Dec	Adult	5	5	5	5	5	5
Jan	Adult	5	5	5	5	5	5
Feb	Adult	5	5	5	5	5	5
Mar	Adult	5	5	5	5	5	5
Apr	Spawn	13	13	13	13	13	13
May	Spawn	13	13	13	13	13	13
Jun	Spawn	13	13	13	13	13	13
Jul	Adult	8	8	8	8	8	8
Aug	Adult	8	8	8	8	8	8
Sep	Adult	8	8	8	8	8	8

The table below presents the adult rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Table BR No. 2-10. Trout WUA associated with the minimum streamflow agreed to by the Resource Agencies, Licensees, and other relicensing participants for the Meadow sub-reach.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	89%	89%	89%	89%	89%	89%
Nov	Adult	89%	89%	89%	89%	89%	89%
Dec	Adult	89%	89%	89%	89%	89%	89%
Jan	Adult	89%	89%	89%	89%	89%	89%
Feb	Adult	89%	89%	89%	89%	89%	89%
Mar	Adult	89%	89%	89%	89%	89%	89%
Apr	Spawn	82%	82%	82%	82%	82%	82%
May	Spawn	82%	82%	82%	82%	82%	82%

Jun	Spawn	82%	82%	82%	82%	82%	82%
Jul	Adult	97%	97%	97%	97%	97%	97%
Aug	Adult	97%	97%	97%	97%	97%	97%
Sep	Adult	97%	97%	97%	97%	97%	97%

Table BR No. 2-11. Trout WUA associated with the minimum streamflow agreed to by the Resource Agencies, Licensees, and other relicensing participants for the Boardman sub-reach.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	85%	85%	85%	85%	85%	85%
Nov	Adult	85%	85%	85%	85%	85%	85%
Dec	Adult	85%	85%	85%	85%	85%	85%
Jan	Adult	85%	85%	85%	85%	85%	85%
Feb	Adult	85%	85%	85%	85%	85%	85%
Mar	Adult	85%	85%	85%	85%	85%	85%
Apr	Adult	n/a	n/a	n/a	n/a	n/a	n/a
May	Adult	n/a	n/a	n/a	n/a	n/a	n/a
Jun	Adult	n/a	n/a	n/a	n/a	n/a	n/a
Jul	Adult	95%	95%	95%	95%	95%	95%
Aug	Adult	95%	95%	95%	95%	95%	95%
Sep	Adult	95%	95%	95%	95%	95%	95%

Conclusion

Fish population data collected in 2008 and 2009 indicate lower productivity as compared to the N. Yuba upper and middle reference reaches for rainbow trout in the Bear River No. 2 middle and lower reaches. The 5 cfs existing minimum streamflow for this reach and out of season high flows are likely limiting overall production of rainbow trout populations. While the resulting rainbow trout WUA for these negotiated minimum streamflows does not meet the optimal criteria described above (in "Determination of Minimum Streamflows"), monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of the health of the rainbow trout populations in the reach and whether the prescribed flows will improve existing populations.

Bear River Below Drum Afterbay Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frog, and benthic macroinvertebrate. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The reach of the Bear River below the Drum Afterbay Dam is approximately 4.7 miles long, extending from the base of Drum Afterbay Dam (El. 3,283 ft) at River Mile 26.9 to Dutch Flat Afterbay (El. 2,741 ft) at River Mile 22.2. The overall channel gradient is approximately 2.3 percent (Technical Memorandum 3-2). The watershed area is approximately 12 square miles and the mean annual unimpaired flow was 33 cfs

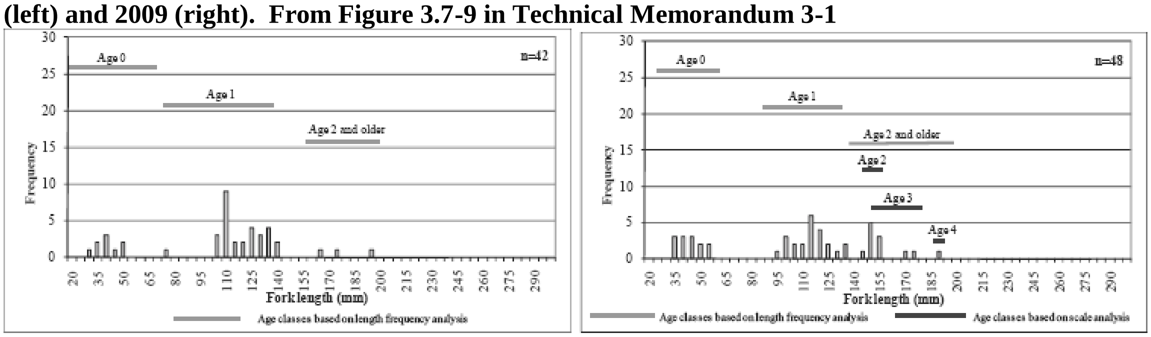
Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a quantitative (Level II) representative fish population survey in the reach according to standard fish population sampling protocols, including the application of electrofishing techniques.

The Drum Afterbay Dam Reach sampling site was located at river mile 24.5, which is 1.7 miles downstream of Drum Afterbay Dam at an elevation of 3,200 ft. It was sampled on July 31, 2008 and August 3, 2009. Rainbow trout and brown trout are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 1,091 and 1,309 in 2008 and 2009 respectively, rainbow trout biomass was 13.6 and 16.6 lbs/acre, and the Fulton's condition factor averaged 1.5 and 1.12. As can be seen in the figures below, all age classes were present, but likely due to the low numbers caught, the population did not exhibit a typical age class distribution in either year.

Figure DA-2. Rainbow trout length-frequency distribution and ages for the Drum Afterbay Reach from 2008 (left) and 2009 (right). From Figure 3.7-9 in Technical Memorandum 3-1



One brown trout was captured in 2008 and none were captured in 2009.

Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Figure DA-3. Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1

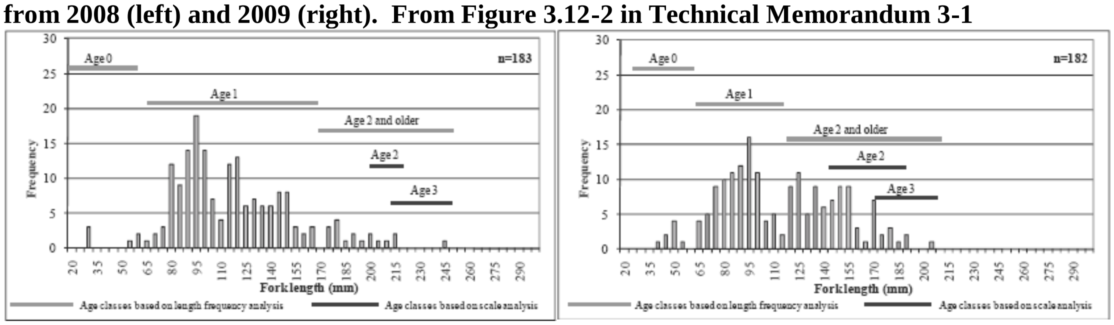
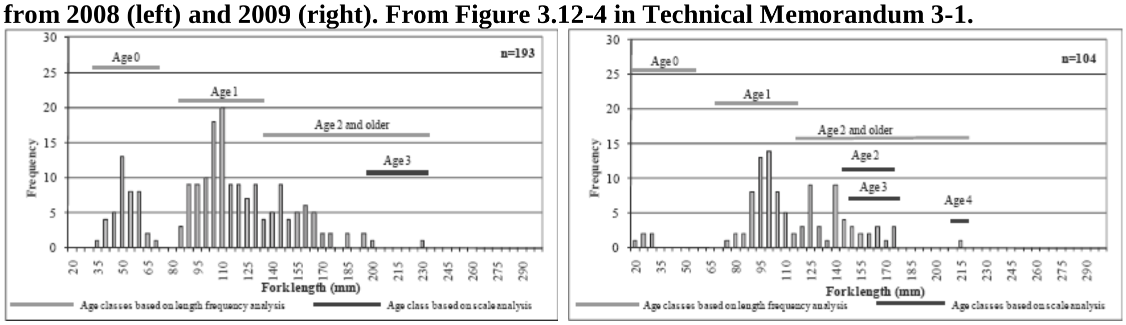


Figure DA-4. Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

Discussion of Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates were sampled in this reach on August 12, 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (see Technical Memorandum 3-10). The benthic macroinvertebrate site was co-located with the stream fish population sampling site in the reach. IBI and MMI scores were 67 and 70 respectively in the site and the dominant substrate for was cobble. The ecozone classification was montane.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Discussion of Foothill Yellow-legged frog (FYLF) Studies

Three mainstem Bear River sites and two tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and one site was resurveyed in 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). Only post-metamorphic lifestages (juveniles, and adults) were found in the main river and tributary surveys and all of these were at the lower most survey site (DA-1). DA-1 is approximately 3.7 miles downstream of the dam. One incidental sighting of an adult was also made in this vicinity in 2009. Based on this information and descriptions of habitat suitability in Technical Memorandum 3-6, information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat is limited. In addition, it appears that water temperatures are relatively cold which may hinder survival of egg masses and tadpoles. However, the presence of juveniles within the reach indicates that breeding is occurring somewhere in the vicinity, potentially in one of the perennial tributaries.

Table DA-1. FYLF detections from survey sites in Bear River below Drum Afterbay Dam in 2008 and 2009; Table 3.4-12 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site	Survey 1				Survey 2				Survey 3[2]			
	Egg Mass	Tadpole	Juvenile	Adult	Tadpole	Young	Juvenile	Adult	Tadpole	Young	Juvenile	Adult
DA-1 Main	May 22, 2008				June 25, 2008				September 11 and 15, 2008			
	0	0	0	2	0	0	0	0	0	0	1	4

[2] N/A indicates survey not conducted because tributary was dry.

Tributary	0	0	1	0	0	0	0	0	0	0	0	1
DA-2 Main	June 13, 2008				June 25, 2008				September 11, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	0	0	0	0	0	N/A	N/A	N/A	N/A
DA-3 Main	June 25, 2008				July 2, 2008				September 11, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
2009 SURVEYS												
Reach/Site	**Survey 1**			**Survey 2**			**Survey 3**			**Survey 4**		
	Egg Mass	**Tadpole**	**Juvenile/ Adult**	**Egg Mass**	**Tadpole**	**Juvenile/ Adult**	**Egg Mass**	**Tadpole**	**Juvenile/ Adult**	**Tadpole**	**Young**	**Juvenile/ Adult**
DA-1 Main	June 2, 2009			June 11, 2009			June 16, 2009			August 13, 2009		
	0	0	0	0	0	3 (adults)	0	0	2 (adults)	0	0	0

Discussion of Western Pond Turtle Studies

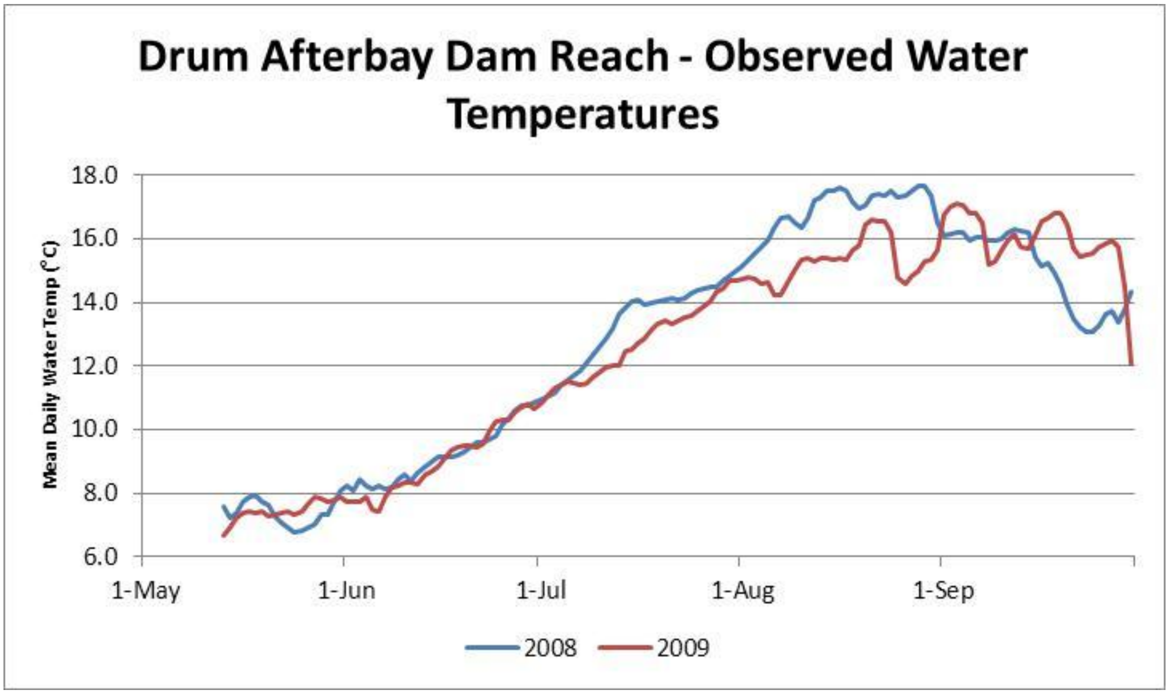
No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

The IBI and MMI scores for the Drum Afterbay Dam Reach study site were comparable to the IBI and MMI scores in the Upper North Yuba River study site, which was also classified as a montane ecozone. Additionally, the IBI and MMI scores were considerably better than the means and medians calculated for all project-affected reaches. These results suggest that there is good quality habitat in the reach.

Foothill yellow-legged frogs were present, but in very low numbers. No egg masses, tadpoles, or young-of-the-year were found in this reach during any of the surveys, and only a small number of juveniles and adults were observed. These results are not surprising given that the water temperatures, as measured at WT-59 below Drum Afterbay Dam, were below the 10°C FYLF breeding/egg laying temperature threshold during April and May of both 2008 and 2009. Figure DA-5 depicts the mean daily temperatures observed during 2008 and 2009.

Figure DA-5. Water Temperatures at Station WT-59.



Rainbow trout population and biomass estimates in the Bear River below the Drum Afterbay Dam were substantially lower than the North Yuba unimpaired reference reaches, including both the Upper study site and the Lower study site. Biomass estimates were also substantially lower than the average North Sierra stream of this width, which is 24 lbs/acre (Gerstung, 1973). Additionally, while the rainbow trout population did contain a few representatives of each age class, the population as a whole was significantly depressed. This suggests that, although there is at least some habitat, there may not be sufficient good quality habitat available to support a healthy and sustainable population in terms of abundance or productivity. Therefore the Resource Agencies do not consider the fish in the Bear River below the Drum Afterbay Dam to be in good condition.

Discussion of Relevant Instream Flow Related Studies

The Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) an SSTEMP-based water temperature modeling study. These studies are described below:

Mean unimpaired flows for the Bear River below Drum Afterbay Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table DA-2 presents the average monthly unimpaired flows, by water year type, for the reach.

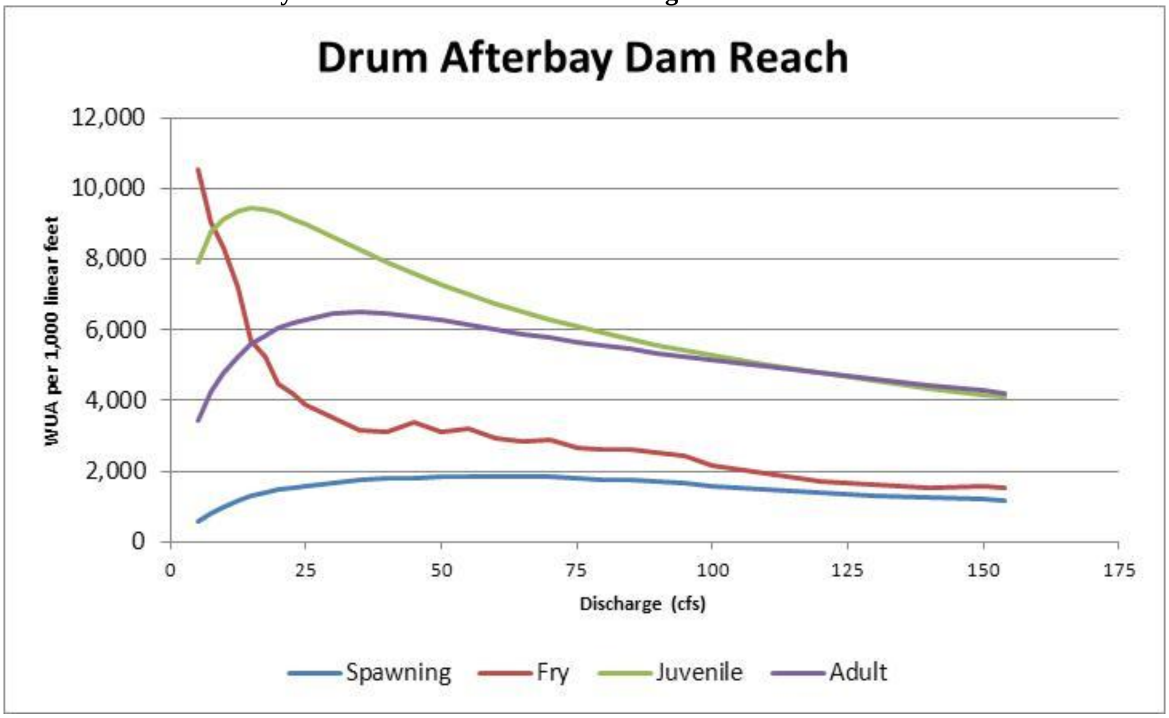
Table DA-2. Synthesized mean unimpaired flows for the Bear River below the Drum Afterbay Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	7	7	7	8	13	23	25	17	5	2	2	2
Dry	6	10	10	11	20	37	45	29	9	4	2	2

Below Normal	4	7	15	21	33	60	62	53	15	5	4	3
Above Normal	5	21	36	70	62	85	75	77	29	9	6	5
Wet	8	24	69	99	138	115	103	103	49	18	8	7

The Licensee conducted a PHABSIM-type instream flow study in the Bear River below the Drum Afterbay Dam. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:

Figure DA-6. Drum Afterbay Dam Reach PHABSIM Modeling Results



The most pertinent results of the PHABSIM study are presented in Table DA-3, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table DA-3. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in the Bear River below Drum Afterbay Dam

	80% Max WUA	100% Max WUA
Adult	12.5 cfs	35 cfs
Spawning	20 cfs	55 cfs
Juvenile	<5 cfs	15 cfs

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table DA-3. The Resource Agencies used this and determined minimum streamflows ranging from 13 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 35 cfs, which represents 100 percent of the maximum WUA, in wet water years provide sufficient water during the months of July through January to address SWE-1 and the rearing component of SWE-3.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph (Table DA-3) to determine minimum streamflows ranging from 20 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 55 cfs, which represents 100 percent of the maximum WUA, in wet water years during the months of March, April and May provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during February from the adult RBT values to the RBT spawning values. Similarly, during June, flows were stepped back down from the RBT spawning values to the adult RBT values.

The recommended minimum streamflows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

Table DA-4 presents the Resource Agencies' determination of flows that should be released from the Drum Afterbay Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table DA-4. Resource Agency initial minimum streamflow recommendation in the Bear River below Drum Afterbay Dam

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	13	13	13	13	13	20	20	20	18	13	13	13
Dry	19	19	19	19	21	29	29	29	25	19	18	18
Below Normal	24	24	24	24	29	38	38	38	32	24	24	24
Above Normal	30	30	30	30	37	46	46	46	38	30	29	29
Wet	35	35	35	35	45	55	55	55	45	35	35	35

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation. In addition, the maximum minimum streamflow was capped at 16 cfs to accommodate Licensee's interest of using the existing infrastructure at the Drum Afterbay Dam. Table DA-5 presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Table DA-5.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	10	10	12	13	13	13
Nov	Adult	10	10	12	13	13	13
Dec	Adult	10	10	12	13	13	13
Jan	Adult	10	10	12	13	13	13
Feb	Adult	10	10	12	13	13	13
Mar	Spawn	14	14	14	14	14	14
Apr	Spawn	16	16	16	16	16	16
May	Spawn	15	15	16	16	16	16
Jun	Spawn	10	10	15	16	16	16
Jul	Adult	10	10	12	14	16	16
Aug	Adult	10	10	12	12	12	15
Sep	Adult	10	10	12	12	12	15

Table DA-6 presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Table DA-6.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	73%	73%	79%	81%	81%	81%
Nov	Adult	73%	73%	79%	81%	81%	81%
Dec	Adult	73%	73%	79%	81%	81%	81%
Jan	Adult	73%	73%	79%	81%	81%	81%
Feb	Adult	73%	73%	79%	81%	81%	81%
Mar	Spawn	83%	83%	83%	83%	83%	83%
Apr	Spawn	73%	73%	73%	73%	73%	73%
May	Spawn	70%	70%	73%	73%	73%	73%
Jun	Spawn	73%	73%	70%	73%	73%	73%
Jul	Adult	73%	73%	79%	83%	87%	87%
Aug	Adult	73%	73%	79%	79%	79%	86%
Sep	Adult	73%	73%	79%	79%	79%	86%

Conclusion

While the resulting rainbow trout WUA for these negotiated minimum streamflows does not meet the optimal criteria described above (in 'Determination of Minimum Streamflows'), other measures for this reach are expected to improve habitat conditions for the aquatic resources, including: rainbow trout, foothill yellow-legged frogs, and western pond turtles. The large woody material debris (Measure No. 9/Condition No. 37) may result in habitat improvements downstream of Drum Afterbay Dam. Monitoring of rainbow trout and foothill yellow-legged frog populations in accordance with Measure No. 8/Condition No. 36 will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Bear River Below Dutch Flat Afterbay Dam (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

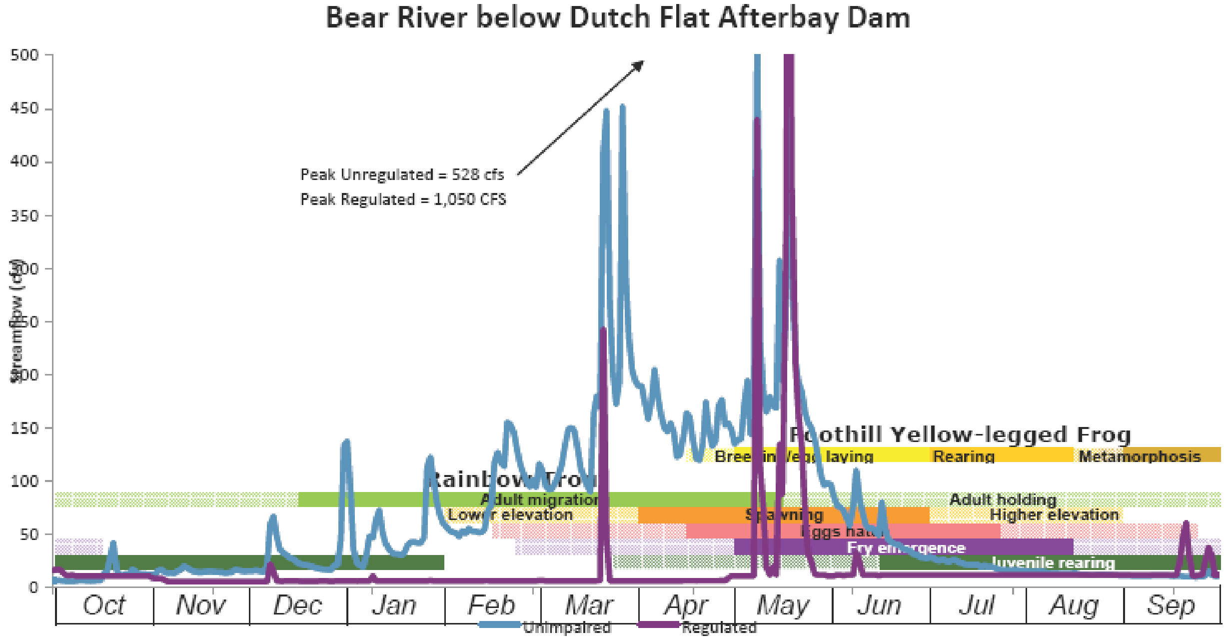
The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frogs, western pond turtles, and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Dutch Flat Afterbay Dam Reach is 4.7 mi long and extends from the outlet at Drum Afterbay Dam to the Dutch Flat Afterbay. The average elevation is 3,000 ft and the average channel gradient is 2.3 percent. (Technical Memorandum 3-2). The watershed above Dutch Flat Afterbay Dam is approximately 21.5 square miles, it is a snowmelt driven system, and has a mean annual unimpaired flow of 45 cfs.

The existing minimum streamflow requirement in this reach is 10 cfs May through October and 5 cfs November through April. Figure DF-1 shows regulated releases for Dutch Flat Afterbay Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra Nevada.

Figure DF-1. Rainbow trout and foothill yellow-legged frog lifestage periodicity and the regulated and unregulated hydrographs for the Bear River below Dutch Flat Afterbay Dam.



Rainbow trout life history timing adapted from Moyle, 2002. Foothill yellow-legged frog life history timing from A. Lind

Discussion of Fish Population Studies

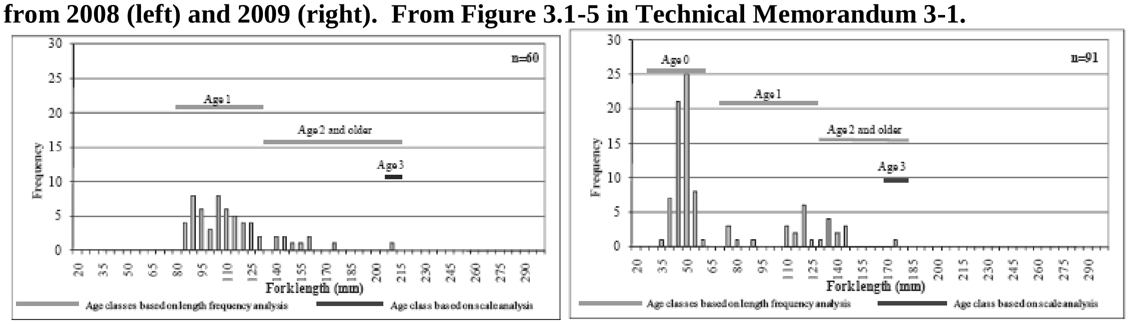
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed Level II fish population surveys at an Upper and Lower section in this reach; electrofishing and snorkeling according to standard fish population sampling protocols. The Upper reach site at river mile 20.8 was located 0.7 miles downstream of Dutch Flat Afterbay Dam at an elevation of 2,550 ft. and was sampled on July 21, 2008 and August 11, 2009. Rainbow trout, speckled dace (a native species), and brown trout were present in this reach.

Electrofishing survey estimates of rainbow trout per mile were 1,203 and 1,636 in 2008 and 2009 respectively, rainbow trout biomass was 19.6 and 13.5 lbs/acre, and the Fulton's condition factor averaged 1.26 and 1.18. Electrofishing estimates of speckled dace per mile were 75 and 154 for 2008 and 2009.

While all age classes of rainbow trout were present in small numbers in 2009, the age 0 class was missing in 2008, possibly due in part to a slightly earlier sampling date. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year.

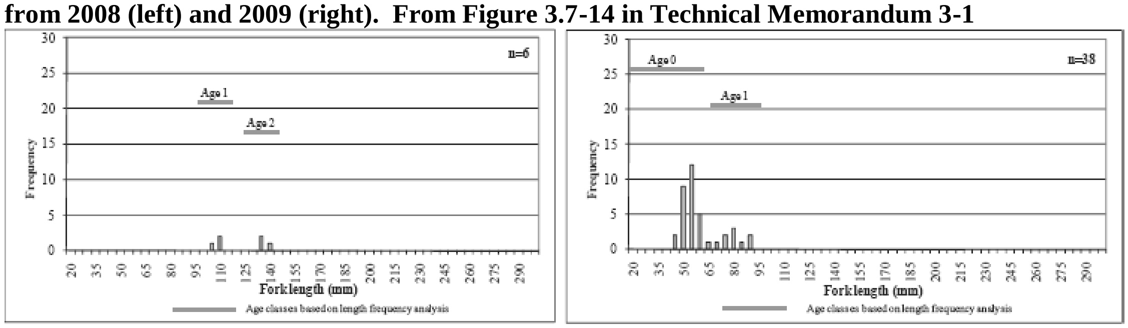
Rainbow trout length-frequency distribution and ages for the Dutch Flat Afterbay Dam Reach – Upper site from 2008 (left) and 2009 (right). From Figure 3.1-5 in Technical Memorandum 3-1.



A 96 foot long deep pool was snorkeled in 2008 and 2009, and the estimated section abundance of rainbow trout was 2 and 59 fish respectively. No other species were observed in this section.

The Lower reach at RM 19.3 was located 2.2 miles downstream of Dutch Flat Afterbay Dam at an elevation of 2,450 ft and was sampled on July 24, 2008 and August 12, 2009. Rainbow trout and speckled dace (a native species) are present in this reach. Electrofishing survey estimates of rainbow trout per mile were 106 and 668 in 2008 and 2009 respectively, rainbow trout biomass was 1.8 and 1.4 lbs/acre, and the Fulton's condition factor averaged 1.14 and 1.22. Electrofishing estimates of speckled dace per mile were 106 and 850 for 2008 and 2009. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year.

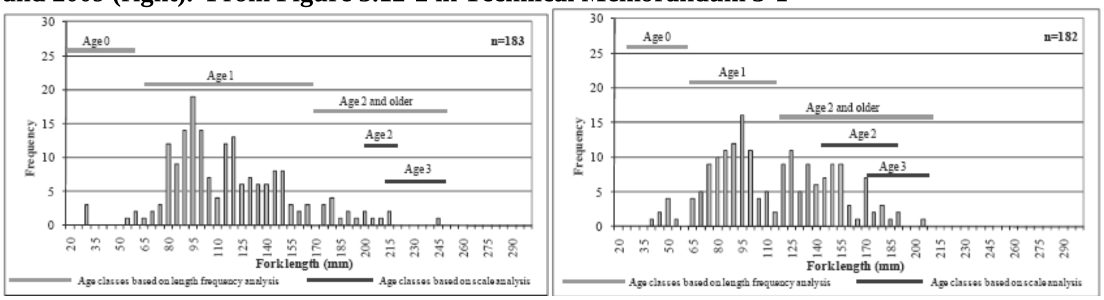
Rainbow trout length-frequency distribution and ages for the Dutch Flat Afterbay Dam Reach – Lower site from 2008 (left) and 2009 (right). From Figure 3.7-14 in Technical Memorandum 3-1



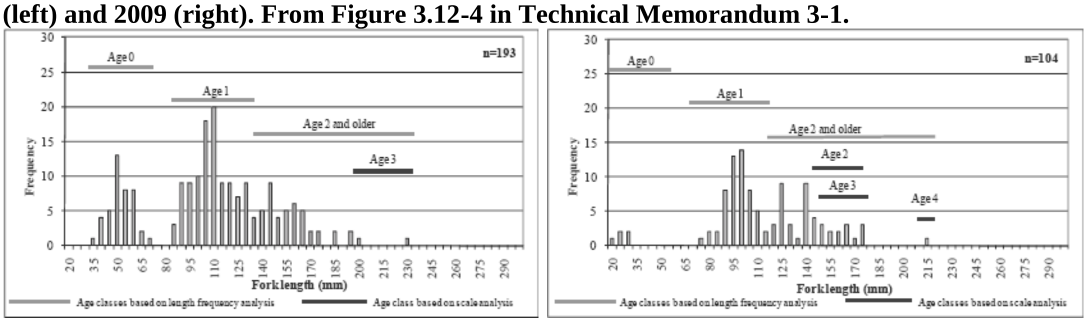
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

Discussion of Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates were sampled in this reach on August 11, 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan. The benthic macroinvertebrate site was co-located with the Upper fish site in the reach. IBI and MMI scores were 43 and 46 respectively, and the dominant substrate was cobble. The ecozone classification was montane.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Discussion of Foothill Yellow-legged Frog Studies

Three years of surveys were conducted prior to the relicensing Study 3-6 and these were deemed sufficient to assess frog populations in this reach. Three mainstem Bear River sites were surveyed for foothill yellow-legged frogs in 2003, 2004, and 2005 (see table Pacific Gas and Electric Company 2006). All life stages (egg masses, tadpoles, juveniles, and adults) were found in the reach. Incidental sightings of all lifestages were also made throughout the Bear River, outside of the survey site boundaries in 2003, 2004, and 2005. The numbers of egg masses found during surveys were highest documented in the project area, averaging 43, 6, and 15 per km in 2003, 2004, and 2005 respectively. Based on this information and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists and foothill yellow-legged frogs occur at relatively high abundance, throughout the reach.

FYLF detections from survey sites in Bear River below Dutch Flat Afterbay Dam in 2003, 2004, and 2005; Table 19 from Bear River Recovery Monitoring Project Report (Pacific Gas and Electric Company 2006).

Survey Timing	Life Stage	Survey Sites 1b	2*	3	Totals	Survey Timing	Life Stage	Survey Sites 1b	2	3	Totals
Spring 2003	Eggs	66	1	18	85	Fall 2003	Tadpoles	1	0	19	20
	Tadpoles	85	0	7	92		Metamorphs	1,845	0	51	1,896
	Juveniles/ Subadults	39	3 (4)	10	52		Juveniles/ Subadults	40	1 (4)	8	49
	Adults	42	2 (6)	13	57		Adults	49	3 (8)	9	61
Spring 2004	Eggs	0	0 (1)	11	11	Fall 2004	Tadpoles	0	0	11	11
	Tadpoles	1,296	0 (120)	533	1,829		Metamorphs	5,481	0	230	5,711
	Juveniles/ Subadults	60	0	19	79		Juveniles/ Subadults	0	1 (2)	0	1
	Adults	21	0 (4)	7	28		Adults	67	1 (3)	20	88
Spring 2005	Eggs	2	0	27	29	Fall 2005	Tadpoles	0	0	0	0
	Tadpoles	1,177	0	42	1,219		Metamorphs	666	0	191	857
	Juveniles/ Subadults	175	1 (3)	14	190		Juveniles/ Subadults	50	1 (2)	5	56
	Adults	13	1 (4)	9	23		Adults	68	5 (15)	15	88

* Data was combined for subsites 2a, b, and c;

Note: Numbers in parentheses represent FYLF observations that occurred outside of established survey areas while walking between subsites 2a, b, c, and Site 3. The numbers are included here for reference but are not included in the totals column in this table or in the results analysis of relative abundance.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach, but incidental sightings were made. Two confirmed sightings of adult western pond turtles were made during other studies in 2009 (Study and Technical Memorandum 3-9; Nevada Irrigation District and Pacific Gas and Electric Company 2010b).

Determination of Aquatic Biota Condition

Rainbow trout population and biomass estimates in the Bear River below the Dutch Flat Afterbay Dam were substantially lower than the North Yuba unimpaired reference reaches. Biomass estimates were also substantially lower than the average North Sierra stream of this width (Gerstung, 1973). In the upper site, rainbow trout population exhibited a normal age class structure in 2009, but 0+ fish were missing in 2008 and in the lower site the age class distribution was atypical. This indicates that, although there is breeding in some years, there may not be good quality habitat available for all life history stages throughout the reach. The benthic macroinvertebrate IBI and MMI scores were lower than the mean of all project affected sites and the non-project site on the North Yuba River. These scores indicate that the habitat quality is low. For foothill yellow-legged frogs, the 2003 egg mass counts were comparable to densities seen in unregulated rivers; while the 2004 and 2005 counts were substantially lower (Kupferberg et al. 2012). Numbers of adults were high relative to other reaches in the Yuba-Bear/Drum-Spaulding project. Due to the lack of quantitative data on western pond turtles and only two incidental sightings, conclusions about the status of this population cannot be made.

Overall, in this reach, rainbow trout and benthic macroinvertebrates are not in good condition. In one of three years, foothill yellow-legged frogs exhibited egg mass densities (= index of adult female frogs) similar to populations in reference unregulated rivers but in the other two years, egg mass densities were relatively low. Therefore the Resource Agencies do not consider the aquatic resources in the Bear River below Dutch Flat Afterbay Dam to be in good condition.

Discussion of Relevant Instream Flow Studies

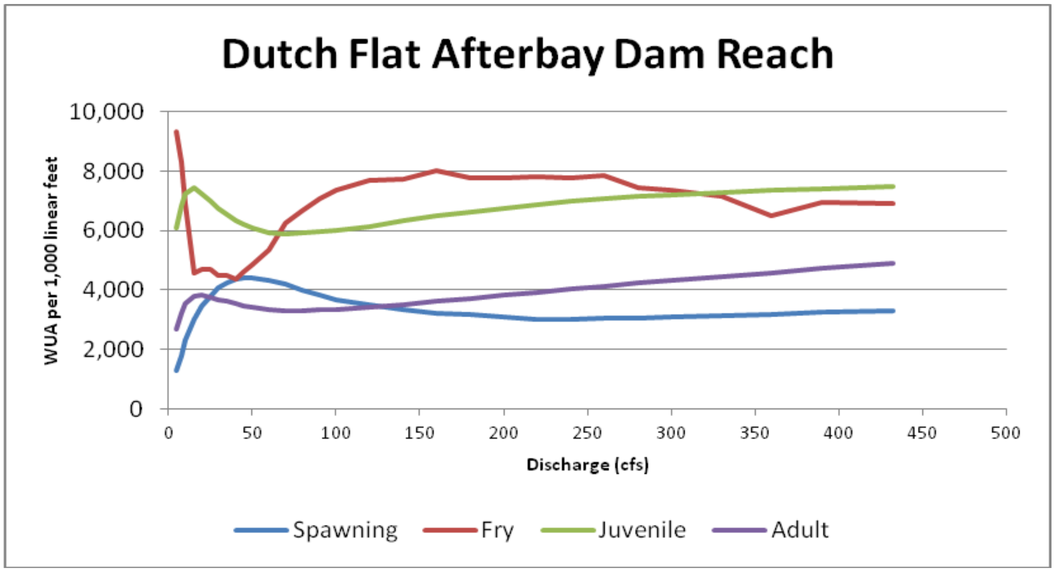
The Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) an SSTEMP-based water temperature modeling study. These studies are described below.

Mean unimpaired flows for the Bear River below Dutch Flat Afterbay Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table DF-1. Synthesized mean unimpaired flows for the Bear River below the Dutch Flat Afterbay Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	10	10	10	11	17	30	29	20	7	3	3	3
Dry	8	13	14	16	27	49	57	35	13	6	3	4
Below Normal	5	9	20	28	45	81	78	64	19	8	5	5
Above Normal	8	28	49	96	87	117	100	94	36	14	8	8
Wet	11	31	92	138	193	160	142	135	61	24	12	10

The Licensee conducted a PHABSIM-type instream flow study in between the Dutch Flat Afterbay and Chicago Park Powerhouse. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for rainbow trout:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table DF-2. Eighty percent and 100% of the Maximum WUA for rainbow trout in the Bear River below Dutch Flat Afterbay.

	80% Max WUA	100% Max WUA
Adult	7 cfs*	15 cfs*
Spawning	20 cfs	45 cfs
Juvenile	< 5 cfs*	15 cfs*

* The percent of maximum weighted usable area is based on a local maximum for the rainbow trout juvenile and adult lifestages.

The PHABSIM study results suggest that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

<u>Determination of Minimum Streamflows</u>

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to ensure sufficient water to substantially improve the condition of the fishery:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

The Resource Agencies used adult rainbow trout WUA, lifestage periodicity, water temperature monitoring and modeling, and flow information, and determined minimum streamflows ranging from 7 cfs, which represents 80 percent of the maximum WUA up to 15 cfs, which represents 100 percent of the maximum WUA provide sufficient water during the months of June through February.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph which results in a range of minimum streamflows from 20 cfs, which represents 80 percent of the maximum WUA to 45 cfs, which represents 100 percent of the maximum WUA during March, April, and May for spawning, to address SWE-3.

Water temperatures were also evaluated relative to foothill yellow-legged frog rearing concerns. A general rule of thumb is that daily average water temperatures of 17 ^{o}C or greater for July and August are required for successful rearing of tadpoles. We considered flows that would maintain these water temperatures in the reach.

Table DF-3 presents the Resource Agencies' determination of flows that the Licensee should release from Dutch Flat Afterbay Dam to enhance the condition of the fishery, improve foothill yellow-legged frog habitat and ensure adequate protection of aquatic biota.

Table DF-3. Resource Agency initial minimum streamflow recommendation in the Bear River below Dutch Flat Afterbay Dam.

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	7	7	7	7	10	15	20	15	10	10	10	10
Dry	8	8	8	8	15	20	25	20	15	10	10	10
Below Normal	10	10	10	10	20	25	30	25	20	10	10	10
Above Normal	12	12	12	12	22	30	35	30	22	12	12	12
Wet	15	15	15	15	30	40	45	40	30	15	15	15

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Collaboratively agreed upon minimum streamflows by month and water year type (in cfs)

Month	Life-Stage	EC	CD	D	BN	AN	W

Oct	Adult	7	7	8	10	13	13
Nov	Adult	7	7	8	10	13	13
Dec	Adult	7	7	8	10	13	13
Jan	Adult	7	7	8	10	13	13
Feb	Adult	10	10	15	20	22	30
Mar	Spawn	15	15	20	25	30	40
Apr	Spawn	20	20	25	30	35	45
May	Spawn	15	15	20	25	30	40
Jun	Adult	10	10	15	20	22	30
Jul	Adult	10	10	10	10	12	15
Aug	Adult	10	10	10	10	12	15
Sep	Adult	10	10	10	10	12	15

The table below presents the rainbow trout WUA associated with the collaboratively negotiated streamflows. In most months of dry, below normal, above normal, and wet water years, rainbow trout WUA is at or above 80 percent, although in extreme critical and critically dry years WUA drops below this level.

Rainbow trout WUA for collaboratively agreed upon minimum streamflows by month and water year type (in cfs)

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult*	70%	70%	84%	92%	92%	92%
Nov	Adult	70%	70%	84%	92%	92%	92%
Dec	Adult	70%	70%	84%	92%	92%	92%
Jan	Adult	70%	70%	84%	92%	92%	92%
Feb	Adult	92%	92%	100%	100%	100%	97%
Mar	Spawn	69%	69%	79%	86%	92%	99%
Apr	Spawn	79%	79%	86%	92%	96%	100%
May	Spawn	69%	69%	79%	86%	92%	99%
Jun	Adult	92%	92%	100%	100%	100%	97%
Jul	Adult	92%	92%	92%	92%	92%	100%
Aug	Adult	92%	92%	92%	92%	92%	100%
Sep	Adult	92%	92%	92%	92%	92%	100%

*The percent of maximum weighted usable area is based on a local maximum for the rainbow trout juvenile and adult lifestages.

Other measures for this reach will provide additional flows and improve conditions for both fish and foothill yellow-legged frogs. The Dutch Flat Afterbay Dam spill cessation measure (Measure No. 2/Condition No. 30 – Spill Cessation) will provide a gradual reduction in flows for Licensee caused spills greater than three days in length. This measure is intended to protect foothill yellow-legged frogs egg masses that are laid at higher flow, but it may also provide improved rainbow trout spawning conditions when spills occur during the months of March, April, or May. Monitoring of rainbow trout and foothill yellow-legged frog populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Bear River Below Chicago Park Powerhouse (Yuba-Bear Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

Chicago Park Powerhouse Reach is 1.4 mi long and extends from the powerhouse tailwater to the head of Rollins Reservoir. Average elevation for this reach is 2,200 ft and average channel gradient is 1.2 percent.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In 2008, the Chicago Park Powerhouse Reach was a Level I (qualitative) study site, but in accordance with the FERC approved Stream Fish Population Study Plan (March 2008), it was converted to a Level II site in 2009 and was sampled using standard fish population sampling protocols.

The Chicago Park Powerhouse Reach site at RM 15.4, located 0.2 miles downstream of the confluence with Steephollow Creek at an elevation of 2,230 ft, was sampled on September 24, 2009. Sacramento sucker, brown trout, Sacramento pikeminnow, smallmouth bass, and speckled dace are present in this reach. No rainbow trout were collected during either the Level I or Level II surveys. Electrofishing survey estimates of Sacramento sucker were 232 per mile, Sacramento pikeminnow -19 per mile, and speckled dace – 10 per mile.

Discussion of Benthic Macroinvertebrate Studies

Benthic macroinvertebrates were not sampled in this reach.

<u>Discussion of Foothill Yellow-legged Frog Studies</u>

One mainstem Bear River site and one tributary (Steephollow Creek) were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and three mainstem sites were surveyed in 2010 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). Surveys were limited to short portions of the channel because of high flows in the reach below the powerhouse outlet. Nonetheless, all lifestages of foothill yellow-legged frogs were found. The majority of breeding (egg masses and tadpoles) occurred in an area adjacent to the Chicago Park Powerhouse that receives flows from the upstream Dutch Flat Reach, rather than directly from the powerhouse outlet. However, in 2009, there were incidental sightings of tadpoles and young of the year in the reach, below Steephollow Creek (which is below the powerhouse outlet). There was also an incidental sighting of an adult frog in Greenhorn Creek at near Rollins Reservoir which is just downstream from the Chicago Park reach in 2009. Due to the limited survey area, comparisons of egg masses per km to reference information cannot be readily made. Steephollow Creek contains a relatively robust population of foothill yellow-legged frogs. A quantitative egg mass count was not made in this creek during the study, but incidental sightings in 2012 indicated that at least 80 egg masses were present in an approximately one mile section extending upstream from the confluence with the Bear River (A. Lind pers. comm. May 23, 2012). Based on this information and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), pockets of suitable breeding habitat exists and foothill yellow-legged frogs occur in low abundance, in the reach.

FYLF detections from survey sites in Bear River below Chicago Park Powerhouse in 2008 and 2010; Table 3.4-14 from Technical Memorandum 3-6.

<table>
<tr><th colspan="13">2008 SURVEYS</th></tr>
<tr><th rowspan="2">Reach/ Site</th><th colspan="4">Survey 1[1, 2]</th><th colspan="4">Survey 2[2]</th><th colspan="4">Survey 3[2]</th></tr>
<tr><th>Egg Mass[3]</th><th>Tadpole[3]</th><th>Juvenile</th><th>Adult</th><th>EM[3] Tadpole[3]</th><th>Young[4]</th><th>Juvenile</th><th>Adult</th><th>Tadpole</th><th>Young[4]</th><th>Juvenile</th><th>Adult</th></tr>
<tr><td rowspan="3">CP-1 Main[5]</td><td colspan="4">June 18, 2008</td><td colspan="4">June 25, 2008</td><td colspan="4">September 2, 2008</td></tr>
<tr><td rowspan="2">N/A</td><td rowspan="2">N/A</td><td rowspan="2">N/A</td><td rowspan="2">N/A</td><td>15 EM (G 19)</td><td colspan="2" rowspan="2">0 young
21 juvenile
4 not differentiated</td><td rowspan="2">6</td><td rowspan="2">284 (G 38–42)</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">0</td></tr>
<tr><td>0 tadpoles</td></tr>
<tr><td>Tributary</td><td>0</td><td>188 (G 25)</td><td colspan="2">137 juveniles
75 adults
16 not differentiated</td><td>199 tadpoles (G 21–26)</td><td colspan="3">5 young
264 juveniles
14 adults
317 not differentiated</td><td>1,026 (G 26-44)</td><td colspan="3">374 young
39 juveniles
349 adults
1,669 not differentiated</td></tr>
</table>

2010 SURVEYS												
Reach/ Site	Survey 1			Survey 2			Survey 3			Survey 4		
	Egg Mass	Tadpole	Juvenile/ Adult	Egg Mass	Tadpole	Juvenile/ Adult	Tadpole	Young	Juvenile/ Adult	Tadpole	Young	Juvenile/ Adult
CP-1A Main	June 22, 2010			July 8, 2010			August 24, 2010			September 8, 2010		
	0	0	2 juvenile 1 adult	0	0	1 juvenile	0	0	0	N/A	N/A	N/A
CP-1A Main[6]	4 (G 10-19)	127 (G 21, 25)	1 adult	0	1 (G ~36 - 38)	1 juvenile	0	0	7 juvenile 1 adult	N/A	N/A	N/A
CP-1B Main[7]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	135	0	2 juvenile 2 adult

1 N/A indicates survey not conducted because of peaking releases in mainstem.
2 FYLF not always separated by post-metamorphic life stage because of large number of detections.
3 "G" is developmental stage as described in Gosner (1960); U = undetermined stage; EM = egg mass
4 "Young" indicates young-of-year
5 In 2008, survey only possible adjacent to Chicago Park Powerhouse Reach in cobble bar channels receiving flow from Dutch Flat Afterbay Dam Reach, not from Chicago Park Powerhouse releases.
6 These observations are from area adjacent to Chicago Park Powerhouse Reach in cobble bar channels receiving flow from Dutch Flat Afterbay Dam Reach, not from Chicago Park Powerhouse releases.
7 CP-1B is comprised of areas on left bank below bridge only accessible when Chicago Park Powerhouse was not releasing flows.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach. One incidental sighting was made of an adult turtle in the Chicago Park Conduit (conveys water to Chicago Park Powerhouse) in 2009. This turtle was observed attempting to climb out of the conduit, but was unable to escape and was swept away in the current. In addition one adult turtle was sighted in Rollins Reservoir downstream of the Chicago Park reach (near the mouth of Greenhorn Creek) (Study and Technical Memorandum 3-9; Nevada Irrigation District and Pacific Gas and Electric Company 2010b). Conclusions about the status of turtles in this area cannot be made without additional quantitative surveys, though entrainment in the conduit is of concern.

Determination of Aquatic Biota Conditions

No rainbow trout were found in the Bear River below Chicago Park Powerhouse. The fish community was primarily warm water tolerant natives (Sacramento sucker, Sacramento pikeminnow, and speckled dace) along with several non-natives (brown trout and small mouth bass). No benthic macroinvertebrate studies were conducted. For foothill yellow-legged frogs, the population currently experiences successful recruitment in most years at Steephollow Creek and in the area of the reach that is not directly affected by the powerhouse outflows, and spotty breeding and recruitment in the areas downstream of the powerhouse. Therefore the Resource Agencies do not find the biota in the Bear River below Chicago Park Powerhouse in good condition.

Determination of Minimum Streamflows and Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

The Resource Agencies, Licensees, and other relicensing participants collaboratively agreed that there would be no additional flow requirements in the reach below Chicago Park Powerhouse beyond the minimum streamflows released from Dutch Flat Afterbay Dam. The Chicago Park reach is a power peaking reach and Steephollow Creek has periodically received high flows (approximately once every 5 years; William Morrow, Nevada Irrigation District, pers. comm., April 2012) when the Chicago Park Powerhouse is in an unplanned outage. The Chicago Park Motoring Measure (Measure No. 2 – Chicago Park Powerhouse Motoring) and Steephollow Creek Foothill Yellow-Legged Frog Monitoring (Measure No. 2 – Steephollow Creek Foothill Yellow-legged Frog Monitoring) provide some protection for frogs and fish in this reach. The motoring measure maintains a minimum streamflow in the Bear River during non-routine planned powerhouse outages that occur from May through September which is intended to protect frog egg masses/tadpoles and fish from being dewatered. The Steephollow Creek monitoring measure incorporates methods for documenting the baseline population of frogs in the creek as well as monitoring, and potential mitigation, following high flow spill events. This measure also includes implementation of automated controls within the powerhouse operating system that are intended to address operator issues and reduce the likelihood and frequency of spills into Steephollow Creek.

Bear River below Rollins Reservoir Dam and Bear River Canal Diversion Dam

Stream Reach Specific Objectives

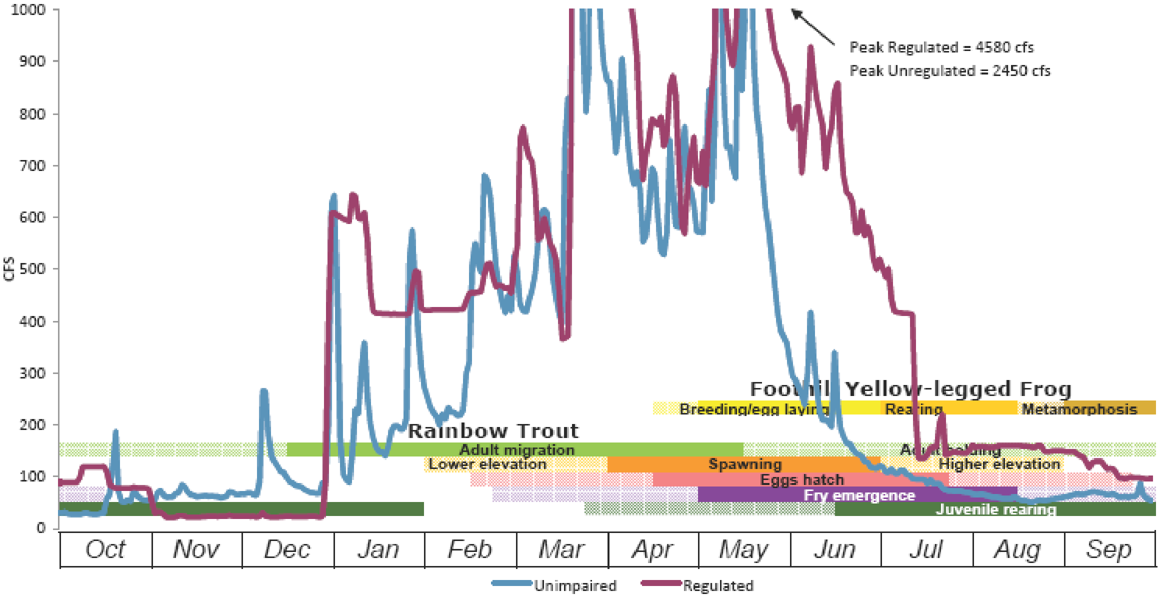
The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frog, western pond turtle, and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The reach of the Bear River below the Bear River Canal Diversion Dam is approximately 10.4 miles long, extending from the base of the Bear River Canal Diversion Dam (El. 1,960 ft), which is immediately below Rollins Dam, to Lake Combie Reservoir (El. 1,600 ft). The overall channel gradient is approximately 0.7 percent (Technical Memorandum 3-2). The watershed area above the Bear River Canal Diversion Dam is 104 square miles and the average unimpaired flow was 235 cfs. However, approximately 365,000 af[3] is diverted from the Yuba River system to the Bear River system. While the existing minimum streamflow varies between 15 cfs and 75 cfs, depending on month and water year type (FLA, April 2011), the reach is used to deliver consumptive water to NID-3 and routinely experiences high aseasonal flows. Figure BR-1 shows regulated releases for the Bear River below the Bear River Canal Diversion Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra.

[3] The average annual diversion from the Yuba River system to the Bear River system is calculated based on YB-28, YB-244, and YB-139 for the period water year 1988 through water year 2005.

Figure BR-1. Rainbow trout and yellow-legged frog lifestage periodicity and the regulated and unregulated hydrographs for the Bear River below Rollins Reservoir and the Bear River Canal Diversion Dam.



Rainbow trout life history timing adapted from Moyle, 2002. Foothill yellow-legged frog life history timing from A. Lind

<u>Discussion of Fish Population Studies</u>

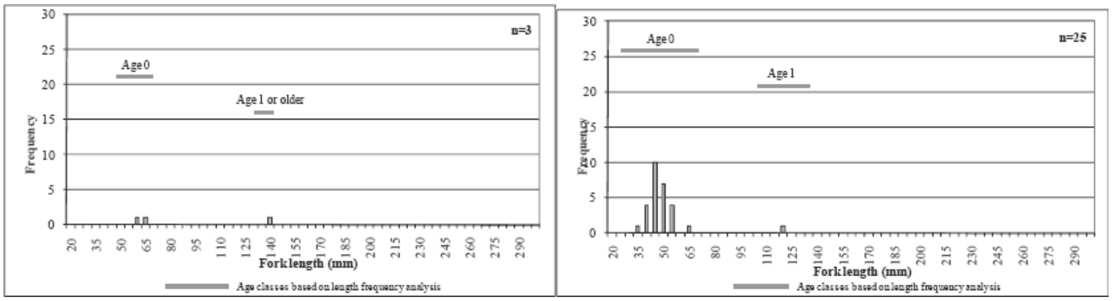
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed two quantitative (Level II) representative fish population surveys at Upper and Lower sections in this reach according to standard fish population sampling protocols. The Upper reach was electrofished, but due to site width and streamflow, the Lower site was only snorkeled.

The Upper study site - located at RM 8.0 which is 2.6 miles downstream of the Bear River Canal Diversion Dam at an elevation of approximately 1,800 ft was sampled on August 14, 2008 and August 17, 2009. Rainbow trout, Sacramento sucker and Sacramento pikeminnow - all native California species - were present in this reach as well as non-native brown trout and green sunfish.

Estimates of rainbow trout per mile in 2008 and 2009 were 92 and 1,161 respectively, rainbow trout biomass was 0.2 and 0.5 lbs/acre, and the Fulton's condition factor averaged 1.10 and 1.03. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year.

Rainbow trout length-frequency distribution and ages from 2008 (left) and 2009 (right) from Figures 3.7-18 and 3.7-19 in Technical Memorandum 3-1)



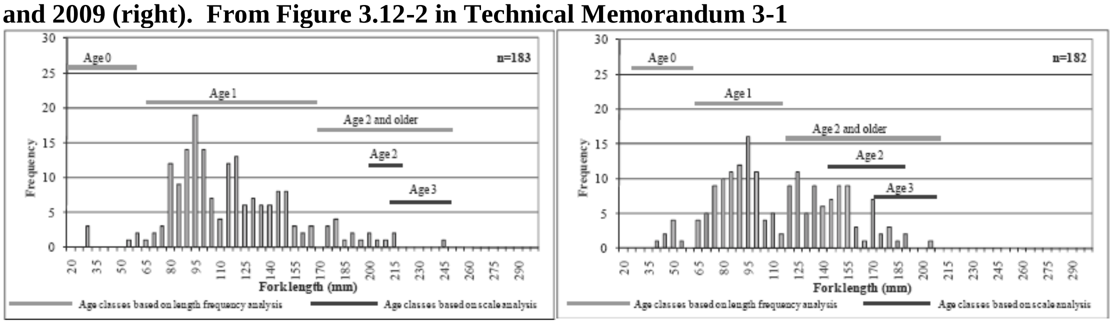
Low numbers of small (Age 0 and Age 1) Sacramento sucker and Sacramento pikeminnow were captured each year.

The 419.5 ft long Lower Site was located at RM 3.4 which is 7.2 miles downstream of Bear River Canal Diversion Dam at an elevation of 1,650 ft. This site was snorkeled on August 15, 2008 and August 13, 2009. Rainbow trout, Sacramento sucker and Sacramento pikeminnow - all native California species - were present in this reach as well as non-native brown trout. Most of the observed Sacramento sucker and Sacramento pikeminnow were Age 0.

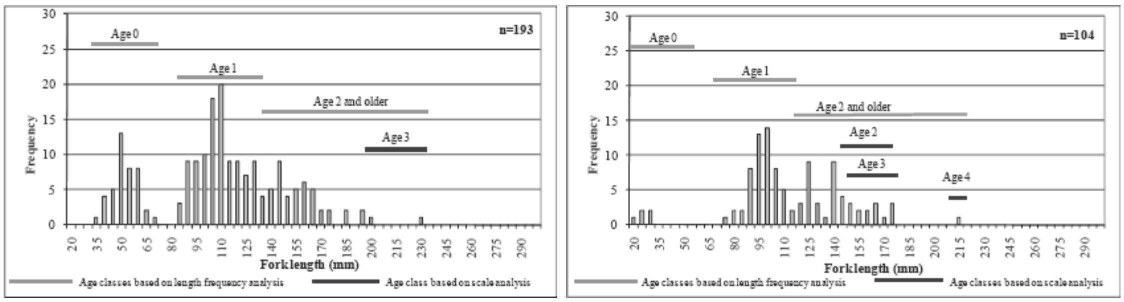
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton’s condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton’s condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a “catchable” length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates were sampled in the Upper reach on August 10, 2009 and in the Lower reach on August 13, 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan. Benthic macroinvertebrate sites were co-located with fish sites. IBI and MMI scores were 36 and 26 respectively in the Upper site, and 51 and 50 respectively in the Lower site. The dominant substrate for the Upper site was cobble, and for the lower site was coarse gravel. Both sites were classified in the foothill ecozone.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

<u>Discussion of Foothill Yellow-Legged Frog Studies</u>

Three mainstem Bear River sites and two tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). No egg masses or tadpoles were found during these surveys, but an incidental sighting was made of five tadpoles just upstream of the BRC-1 site boundary in August 2008. A small number of juveniles and adults were found at between 3.1 and 7.7 miles below the Bear River Canal Diversion Dam, at all sites except BRC 1-A. Based on this information and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists and foothill yellow-legged frogs occur at low abundance throughout the reach.

FYLF detections in the five survey sites in Bear River below the Bear River Canal Diversion Dam reach. Table 3.4-16 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site	Survey 1				Survey 2				Survey 3			
	Egg Mass	Tadpole	Juvenile	Adult	Tadpole	Young	Juvenile	Adult	Tadpole	Young	Juvenile	Adult
BRC-1 Main	June 2, 2008				June 15, 2008				August 29, 2008			
	0	0	1	0	0	0	1	0	0	0	0	0
BRC-2 Main	June 9, 2008				June 24, 2008				August 28, 2008			
	0	0	1 juvenile; 1 not differentiated		0	0	1	4	0	0	0	6
Tributary	0	0	0	0	0	0	1	0	0	0	0	0
BRC-3 Main	June 15, 2008				June 26, 2008				August 28, 2008			
	0	0	3	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	0	0	0	0	0	0	0	0	0

2009 SURVEYS												
Reach/Site	Survey 1			Survey 2			Survey 3			Survey 4		
	Egg Mass	Tadpole	Juvenile/ Adult	Egg Mass	Tadpole	Juvenile/ Adult	Egg Mass	Tadpole	Juvenile/ Adult	Tadpole	Young	Juvenile/ Adult
BRC-1A	June 11, 2009			June 18, 2009			June 23, 2009			July 24, 2009		
	0	0	0	0	0	0	0	0	0	0	0	0
BRC-2B	June 11, 2009			June 18, 2009			June 23, 2009			July 24, 2009		
	0	0	1 (adult)	0	0	2 (adults)	0	0	1 (juv.)	0	0	1 (adult)

Discussion of Western Pond Turtle Observations

No formal surveys were conducted for western pond turtles in this reach, but several incidental sightings were made. Five confirmed sightings of adult western pond turtles were made during other studies in 2008 and 2009. One unidentified turtle was also documented in this reach in 2008 (Study and Technical Memorandum 3-9; Nevada Irrigation District and Pacific Gas and Electric Company 2010b). Conclusions about the status of this population cannot be made without quantitative surveys and documentation of age distribution.

Determination of Biota Condition

While the benthic macroinvertebrate IBI in the Lower site was around the mean of all project affected sites, the MMI was somewhat lower. The IBI and MMI scores in the Upper site were well below the mean and median for all project affected sites. The scores for both the Upper and Lower site were all well below those for the non-project affected reference reaches in the North Yuba River. These scores indicate that the habitat quality is low - especially in the Upper site.

As noted above, foothill yellow-legged frogs occur throughout the reach, but in very low numbers and suitable habitat exists throughout the reach. No egg masses were found in this reach during the surveys, although one tadpole (Site BRC-2B Survey 3) and a small number of juveniles present indicated that breeding had occurred.

Rainbow trout population and biomass estimates in the Bear River below the Bear River Canal Diversion Dam Upper site were substantially lower than the North Yuba unimpaired reference reaches. Only three rainbow trout were captured during 2008. Biomass estimates were also substantially lower than the average North Sierra stream of this width (Gerstung, 1973). Additionally, the rainbow trout population did not exhibit a robust age class structure - 24 out of 25 fish captured in 2009 were young-of-the-year. This indicates that, although there is at least some breeding in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of diversity, spatial structure, abundance or productivity.

Taking the above benthic macroinvertebrate, FYLF, and rainbow trout information into account, the Resource Agencies do not consider the biota in the Bear River below the Bear River Canal Diversion Dam to be in good condition.

Discussion of Relevant Instream Flow Related Studies

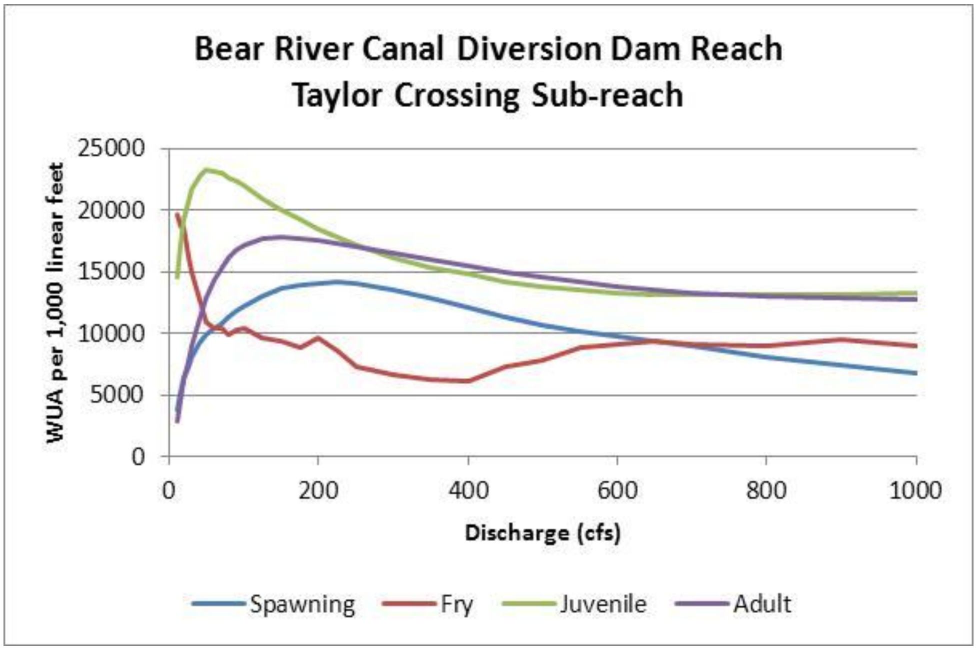
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow); 3) water temperature monitoring; and 4) an SSTEMP-based water temperature modeling study. These studies are described below:

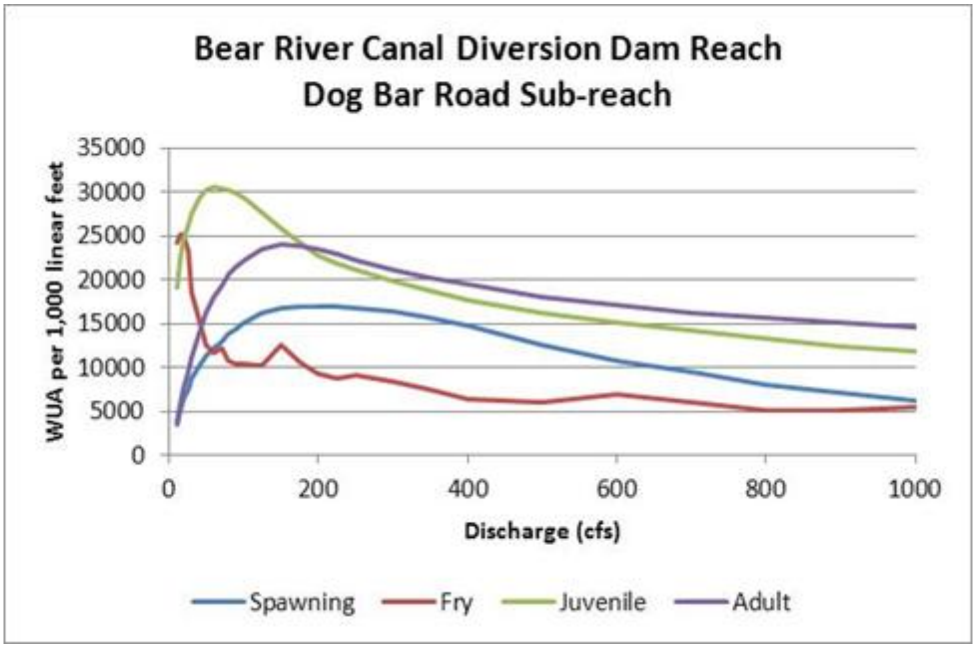
Mean unimpaired flows for the Bear River below Bear River Diversion Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table BR-1. Synthesized mean unimpaired flows for the Bear River below the Bear River Canal Diversion Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	52	51	55	63	98	153	112	77	35	18	15	16
Dry	46	73	78	89	144	247	254	143	65	34	20	23
Below Normal	30	52	119	158	265	425	355	257	88	48	33	29
Above Normal	43	143	265	540	517	638	500	399	158	75	48	48
Wet	60	154	500	811	1097	894	782	656	262	119	66	58

Licensee conducted a PHABSIM-type instream flow study in two subreaches between the Bear River Canal Diversion Dam and Lake Combie Reservoir. The reaches are designated as the Taylor Crossing subreach and the Dog Bar Road subreach. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the two reaches:





The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

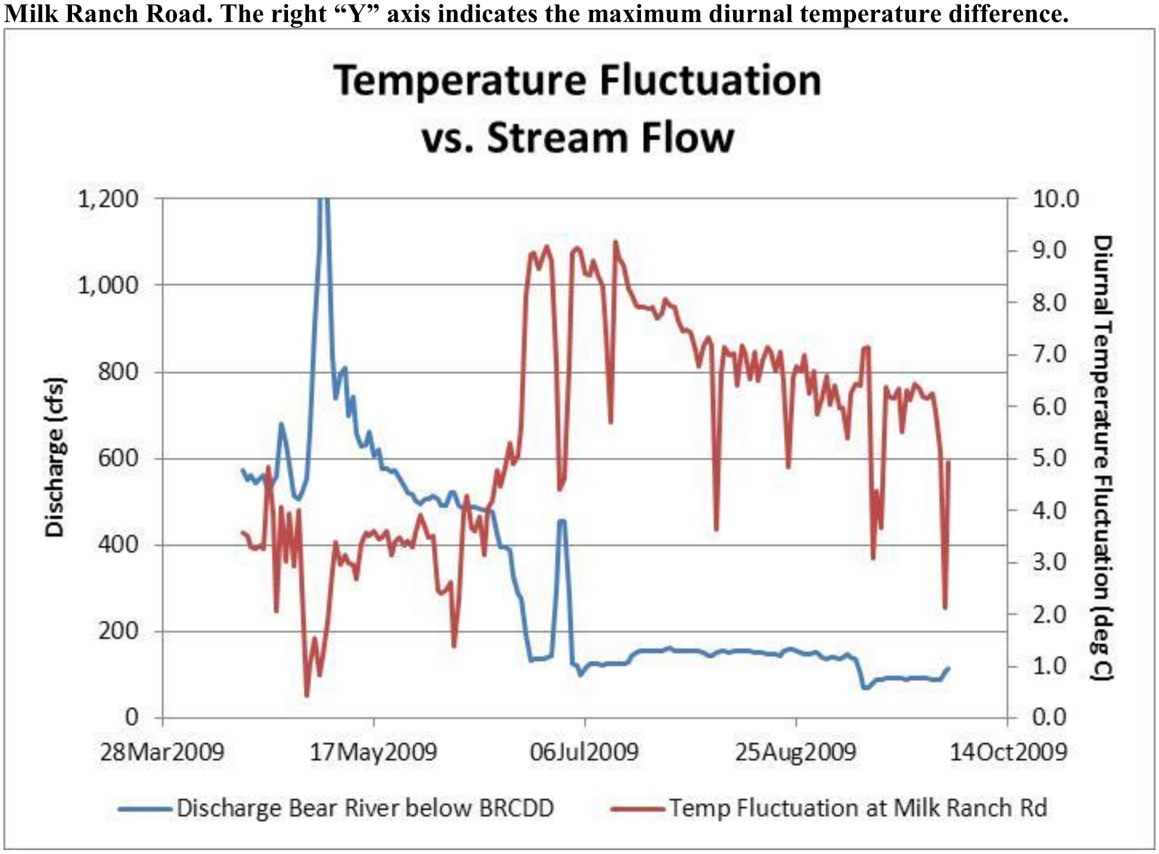
Table BR-2. Eighty percent and 100% of the Maximum WUA for rainbow trout in the Bear River below Bear River Canal Diversion Dam Taylor Crossing and Dog Bar Road Sub-reaches

	80% Max WUA	100% Max WUA

Taylor Crossing Reach		
Adult	60	150
Spawning	80	225
Juvenile	18	50
Dog Bar Road Reach		
Adult	70 cfs	150 cfs
Spawning	80 cfs	200 cfs
Juvenile	20 cfs	60 cfs

The PHABSIM results suggest that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance. However, Resource Agency staff believe that there are also other factors influencing the poor condition of the fishery in this reach. For instance, as depicted in Figure BR-2 (below), the diurnal temperatures fluctuated up to 9˚C at Milk Ranch Road during late June – early July 2009. While the temperatures were not in the lethal range for individual fish, the fluctuations may be causing chronic stress during fry emergence and juvenile rearing.

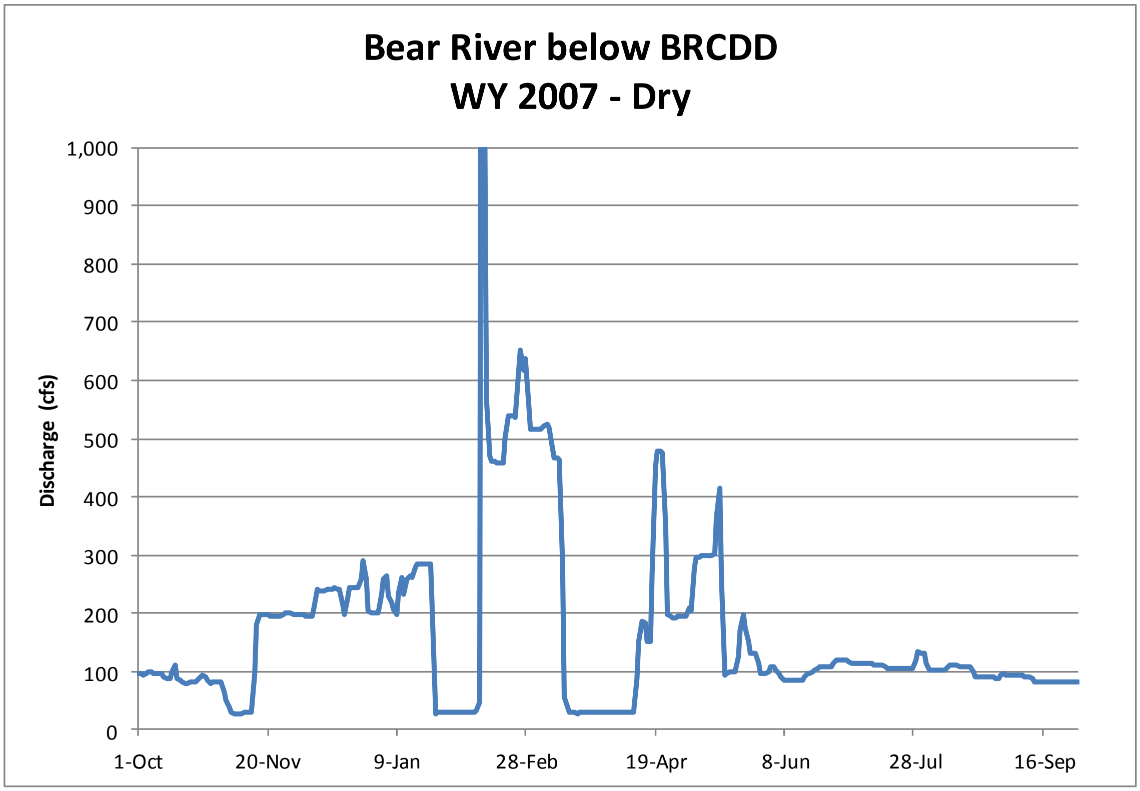
Figure BR-2. Discharge below the Bear River Canal Diversion Dam vs the diurnal temperature fluctuation at Milk Ranch Road. The right "Y" axis indicates the maximum diurnal temperature difference.



Notice that the diurnal fluctuation hovers around 4°C when streamflows are at or above 400 cfs. This is particularly evident during the late-June and early-July period when the streamflow was increased from approximately 140 cfs to approximately 450 cfs. The temperature fluctuation at Milk Ranch Road dropped from a maximum of about 9°C to approximately 4.5°C.

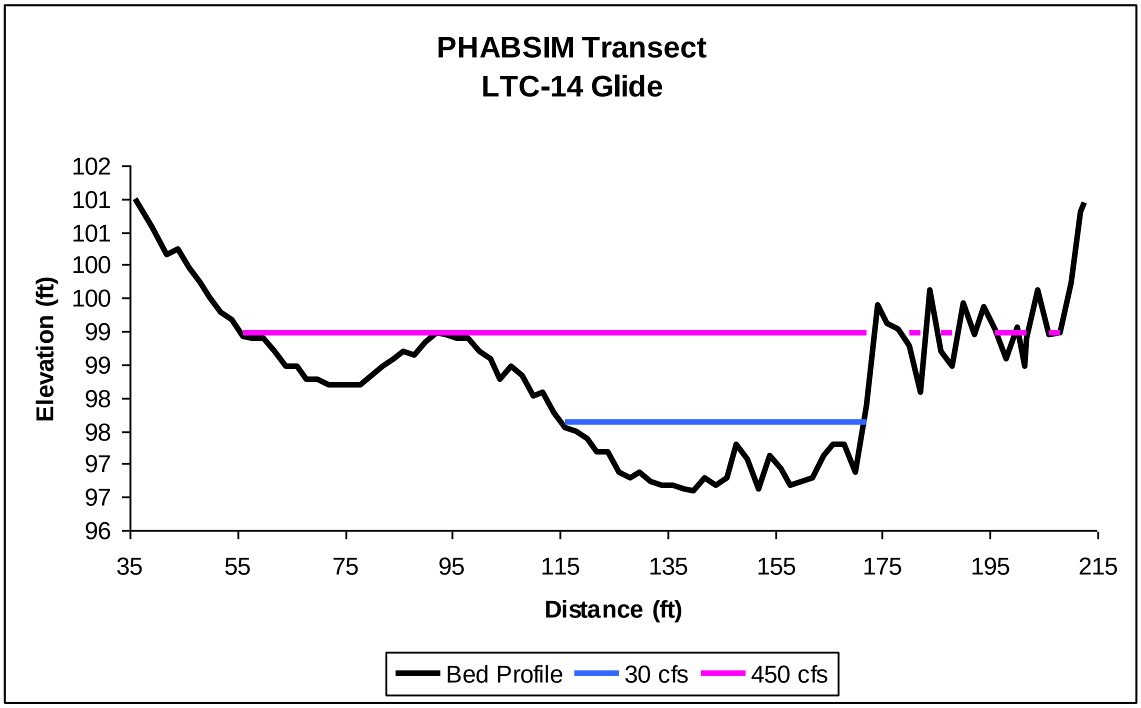
It is also important to note that the flows in the Bear River below the BRCDD drop precipitously in many years. The following graph depicts the mean daily streamflow for the reach during 2007, a Dry water year.

Figure BR-3. The mean daily streamflow for the Bear River below the Bear River Canal Diversion Dam for Water Year 2007 measured at YB-196 (USGS Gage No. 11422500).



Based on an analysis of riffle and glide PHABSIM transects in the Taylor Crossing and Dog Bar Road sub-reaches, the water surface elevation dropped between one and one and a half feet as flows drop from 450 cfs to 30 cfs. Abrupt flow changes during the spring and early summer potentially dewater redds or strand fry and juveniles and may have contributed to the poor condition of the fishery in this reach. The affect of abrupt flow chances is clearly depicted on Figure BR-4, which shows the water surface change at PHABSIM cross section plot at Transect 14 (glide) in the Taylor Crossing subreach as flows change from 450 cfs to 30 cfs.

Figure BR-4. Water surface elevation at Taylor Crossing subreach, Transect 14.



Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table BR-2. The Resource Agencies used this and the lifestage periodicity and flow information presented in Figure BR-1, and determined minimum streamflows ranging from 60 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 125 cfs, which represents 100 percent of the maximum WUA, in wet water years provide sufficient water during the months of June through February to address SWE-1 and the rearing component of SWE-3.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph (Table BR-1) to determine minimum streamflows ranging from 80 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 200 cfs, which represents 100 percent of the maximum WUA, in wet water years during April provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during March from the adult RBT values to the RBT spawning values. Similarly, during May, flows were stepped back down from the RBT spawning values to the adult RBT values.

Recommended minimum streamflows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

Although not a component of the Resource Agency minimum streamflow recommendations, it is important to note that the empirical temperature and flow data presented in Figure BR-2 above suggest that summer flows of 400 cfs are needed to reduce diurnal temperature fluctuations to about 4.5C.

It is also important to note that abrupt flow changes may contribute to the poor condition of the fishery and should be eliminated. The Resource Agencies intend to establish a conservative ramping rate for the projects in general, and this reach in particular.

Table BR-3 presents the Resource Agencies' determination of flows that should be released from Rollins Reservoir to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table BR-3. Resource Agency initial minimum streamflow recommendation in the Bear River below Bear River Canal Diversion Dam

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	60	60	60	60	60	70	80	70	60	60	60	60
Dry	76	76	76	76	76	90	110	90	76	76	76	76
Below Normal	93	93	93	93	93	110	140	110	93	93	93	93
Above Normal	109	109	109	109	109	130	170	130	109	109	109	109
Wet	125	125	125	125	125	150	200	150	125	125	125	125

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. Specifically the flow regime was adjusted to more closely reflect Licensee water deliveries to NID 3. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	20	40	40	55	65	65

Nov	Adult	15	20	25	30	40	50
Dec	Adult	15	20	25	30	40	50
Jan	Adult	15	20	25	30	40	50
Feb	Adult	15	20	25	30	40	50
Mar	Spawn	15	20	25	30	40	50
Apr	Spawn	20	40	40	50	75	75
May	Spawn	20	45	45	65	100	100
Jun	Adult	20	50	50	65	125	125
Jul	Adult	20	50	50	70	109	125
Aug	Adult	20	50	50	70	109	125
Sep	Adult	20	50	50	70	80	80

The table below presents the rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	35%	63%	63%	77%	83%	83%
Nov	Adult	26%	35%	43%	51%	63%	73%
Dec	Adult	26%	35%	43%	51%	63%	73%
Jan	Adult	26%	35%	43%	51%	63%	73%
Feb	Adult	26%	35%	43%	51%	63%	73%
Mar	Spawn	37%	45%	52%	57%	65%	70%
Apr	Spawn	45%	65%	65%	70%	79%	79%
May	Spawn	45%	67%	67%	75%	87%	87%
Jun	Adult	35%	73%	73%	83%	100%	100%
Jul	Adult	35%	73%	73%	86%	98%	100%
Aug	Adult	35%	73%	73%	86%	98%	100%
Sep	Adult	35%	73%	73%	86%	91%	91%

While the resulting rainbow trout WUA for these negotiated minimum streamflows does not meet the optimal criteria described above (in 'Determination of Minimum Streamflows'), other measures for this reach are expected to improve habitat conditions for rainbow trout, other native fish, foothill yellow-legged frogs, and western pond turtles. A Rollins Reservoir flow fluctuation measure (Measure No. 2 - Rollins Elevation Control) was developed to reduce flow fluctuations below Rollins Dam and should also result in a gradual decline of flows in the spring and less variable water temperatures throughout the year. A woody material measure (Measure No. 2 – Rollins Dam Large Woody Material Management) will move accumulated logs and other debris into the reservoir near the spill channel, so that that material can be carried downstream into the reach during storms/spill events. The potential benefits of the woody debris measure for creating habitat complexity in this reach will be assessed through monitoring, and additional steps may be taken if needed (e.g., anchoring of wood along the reach). Monitoring of rainbow trout and foothill yellow-legged frog populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Little Bear River below Alta Powerhouse (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as both "cold freshwater habitat" and "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Alta Powerhouse Reach is approximately 2.0 mi long and extends from Dutch Flat Afterbay (RM 0.0) to the Alta Powerhouse (RM 2.0). The reach has an average elevation of 3,140 ft and a channel gradient of 8.3 percent (Technical Memorandum 3-2). The watershed area of the Lower Boardman Diversion below the Alta Powerhouse is approximately 1.2 square miles. The mean annual unimpaired flow is 3.6 cfs. The existing minimum streamflow is 0.25 year-round or natural flow, whichever is less.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

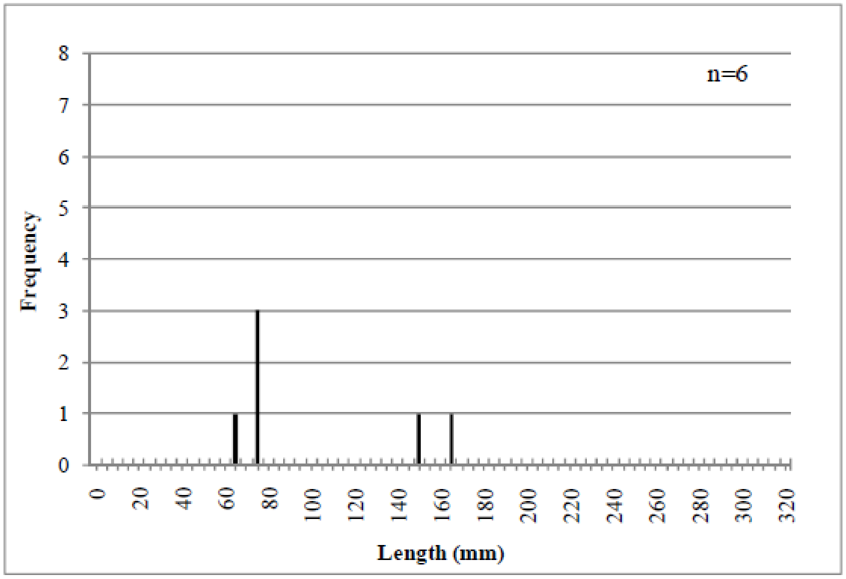
Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), the Licensee performed two qualitative (Level I) representative fish population surveys in this reach according to standard fish population sampling protocols. Both sites were sampled using habitat spot check electrofishing.

Due to its length and habitat diversity, Alta Powerhouse Reach was sampled at both an upper (September 10, 2009) and a lower site (October 23, 2009). The lower site was sampled subsequent to data review that indicated more sampling was needed. Licensees sampled 25 potential fish habitat spots at the upper site (accessed at RM 2.0) along a 327-ft section of stream starting approximately 0.10 mi downstream of the Alta Powerhouse. Reach characteristics were visually estimated. Channel substrate within the sampled reach was comprised of gravel (40 percent) and cobble (60 percent). The reach averaged 8 ft in width and < 1 ft in depth and was characterized as riffle (30 percent), shallow pool (50 percent), and glide (20 percent) habitat. Canopy generally covered 80 percent of the stream channel. In-stream cover was provided by instream objects (i.e., boulders or LWD) (5 percent) and overhanging vegetation (20 percent). Instantaneous water temperature was 10.2 ºC.

At the lower site (accessed at RM 1.1), Licensees sampled 25 potential fish habitat spots along a 310-ft section of stream starting approximately 0.86 mi upstream of Dutch Flat Afterbay. Channel substrate within the lower site was comprised of sand (10 percent), cobble (70 percent), and boulders (20 percent). The channel averaged 7 ft in width and 0.5 ft in depth and was characterized by riffle (30 percent), shallow pool (30 percent), and glide (40 percent) habitats. Canopy covered 85 percent of the stream channel. In-stream cover was provided by surface turbulence (5 percent), in-stream objects (50 percent), undercut banks (10 percent), and overhanging vegetation (5 percent). Instantaneous water temperature was 16.4 ºC.

A total of six rainbow trout were collected in the upper site, while no fish were observed or collected in the lower site.

Length frequency for rainbow trout collected in Alta Powerhouse Reach, September 10, 2008.



Discussion of Benthic Macroinvertebrate Studies

Benthic Macroinvertebrates were not sampled in this reach

Discussion of Foothill Yellow-legged Frog Studies

No formal surveys were conducted for foothill yellow-legged frogs in this reach and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

The Licensee only found 6 fish in a total of 637 feet sampled. Therefore the Resource Agencies do not consider the fish in the Alta Powerhouse Reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

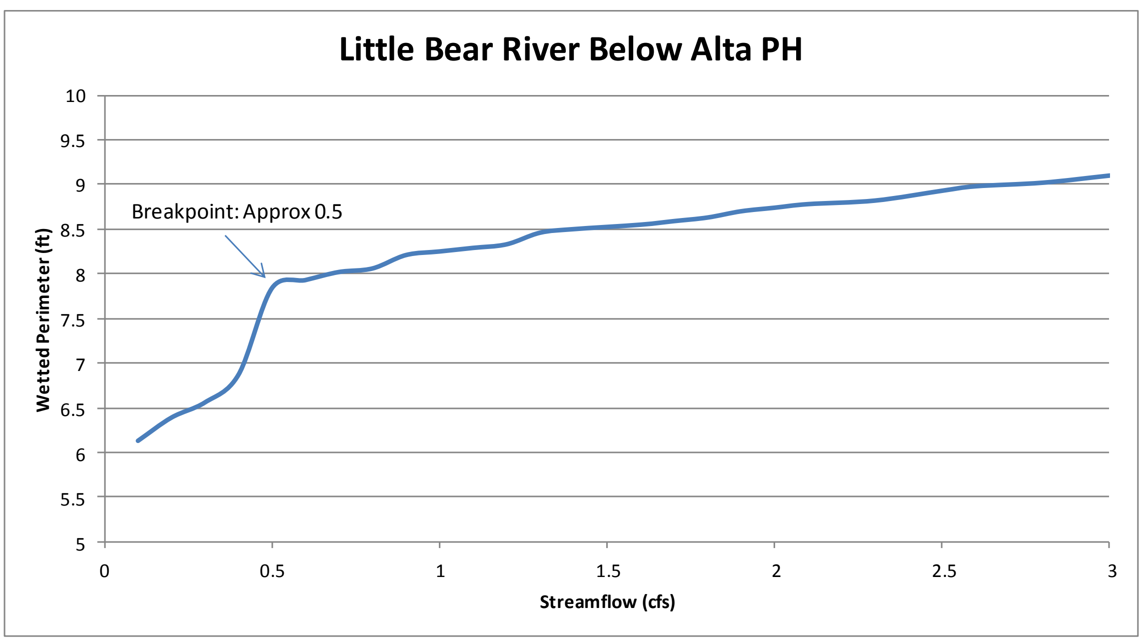
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) Channel Flow Response (CFR). Both studies are described below.

Mean unimpaired flows for the Alta Powerhouse reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Synthesized mean unimpaired flows for the Alta Powerhouse Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.9	0.8	0.9	1.0	1.5	2.4	1.4	1.0	0.6	0.3	0.2	0.2
Dry	0.8	1.2	1.2	1.3	2.1	3.7	3.7	1.9	1.0	0.6	0.3	0.4
Below Normal	0.5	0.8	1.7	2.2	3.8	6.4	5.2	3.3	1.3	0.8	0.6	0.5
Above Normal	0.7	2.2	4.1	8.4	7.9	9.9	7.6	5.4	2.2	1.3	0.9	0.8
Wet	1.0	2.3	7.2	12.3	17.1	14.0	12.4	10.1	3.7	1.8	1.1	1.0

Using the CFR hydraulic model, the Resource Agencies determined the relationship between flow and wetted perimeter at the one riffle transect evaluated below the Lower Boardman Diversion. This relationship is depicted below:



Note that the breakpoint in the flow versus wetted perimeter analysis occurs at approximately 0.5 cfs. The wetted perimeter method is intended to establish a summer low-flow standard.

The Resource Agencies also determined a mean monthly flow based on Tessman's adaptation of the Tennant Method, which is a hydrology-based standard setting method. The results are presented below:

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Tessman Adaptation of Tennant Method	0.8	1.4	1.4	2.4	3.0	3.2	2.7	1.9	1.4	1.1	0.7	0.6

Further, the Resource Agencies calculated the optimum rainbow trout spawning flow based on the Hatfield-Bruce equations, which suggested a flow of 7.4 cfs

CFR studies provide data that show how much wetted perimeter is available at each of the calibration flows to support rainbow trout and benthic macroinvertebrates production. However, Resource Agency staff believe that there are also other factors influencing the poor condition of the fishery in this reach. The existing low minimum streamflow of 0.25 cfs year round may be causing chronic stress for adults during summer conditions and increased predation on rainbow trout.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the fishery:

- The results of Tessman's adaptation of the Tennant Method were considered to determine flows that maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- The optimum flow determined from the application of the Hatfield-Bruce equations was used in conjunction with the unimpaired hydrology to establish a flow for spawning and juvenile rearing rainbow trout during the spring and to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Table AP-1 presents the Resource Agencies determination of flows that Licensee should release below the Alta Powerhouse to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table AP-1. Resource Agency initial minimum streamflow recommendation in the Little Bear River below Alta Powerhouse.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug

Critically Dry	1	1	1	1	1	1	1	1	1	0.5	0.5
Dry	1	1	1	1	1	2	1	1	1	0.5	0.5
Below Normal	1	1	1	1	2	4	4	2	1	0.5	0.5
Above Normal	1	1	2	3	4	7	6	4	2	1	1
Wet	1	2	5	6	9	11	8	4	2	1	1

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were determined using the methods described above, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.5	1	1	1	1	1
Nov	Adult	0.5	1	1	1	1	1
Dec	Adult	0.5	1	1	1	1	1
Jan	Adult	0.5	1	1	1	1	1
Feb	Spawn	0.5	1	1	2	3	3
Mar	Spawn	0.5	1	2	3	4	4
Apr	Spawn	0.5	1	1	2	3	3
May	Adult	0.5	1	1	1	2	2
Jun	Adult	0.5	1	1	1	1	1
Jul	Adult	0.5	1	1	1	1	1
Aug	Adult	0.5	1	1	1	1	1
Sep	Adult	0.5	1	1	1	1	1

Conclusion

Monitoring of rainbow trout populations will occur in this reach and will inform our understanding of how the new streamflow measures are affecting this species.

North Fork of North Fork American River Below Lake Valley Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as existing "cold freshwater habitat" and potential "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Lake Valley Reservoir Dam reach below Lake Valley Reservoir Dam is approximately 3.1 miles long, extending from the base of Lake Valley Reservoir, to Lake Valley Canal Diversion Dam Reach. Average elevation for this reach is 5,620 ft, and average channel gradient is 3.1 percent. (Technical Memorandum 3-2). The watershed area at the Lake Valley Dam is approximately 4.5 square miles. The mean annual unimpaired flow is 23 cfs. The existing minimum streamflow is 1 cfs year-round.

Discussion of Fish Population Studies

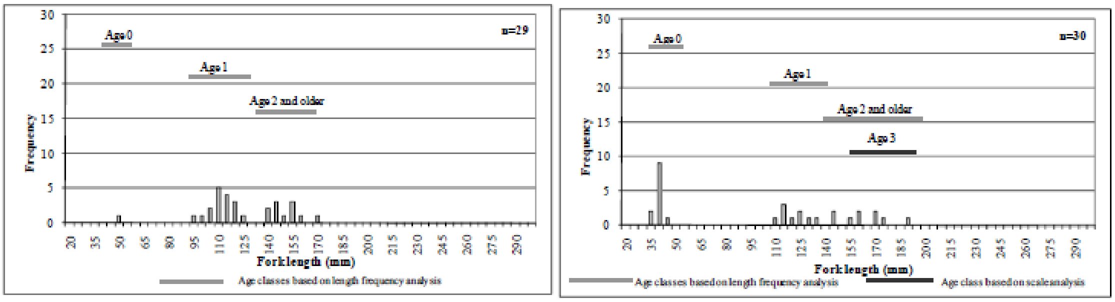
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one quantitative (Level II) representative fish population surveys in this reach according to standard fish population sampling protocols. The reach was sampled using multi-pass electrofishing.

The Lake Valley Reservoir Dam Reach (North Fork of the North Fork American River, RM 14.3) Level II quantitative site, located 2.1 miles downstream of the Lake Valley Reservoir Dam at an elevation of 5,550 ft, was sampled on July 30, 2008 and August 4, 2009. The 2001 Emigrant Gap Fire burned through this site resulting in abundant deadfall that recruits to the stream channel. Rainbow and brown trout were the only species collected at this site, and brown trout was the dominant species observed by both relative number and weight each year.

Estimates of rainbow trout per mile in 2008 and 2009 were 570 and 487 respectively, rainbow trout biomass was 10.2 and 8.6 lbs/acre, and the Fulton's condition factor averaged 1.10 and 1.08. As can be seen in the figures below, the population did not exhibit a typical age class distribution in either year.

Rainbow trout length-frequency distribution and ages for NFNF American River below Lake Valley Dam– from 2008 (left) and 2009 (right). From Figure 3.6-5 in Technical Memorandum 3-1.

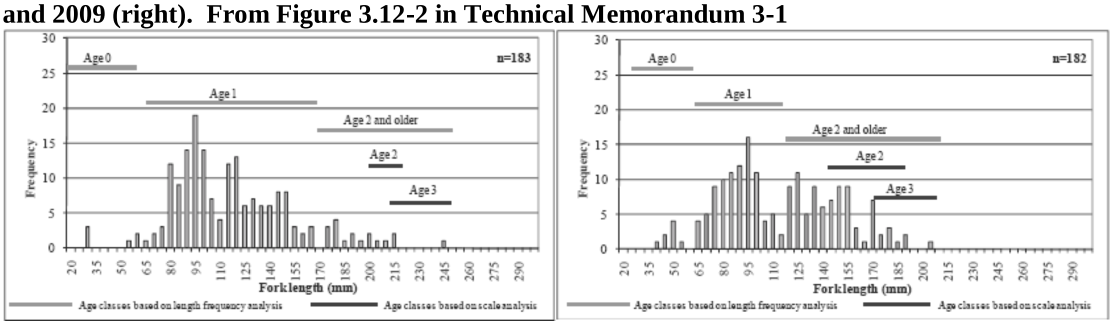


Multiple age classes of both species were collected each year, but included only a single age-0 rainbow trout in 2008.

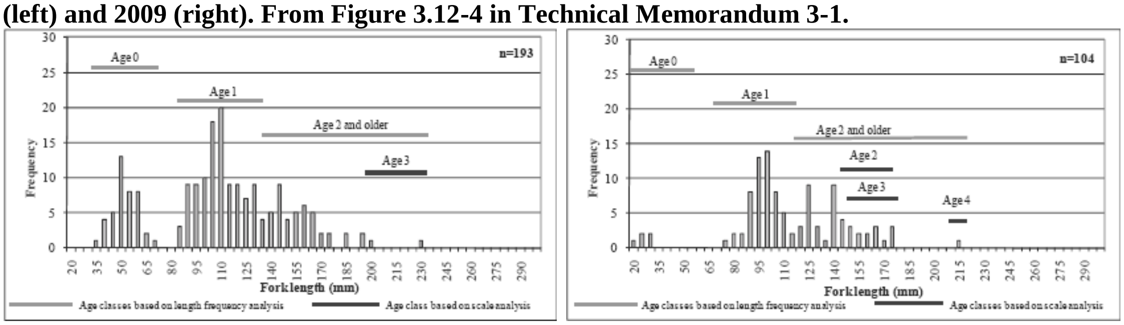
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

Discussion of Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at one site in August 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP)(see Technical Memorandum 3-10). The site was co-located with the Lake Valley Dam Reach - Level II fish sampling site.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Determination of Fish Condition

While the benthic macroinvertebrate IBI site was around the mean of all project affected sites, the MMI was somewhat lower. The scores for this site were well below those for the non-project affected reference reaches in the North Yuba River. These scores indicate that the habitat quality is low.

Rainbow trout population and biomass estimates for this site in the North Fork of the North Fork of the American River were substantially lower than the North Yuba unimpaired reference reaches. Biomass estimates were also substantially lower than the average North Sierra stream of this width. Additionally, the rainbow trout population did not exhibit a robust age class structure. This suggests that there may not be good quality habitat available for all life history stages during times that each stage would require it. Further, the data does not indicate a healthy or viable population in terms of abundance or productivity. Therefore the Resource Agencies do not consider the fish in the Lake Valley Dam Reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). In addition, an entrainment study was done on the Lake Valley Canal Diversion Dam structure. These studies are described below:

Mean unimpaired flows for the Lake Valley Dam reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table LV-1. Synthesized mean unimpaired flows for the Lake Valley Dam Reach

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	3	4	3	3	6	15	38	27	3	0	1	1
Dry	1	3	4	5	12	27	53	41	8	0	0	0
Below Normal	0	2	7	12	15	39	69	78	16	0	0	0
Above Normal	2	14	19	30	21	44	64	105	41	3	1	1
Wet	4	18	45	37	52	51	60	98	69	17	2	1

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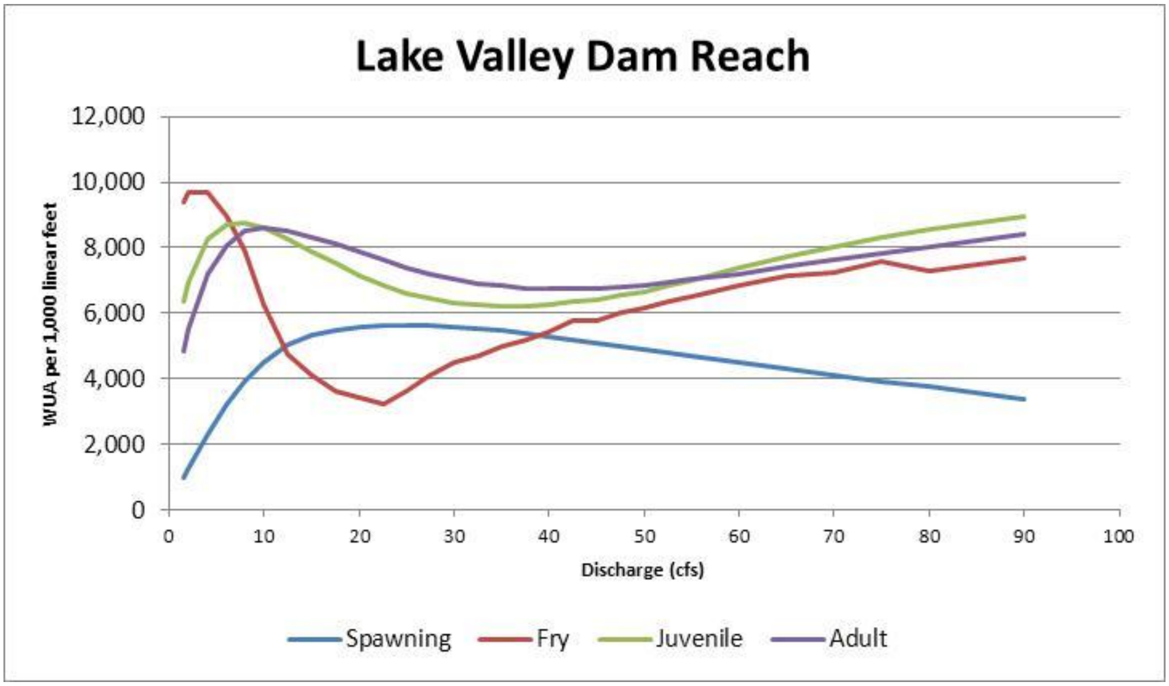
Licensee conducted one PHABSIM-type instream flow study between Lake Valley Reservoir and Lake Valley Diversion Dam Reach. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table LV-2 Eighty percent and 100 percent of the Maximum WUA for rainbow trout in Lake Valley Reservoir Dam Reach.

	80% Max WUA	100% Max WUA
Lake Valley Reservoir Dam Reach		
Adult	4 cfs	10 cfs
Spawning	10 cfs	22.5 cfs
Juvenile	2 cfs	8 cfs

The PHABSIM results suggest that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance. However, Resource Agency staff believes that there are also other factors influencing the poor condition of the fishery in this reach. While the temperatures were not in the lethal range for individual fish, the existing minimum streamflow of 1 cfs may be causing chronic stress for adults due to the reduced living conditions.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);

- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

Adult rainbow trout WUAs for this reach are presented in Table LV-4 below. The Resource Agencies used this, lifestage periodicity and flow information, and determined minimum streamflows ranging from 4 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 10 cfs, which represents 100 percent of the maximum WUA, in wet water years to provide sufficient water during July through March to address SWE-1 and the rearing component of SWE-3.

Similarly, the Resource Agencies used adult rainbow trout spawning WUA and the peak of the natural hydrograph to determine minimum streamflows ranging from 10 cfs, which represents 80 percent of the maximum WUA, in critically dry water years to 23 cfs, which represents 100 percent of the maximum WUA, in wet water years during May to provide sufficient water for spawning to address SWE-3.

To attempt to recreate a more natural hydrograph and address SWE-2, flows were stepped-up during April from the adult RBT values to the RBT spawning values. Similarly, during June, flows were stepped back down from the RBT spawning values to the adult RBT values.

Recommended minimum streamflows for dry, below normal, and above normal water years were interpolated between the values specified for critically dry and wet water years.

Table LV-3 presents the Resource Agencies determination of flows that Licensee should release from Lake Valley Reservoir to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table LV-3. Resource Agency initial minimum streamflow recommendation in the North Fork of the North Fork of the American River below Lake Valley Reservoir

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	4	4	4	4	4	4	6	10	7	4	4	4
Dry	5	5	5	5	5	5	8	13	9	5	5	5
Below Normal	6	6	6	6	6	6	9	15	11	6	6	6
Above Normal	8	8	8	8	8	8	12	20	14	8	8	8
Wet	10	10	10	10	10	10	14	23	17	10	10	10

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Table LV-3

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	2	2	3	3	3	4
Nov	Adult	2	2	3	3	3	4
Dec	Adult	2	2	3	3	3	4
Jan	Adult	2	2	3	3	3	4
Feb	Adult	2	2	3	3	3	4
Mar	Adult	2	2	3	3	3	4
Apr	Spawn	2	4	4	6	8	10
May	Spawn	2	6	6	9	11	15
Jun	Spawn	2	5	5	6	8	10
Jul	Adult	2	3	3.5	5	5.5	6
Aug	Adult	2	3	3.5	5	5.5	6
Sep	Adult	2	3	3.5	5	5.5	6

The table below presents the adult rainbow trout weighted usable area associated with the collaboratively-negotiated streamflows.

Table LV-4

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	64%	64%	74%	74%	74%	84%
Nov	Adult	64%	64%	74%	74%	74%	84%
Dec	Adult	64%	64%	74%	74%	74%	84%
Jan	Adult	64%	64%	74%	74%	74%	84%
Feb	Adult	64%	64%	74%	74%	74%	84%
Mar	Adult	64%	64%	74%	74%	74%	84%
Apr	Spawn	22%	41%	41%	57%	70%	80%
May	Spawn	22%	57%	57%	75%	84%	95%
Jun	Spawn	22%	49%	49%	57%	70%	80%
Jul	Adult	64%	74%	79%	89%	91%	94%
Aug	Adult	64%	74%	79%	89%	91%	94%
Sep	Adult	64%	74%	79%	89%	91%	94%

Conclusion

Fish population data collected in 2008 and 2009 indicated low densities in population levels. Rainbow trout populations in this reach are depressed and are experiencing inter-specific competition with non-native brown trout populations. Loss of biomass to the North Fork of the North Fork of the American River through entrainment at the Lake Valley Canal Diversion Dam may be playing a factor in the poor condition of the fishery. The existing minimum streamflow for this reach is 1 cfs which is less than 56 percent of the Weighted Usable Area for adult trout and is likely limiting overall production of rainbow trout populations. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

North Fork of North Fork American River Below Lake Valley Canal Diversion Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient water is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as existing "cold freshwater habitat" and potential "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

The Lake Valley Canal Diversion Dam reach below Lake Valley Reservoir Dam is approximately 13.1 miles long, extending from the Lake Valley Canal Diversion Dam, to the confluence with the North Fork American River. Average elevation for the upper-reach was 5,250 ft, with an average elevation of 4,800 for the lower-reach and average channel gradient is 3.0 percent. (Technical Memorandum 3-2). The watershed area at the Lake Valley Dam is approximately 9.2 square miles. The mean annual unimpaired flow is 40 cfs. The existing minimum streamflow is 3 cfs June 1 through September 30 and 1 cfs October 1 through May 31.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

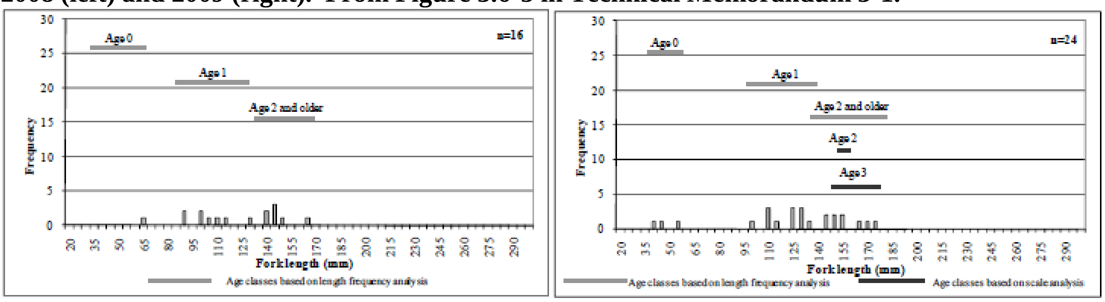
Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed two quantitative (Level II) representative fish population surveys in this reach according to standard fish population sampling protocols. The reaches were sampled using multi-pass electrofishing.

The Lake Valley Canal Diversion Dam Reach-Upper Site (North Fork of the North Fork American River, RM 11.8) Level II quantitative site, located 1.7 miles downstream of the Lake Valley Canal Diversion Dam at an elevation of 5,250 ft, was sampled by electrofishing on

July 23, 2008 and August 10, 2009. The site was 226.0 ft long in a medium-gradient channel (3.0 percent), and was composed of three habitat types: low- and high gradient riffle, and pool. The average channel width for the entire site was 27.8 ft in 2008 and 22.3 ft in 2009.

Estimates of rainbow trout per mile in 2008 and 2009 were 374 and 563 respectively, rainbow trout biomass was 5.9 and 12.7 lbs/acre, and the Fulton's condition factor averaged 1.26 and 1.23. As can be seen in the figures below, multiple age classes were collected each year, but few fish were collected either year. This indicates that there is some reproduction occurring, but the population did not exhibit a typical age class distribution in either year partly due to the low numbers of fish captured.

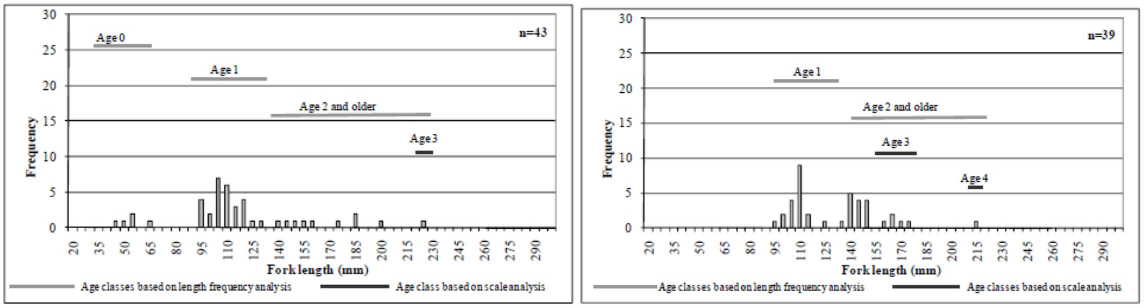
Rainbow trout length-frequency distribution and ages for Lake Valley Canal Diversion Dam–Upper From 2008 (left) and 2009 (right). From Figure 3.6-5 in Technical Memorandum 3-1.



The Lake Valley Canal Diversion Dam Reach-Lower (North Fork of the North Fork American River, RM 10.3), located 3.2 miles downstream of the Lake Valley Canal Diversion Dam at an elevation of 4,800 ft was sampled on July 23, 2008 and August 10, 2009. The site was 321.0 ft long in a medium-gradient channel (3.0 percent), and was composed of four habitat types: low- and high-gradient riffle, run, and pool. Sampling was conducted by electrofishing the riffle, run, and small pool portions of the site and snorkeling the, 58.0 ft long, deep pool at the upstream end of the site. The average channel width for the entire site was 19.8 ft in 2008 and 23.8 ft in 2009. Streamflow at the time of sampling was visually estimated to be 5 cfs both years. Two low-flow fish passage impediments were observed within the site: a high-gradient riffle, and a bedrock chute. No large woody debris was observed at this site either year. The freshwater diatom, D. geminata, was abundant at this site.

Estimates of rainbow trout per mile in 2008 and 2009 were 883 and 800 respectively, rainbow trout biomass was 20.2 and 18 lbs/acre, and the Fulton's condition factor averaged 1.22 and 1.18. As can be seen in the figures below, multiple age classes were collected each year, but again few age-0 fish were collected either year. Similar to the sampling results at the Upper site, this indicates that there is some reproduction occurring, but the population did not exhibit a typical age class distribution in either year - partly due to the low numbers of fish captured.

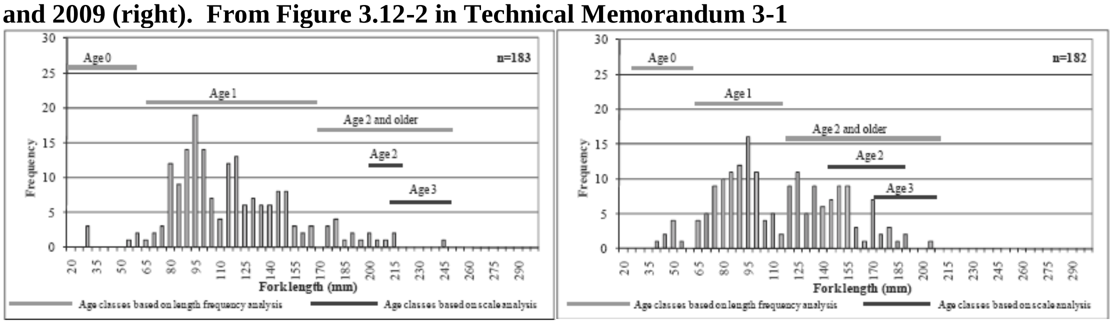
Rainbow trout length-frequency distribution and ages for Lake Valley Canal Diversion Dam–Lower From 2008 (left) and 2009 (right). From Figure 3.6-5 in Technical Memorandum 3-1.



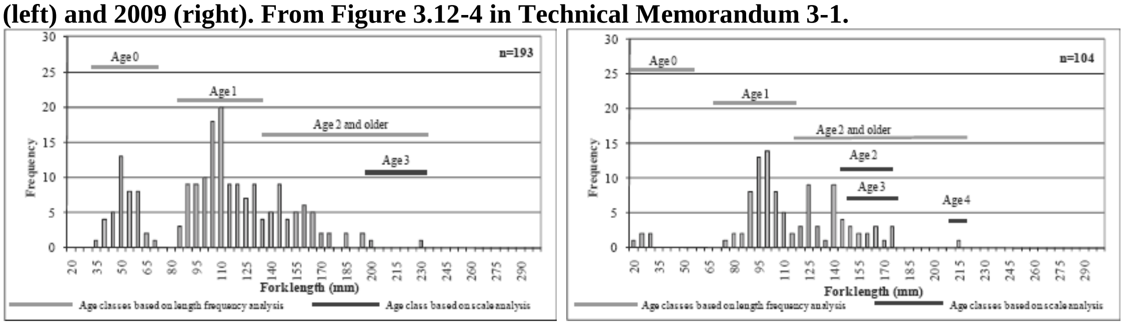
Reference Reach Information

Three sites in the North Yuba River were sampled in 2008 and 2009 as part of the FERC approved Stream Fish Population Study Plan as unregulated reference reaches. The Upper site (RM 55.2 and elev. 5.350 ft) was sampled on July 29, 2008 and July 20, 2009. Rainbow trout per mile were estimated to be 4,165 and 4,312 respectively, with biomass estimates of 53.2 and 52.5 lbs/acre and average Fulton's condition factor of 1.15 and 1.16. The Middle site (RM 51.4 and elev. 4,300 ft) was sampled on August 20, 2008 and July 21, 2009. Rainbow trout per mile were estimated to be 5,994 and 3,137 respectively with biomass estimates of 83.6 and 40.2 lbs/acre and average Fulton's condition factor of 1.17 and 0.76. A small number of brown trout were captured at each site in each year. The age class structure for rainbow trout in each site can be seen in the following charts:

Rainbow trout length-frequency distribution and ages for the North Yuba River – Upper site from 2008 (left) and 2009 (right). From Figure 3.12-2 in Technical Memorandum 3-1



Rainbow trout length-frequency distribution and ages for the North Yuba River – Middle site from 2008 (left) and 2009 (right). From Figure 3.12-4 in Technical Memorandum 3-1.



Age 0 fish are only abundant in the Middle site during 2008, likely due to sampling dates. The Upper site was sampled in late July of both 2008 and 2009, while the Lower site was sampled in late August in 2008 and late July in 2009. In these higher elevation sites, young-of-the-year trout likely were still emerging or recently emerged from the gravel in late July. Additionally, electrofisher efficiency is generally lower for smaller fish (unless the settings are adjusted to specifically target small fish – which would then bias the electrofisher capture efficiency against larger fish), so the later season sampling date possibly gave the juveniles more time to grow to a "catchable" length.

The Lower site (RM 22.3, elev. 2,150 ft) was sampled on August 21, 2008 and July 22, 2009. Because the site was deep, the entire 601.0 ft long site was snorkeled rather than electrofished, and a community of rainbow trout, Sacramento pikeminnow, and Sacramento sucker was present in both years.

The unregulated Lavezzola Creek, a tributary to the Downie River thence the North Fork Yuba River was studied in 1987. This creek is a high elevation designated wild trout stream. Estimated rainbow trout per mile averaged 3,554 and biomass averaged 46.8 lbs/acre.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at the lower site on July, 29, 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP). The site was co-located with the Lake Valley Canal Diversion Dam site - Lower Level II fish sampling site (RM 10.3). IBI and MMI scores were 54 and 62 respectively. The site ecozone classification was montane and the dominant substrate was boulder.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

<u>Discussion of Foothill Yellow-legged Frog Studies</u>

Four mainstem NF of the NF American River sites and two tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and one site was resurveyed in 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). All life stages (egg masses, tadpoles, juveniles, and adults) were found in at the lowest site in the reach (NF-1A) which is approximately 13 miles downstream of the diversion dam. At least one adult was found in a tributary within the next most downstream site NF-2 which is about 7 miles downstream of the diversion dam. No incidental sightings were documented. Only two egg masses were found at one site, which is low compared to averages from both regulated and unregulated rivers. Based on this information and habitat information from the habitat modeling study (Study and

Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists and foothill yellow-legged frogs occur in low abundance in the lower portion of the reach.

FYLF detections from survey sites in the North Fork of the North Fork of the American River Below Lake Valley Canal Diversion in 2008 and 2009 Dam; Table 3.4-18 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site	Survey 1				Survey 2[1]				Survey 3[1]			
	Egg Mass[2]	Tadpole[2]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult	Tadpole[2]	Young[3]	Juvenile	Adult
NF-1A Main	June 17, 2008				None				None			
	2 (G 24)	310 (G 24–25)	12	13	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NF-2 Main	June 18, 2008				July 24, 2008				September 19, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	1	0	0	0	1	0	0	0	0
NF-3 Main	June 19, 2008				July 23, 2008				September 15, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
NF-4 Main	June 25, 2008				July 23, 2008				September 15, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

2009 SURVEYS												
Reach/Site	Survey 1				Survey 2				Survey 3			
	Egg Mass	Tadpole	Juvenile	Adult	Egg Mass	Tadpole	Juvenile	Adult	Tadpole	Young	Juvenile	Adult
NF-2 Main	June 1, 2009				June 9, 2009				August 11, 2009			
	0	0	0	1	0	0	0	0	0	0	0	0

1 N/A indicates mainstem survey not conducted according to study proposal or because tributary was dry.
2 "G" is developmental stage as described in Gosner (1960).
3 "Young" indicates young-of-year.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

The benthic macroinvertebrate IBI and MMI at site was close to the mean of all project affected sites. The scores at this site were all well below those for the non-project affected reference reaches in the North Yuba River. These scores indicate that the habitat quality is relatively low.

As noted above, foothill yellow-legged frogs were observed at the lower end of the reach, but in low numbers and suitable habitat exists throughout the reach. The highest population of adults occurred at the lowest site in the reach and a small number of juveniles present indicated that breeding had occurred.

Rainbow trout population and biomass estimates for the two sites in the North Fork of the North Fork of the American River below the Lake Valley Canal Diversion Dam were substantially lower than the North Yuba unimpaired reference reaches. Biomass estimates were also substantially lower than the average North Sierra stream of this width (Gerstung 1973). Additionally, the rainbow trout population did not exhibit a robust age class structure. This indicates that, although there is at least some spawning in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of abundance or productivity.

Taking the benthic macroinvertebrate, FYLF, and rainbow trout information into consideration, the Resource Agencies do not consider the aquatic biota in the Lake Valley Canal Diversion Dam Reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

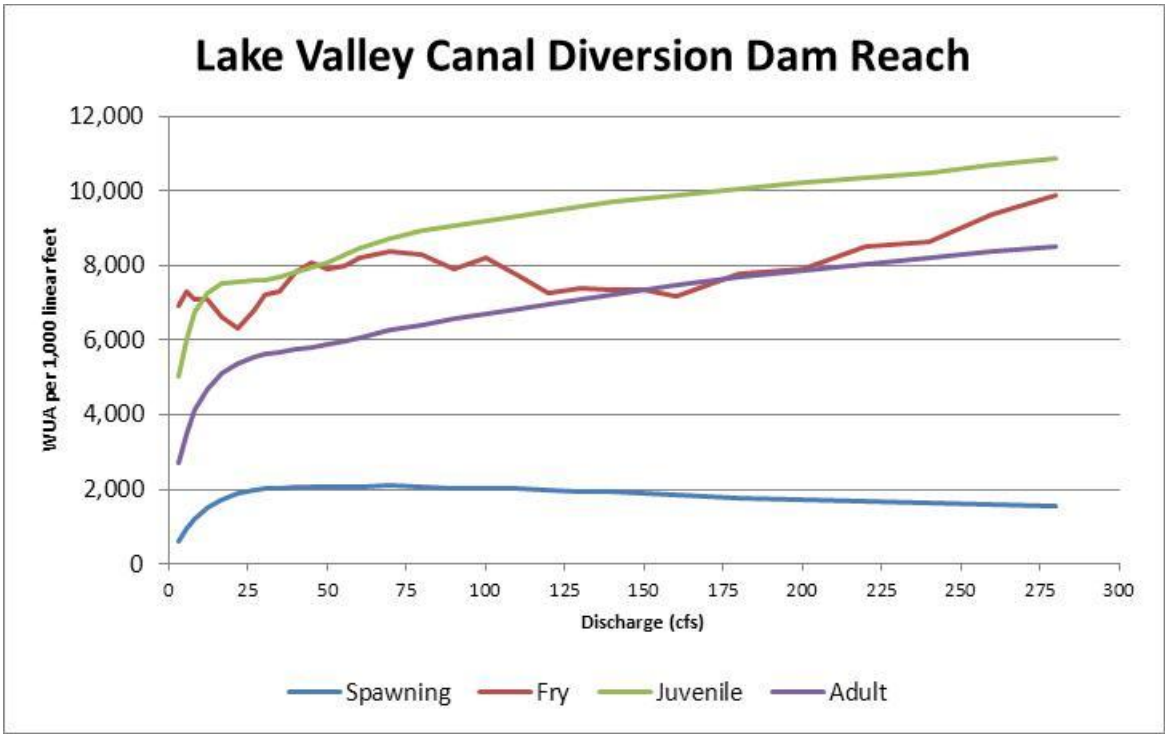
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). Additionally, an entrainment study was conducted at the Lake Valley Canal Diversion Dam. These studies are described below:

Mean unimpaired flows for the Lake Valley Canal Diversion Dam reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table LVC-1 presents the average monthly unimpaired flows, by water year type, for the reach.

Table LVC-1. Synthesized mean unimpaired flows for the Lake Valley Canal Diversion Dam Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	5	6	5	5	11	28	64	45	5	0	1	1
Dry	2	6	8	10	22	49	91	70	13	1	0	1
Below Normal	1	5	13	23	27	70	116	132	27	1	0	0
Above Normal	3	25	34	54	38	78	108	178	67	5	1	1
Wet	8	33	80	67	96	90	101	164	113	28	3	2

The Licensee conducted a PHABSIM-type instream flow study between the Lake Valley Canal Diversion Dam Reach and the North Fork American River. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:



As can be seen, the adult, juvenile, and fry curves trended upward as flows increased. This is an atypical and unexpected result. Therefore, the PHABSIM results for the Lake Valley Dam reach were also considered.

In the Drum-Spaulding Project's Lake Valley Canal Entrainment Study, Licensee's netting apparatus captured 19 fish during the 58 days of sampling between May 5 and November 13, 2009. These samples are snapshots of the conditions at the time they were taken and when extrapolated over the course of the projects historical operation, the loss of biomass to the North Fork of the North Fork of the American River through entrainment at the Lake Valley Canal Diversion Dam may be playing a factor in the poor condition of the fishery.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows generally focuses on the following study information in an effort to enhance the condition of the aquatic biota:

- PHABSIM study results between 80 percent and 100 percent Maximum WUA for adult rainbow trout during the summer to maintain a living stream at all times (SWE-1);
- Emulating the natural timing, general mode and pattern of natural flow regimes including preserving the timing and magnitude and inter and intra-annual flow variation to the extent feasible (SWE-2);
- PHABSIM study results between 80 percent and 100 percent Maximum WUA for spawning and juvenile rearing rainbow trout during the spring to provide resident native fish migration, spawning and rearing habitat (SWE-3);

However, since the PHABSIM results for the Lake Valley Canal Diversion Dam Reach were atypical, and since the only sources of water to support any minimum streamflow prescription below the diversion dam include Lake Valley Reservoir and Kelly Lake, the Resource Agencies developed a minimum streamflow regime that reflects the the Resource Agencies' combined initial minimum streamflow recommendations for releases from Lake Valley Dam and Kelly Lake Dam.

Table LVC-3 presents the Resource Agencies determination of flows that Licensee should release below Spaulding Dam to enhance the condition of the fishery and ensure adequate protection of aquatic biota (including foothill yellow-legged frogs) in the reach.

Table LVC-3. Resource Agency initial minimum streamflow recommendation in the North Fork of the North Fork American River below Lake Valley Diversion Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Critically Dry	4	4	4	4	4	4	6	10	7	4	4
Dry	6	6	6	6	6	6	9	14	10	6	6
Below Normal	7	7	7	7	7	7	10	16	12	7	7
Above Normal	9	9	9	9	9	9	13	21	15	9	9
Wet	11	11	11	11	11	11	15	24	18	11	11

Adjustment of Minimum Streamflows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows to address site-specific considerations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process. The flow regime reflects the combination of the collaboratively adjusted minimum streamflow releases from Lake Valley Dam and Kelly Lake Dam.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Nov	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Dec	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Jan	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Feb	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Mar	Adult	2.2	2.2	3.2	3.5	3.5	4.5
Apr	Spawn	2.2	4.2	4.2	6.5	8.5	10.5
May	Spawn	2.2	6.2	6.2	9.5	11.5	15.5
Jun	Spawn	2.2	5.2	5.2	6.5	8.5	10.5
Jul	Adult	2.2	3.2	3.7	5.5	6	6.5
Aug	Adult	2.2	3.2	3.7	5.5	6	6.5
Sep	Adult	2.2	3.2	3.7	5.5	6	6.5

Conclusion

Fish population data collected in 2008 and 2009 indicated low densities in population levels. Rainbow trout populations in this reach are depressed and are experiencing inter-specific competition with non-native fish populations. The existing minimum streamflow for this reach is 3 cfs June 1 through September 30 and 1 cfs from October 1 through May 31, which is less than 32 percent of the Weighted Usable Area for adult trout and is likely limiting overall production of rainbow trout populations. In addition, loss of biomass to the North Fork of the North Fork of the American River through entrainment at the Lake Valley Canal Diversion Dam may also be playing a factor in the poor condition of the fishery. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Canyon Creek Below Towle Canal Diversion Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to: improve the habitat so that populations of native fish are viable with adequate habitat consistent with species needs; maintain, enhance or restore all life stages of native aquatic species; ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, foothill yellow-legged frogs, and benthic macroinvertebrates. The reach is designated as existing "cold freshwater habitat" and potential "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement, and Rationale

Canyon Creek below Towle Canal Diversion Dam is 3.7 mi long and extends from the outlet at Towle Canal Diversion Dam to Placer County Water Agency's Pulp Mill Diversion. The average elevation is approximately 3,800 ft, and the average channel gradient is 3.7 percent (Technical Memorandum 3-2). The watershed above Towle Canal Diversion Dam is approximately 1.56 square miles, it is a snowmelt driven system, and has a mean annual unimpaired flow of 3.9 cfs. The existing minimum streamflow requirement below the Towle Canal Diversion Dam is 1 cfs year round.

Licensee's use of Canyon Creek is subtly different than in other reaches of the project. Licensee delivers water from Drum Forebay through the Towle Diversion to Canyon Creek where it is re-diverted a few hundred feet downstream at the Towle Canal Diversion Dam into the Towle Canal. Water from the Towle Canal is used to generate power at the Alta Powerhouse before it is delivered to PCWA at the Lower Boardman Diversion immediately downstream from the powerhouse.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In 2008, the Towle Canal Diversion Dam Reach was a Level I (qualitative) study site and 82 sites were sampled. Forty-one brown trout were found in the reach at a rate of 6.4 fish/minute. Fish ranged from 52 to 255 mm in length. Rainbow trout were found in low numbers in the reach above the diversion dam and in higher numbers downstream of the Pulp Mill Diversion (outside of the project area). However, no rainbow trout were found downstream of the Towle Canal Diversion Dam.

Discussion of Benthic Macroinvertebrate Studies

Benthic macroinvertebrates were not sampled in this reach.

Discussion of Foothill Yellow-legged Frog Studies

Three mainstem Canyon Creek sites and two tributaries were surveyed for foothill yellow-legged frogs during Study 3-6 in 2008 and one site was resurveyed in 2009 (see table; Nevada Irrigation District and Pacific Gas and Electric Company 2010a). Juveniles and adults were found at one site (TC-1 main) and no individuals were found in tributaries. This site was the farthest downstream of the survey sites and was 3.5 miles downstream of the diversion dam. No incidental sightings were documented. Based on this information and habitat information from the habitat modeling study (Study and Technical Memorandum 3-7; Nevada Irrigation District and Pacific Gas and Electric Company 2011), suitable breeding habitat exists and foothill yellow-legged frogs occur in low abundance in the lower portion of the reach.

FYLF detections from survey sites in the Canyon Creek Below Towle Canal Diversion Dam in 2008 and 2009; Table 3.4-20 from Technical Memorandum 3-6.

2008 SURVEYS												
Reach/Site	Survey 1				Survey 2				Survey 3[1]			
	Egg Mass	Tadpole	Juvenile	Adult	Tadpole	Young	Juvenile	Adult	Tadpole	Young	Juvenile	Adult
TC-1 Main	June 17 and 20, 2008				June 26, 2008				August 25, 2008			
	0	0	0	0	0	0	1	0	0	0	0	1
Tributary	0	0	0	0	0	0	0	0	N/A	N/A	N/A	N/A
TC-2A Main	June 10, 2008				June 24, 2008				August 9, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Reach/Site	Survey 1				Survey 2				Survey 3[1]			
	Egg Mass	Tadpole	Juvenile	Adult	Tadpole	Young	Juvenile	Adult	Tadpole	Young	Juvenile	Adult
TC-3 Main	June 20, 2008				June 26, 2008				August 8, 2008			
	0	0	0	0	0	0	0	0	0	0	0	0
Tributary	0	0	0	0	0	0	0	0	N/A	N/A	N/A	N/A

2009 SURVEYS										
Reach/Site	Survey 1		Survey 2		Survey 3		Survey 4		Survey 5	
	Egg Mass/Tad	Juvenile/ Adult	Egg Mass/Tad	Juvenile/ Adult	Egg Mass/Tad	Juvenile/ Adult	Egg Mass/Tad	Juvenile/ Adult	Tadpole	Juvenile/ Adult
TC-1 Main	June 11, 2009		June 16, 2009		June 24, 2009		July 1, 2009		August 15, 2009	
	0	0	0	0	0	1 (adult)	0	0	0	0

[1] N/A indicates survey not conducted because tributary was dry.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

No rainbow trout were found in this reach and very few foothill yellow-legged frogs were observed, even though suitable breeding habitat exists. Therefore, the Resource Agencies do not consider the aquatic biota in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); and 2) a PHABSIM-based instream flow study (Technical Memorandum 3-2, Instream Flow). These studies are described below:

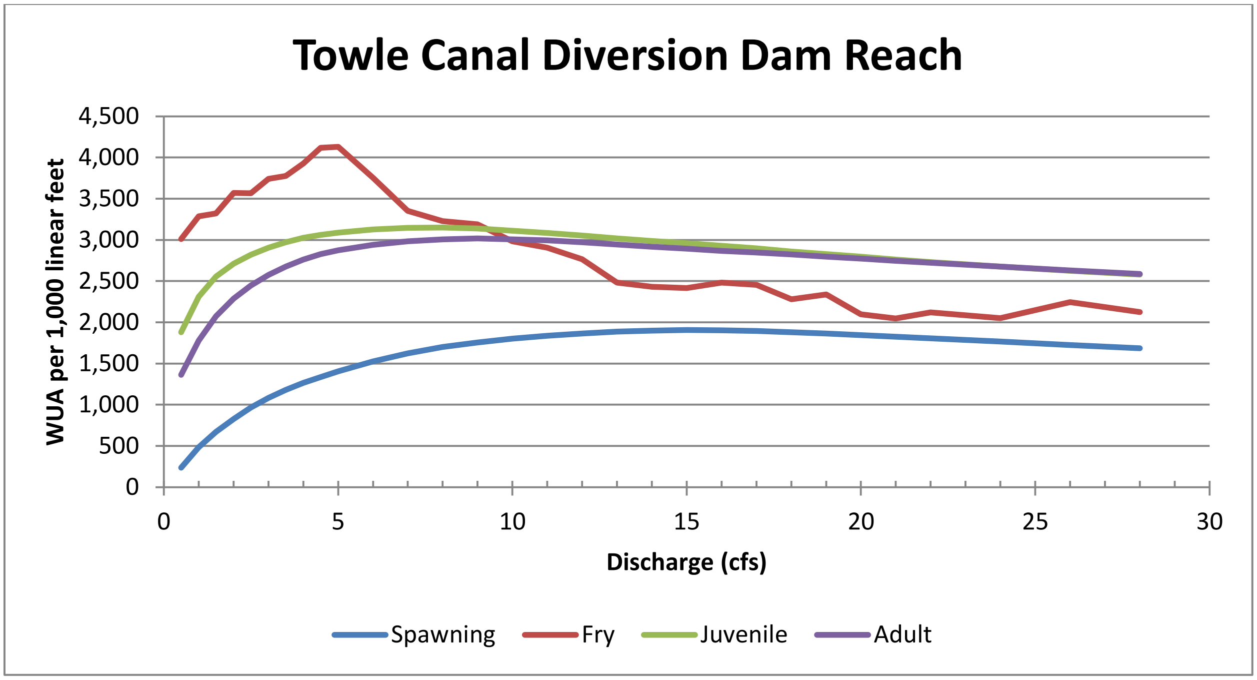
Mean unimpaired flows for the Canyon Creek below the Towle Canal Diversion Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. Table TC-**2** presents the average monthly unimpaired flows, by water year type, for the reach.

Table TC-2. Synthesized mean unimpaired flows for the Canyon Creek below the Towle Diversion Dam

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.9	0.9	0.9	1.0	1.5	2.6	2.3	1.6	0.6	0.3	0.2	0.2
Dry	0.7	1.2	1.3	1.4	2.3	4.2	4.8	2.8	1.1	0.5	0.3	0.3
Below Normal	0.5	0.9	1.8	2.4	4.0	7.1	6.6	5.1	1.6	0.8	0.5	0.4
Above Normal	0.7	2.4	4.3	8.6	7.9	10.4	8.7	7.6	3.0	1.2	0.8	0.7
Wet	1.0	2.7	8.0	12.5	17.4	14.4	12.8	11.7	5.0	2.1	1.1	0.9

The Licensee conducted a PHABSIM-type instream flow study in Canyon Creek below the Towle Canal Diversion Dam. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The study results generated the following flow vs. weighted usable area (WUA) relationships for the reach:

Figure TC-1. Towle Canal Diversion Dam Reach PHABSIM Modeling Results



The most pertinent results of the PHABSIM study are presented in Table TC-3, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning.

Table TC-3. Eighty percent and 100 percent of the Maximum WUA for rainbow trout in the Canyon Creek below the Towle Canal Diversion Dam

	80% Max WUA	100% Max WUA
Adult	2.5 cfs	8 cfs
Spawning	6 cfs	14 cfs
Juvenile	1.5 cfs	7 cfs

Resource Agency staff considered the PHABSIM study results presented in Table TC-3 and determined that the 80 percent and 100 percent WUA values for adult rainbow trout and rainbow trout spawning were inconsistent with the unimpaired hydrology information presented in Table TC-2. Therefore, the Resource Agencies focused on other information to determine minimum streamflows that help keep fish and other aquatic resources in good condition.

Determination of Minimum Streamflows

As noted above, the fish in this reach were determined not to be in good condition and the PHABSIM study results were deemed inconsistent with the unimpaired hydrology. Therefore, given project operations, the Resource Agencies' initial determination of minimum streamflows focused on generally passing through unimpaired flow in Canyon Creek in order to improve the condition of the fishery: Table TC-4 presents the Resource Agencies' determination of flows that should be released from the Towle Canal Diversion Dam to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table TC-4. Resource Agency initial minimum streamflow recommendation in Canyon Creek below the Towle Canal Diversion Dam

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1	1	1	1	2	2	2	1	1	1	1	1
Dry	1	1	1	2	3	4	3	3	1	1	1	1
Below Normal	1	1	2	4	5	6	5	4	2	1	1	1
Above Normal	1	2	4	7	8	10	9	7	3	1	1	1
Wet	1	3	6	10	12	14	12	11	4	2	1	1

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Collaboratively agreed upon minimum streamflows by month and water year type (in cfs)

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	1	1	1	1	1	1
Nov	Adult	1	1	1	1	1	1
Dec	Adult	1	1	1	1	1	1
Jan	Adult	1	1	1	1	1	1
Feb	Adult	1	1	1	1	2	2
Mar	Spawn	1	2	2	2 or NF if NF>2	2 or NF if NF>2	2 or NF if NF>2
Apr	Spawn	1	2	2	2 or NF if NF>2	2 or NF if NF>2	2 or NF if NF>2
May	Spawn	1	1	1	2	2	3
Jun	Adult	1	1	1	2	2	2
Jul	Adult	1	1	1	1	2	2
Aug	Adult	1	1	1	1	2	2
Sep	Adult	1	1	1	1	2	2

NF = Natural Flow

Conclusion

Fish population data collected in 2008 indicated the absence of rainbow trout in this reach and only a small number of post-metamorphic foothill yellow-legged frogs were found. The existing minimum streamflow for this reach is 1 cfs, which is likely limiting overall production of rainbow trout populations. Increased spawning flows identified during March and April in critically dry, dry, below normal, above normal and wet water years will be provided to increase reproduction of rainbow trout populations. Monitoring of fish and foothill yellow-legged frog populations will occur in this reach and will inform our understanding of how the combined streamflow measures are affecting these species.

Dry Creek Below Halsey Afterbay Dam

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition.

Existing Conditions, Problem Statement, and Rationale

Halsey Afterbay Dam Reach on Dry Creek is approximately 2.2 mi long, beginning at the highwater pool of Redhawk Ranch Reservoir, and ending at the Halsey Afterbay Dam. The reach has an average elevation of 1,450 ft and a channel gradient of 1.6 percent (Technical Memorandum 3-2). The watershed area of Halsey Afterbay is approximately 3 square miles, and the mean annual unimpaired flow is approximately 4.4 cfs. There is no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: Level I sampling at Halsey Afterbay Dam Reach in 2008 was difficult due to thick Himalayan blackberry (*Rubus discolor*) bushes, and no fish were collected. In 2009, the site was converted to a Level II site and prior to the sampling effort the site was cleared of blackberry bushes to facilitate access and sampling efficiency. Level II sampling via electrofisher resulted in the collection of 98 fish.

The Halsey Afterbay Dam Reach (Dry Creek, RM 1.7) Level II quantitative site, located 1.7 miles downstream of Halsey Afterbay Dam at an elevation of 1,350 ft, was sampled on August 14, 2009 (the original Level I site). The site was 435.0 ft long in a low-gradient channel (2.0 percent), and comprised four habitat types: low- and high-gradient riffle, run, and pool. The average channel width for the entire site was 6.0 ft (1.8 m). Streamflow was visually estimated to be approximately 1 cfs. In many places, blackberry formed a complete canopy over the channel, forming dense thickets along approximately 75 percent of both sides of the channel. Two days prior to sampling, a path was manually cut through the thickets that formed a canopy over the channel to allow access for fish sampling.

Brown trout dominated this reach and no rainbow trout were collected. Other species collected included bluegill, green sunfish, golden shiner, and mosquito fish. However, no native fish species, such as rainbow trout, were collected.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

Benthic macroinvertebrates (BMIs) were sampled at one site in August 2009 in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP)(see Technical Memorandum 3-10). The site was co-located with the Halsey Afterbay Dam Reach fish sampling site. The IBI score was 21 and the MMI score was 24.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

<u>Determination of Fish Condition</u>

As is noted above, no native fish species were collected in the reach below Halsey Afterbay. Therefore the Resource Agencies do not consider the fish in the Halsey Afterbay Dam Reach to be in good condition.

<u>Discussion of Relevant Instream Flow Related Studies</u>

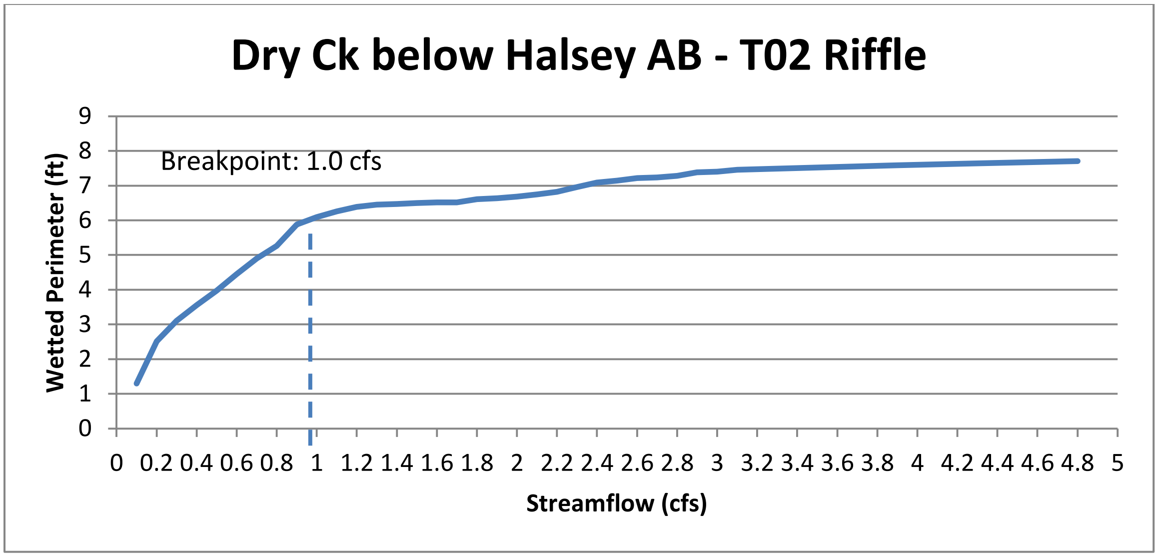
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) Channel Flow Response (CFR). Both studies are described below.

Mean unimpaired flows for the Halsey Afterbay Dam reach were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table HA-1. Synthesized mean unimpaired flows for the Halsey Afterbay Dam Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1.1	1.0	1.1	1.2	1.8	2.9	1.7	1.2	0.7	0.4	0.3	0.3
Dry	1.0	1.5	1.5	1.6	2.6	4.5	4.5	2.3	1.2	0.7	0.4	0.4
Below Normal	0.6	1.0	2.1	2.7	4.7	7.9	6.4	4.1	1.6	1.0	0.7	0.6
Above Normal	0.9	2.7	5.0	10.3	9.7	12.2	9.4	6.6	2.8	1.6	1.0	0.9
Wet	1.2	2.8	8.9	15.1	21.1	17.2	15.2	12.4	4.6	2.3	1.4	1.2

Using the CFR hydraulic model developed by Licensee, the Resource Agencies determined the relationship between flow and wetted perimeter at the one riffle transect evaluated below Halsey Afterbay. This relationship is depicted below:



Note that the breakpoint in the flow versus wetted perimeter analysis occurs at approximately 1 cfs. The application of the breakpoint is intended to establish a summer low-flow standard.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the results of wetted perimeter method presented above in an effort to enhance the condition of the aquatic biota.

The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	1	1	1	1	1	1
Nov	Adult	1	1	1	1	1	1
Dec	Adult	1	1	1	1	1	1
Jan	Adult	1	1	1	1	1	1
Feb	Adult	1	1	1	1	1	1
Mar	Adult	1	1	1	1	1	1
Apr	Adult	1	1	1	1	1	1
May	Spawn	1	1	1	1	1	1
Jun	Spawn	1	1	1	1	1	1
Jul	Adult	1	1	1	1	1	1

Aug	Adult	1	1	1	1	1	1
Sep	Adult	1	1	1	1	1	1

Conclusion

Fish population data collected in 2009 indicated an absence of native species. Dewatering of historic habitat in this reach is likely limiting overall production of native species populations including BMI. Having a year round minimum streamflow requirement will keep the channel wetted and increase the amount of habitat available to aquatic biota. Monitoring of fish populations and BMI will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting these species.

Rock Creek Below Rock Creek Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition.

Existing Conditions, Problem Statement, and Rationale

Rock Creek Dam Reach is approximately 2.1 mi long and extends from the confluence with Dry Creek to Rock Creek Dam. The reach has an average elevation of 1,310 ft and a channel gradient of 2.4 percent .The watershed area at the Rock Creek Dam is approximately 2.2 square miles. There is currently no minimum streamflow requirement in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

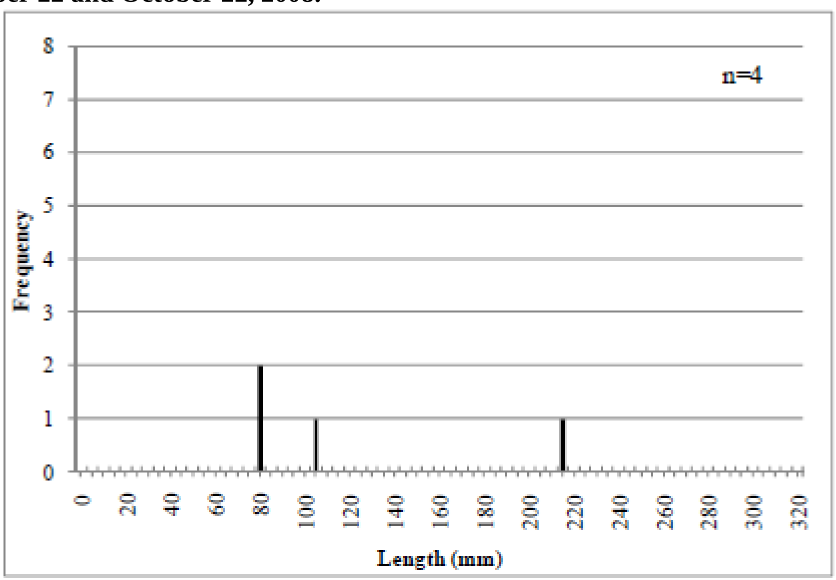
Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees sampled fish habitat spots in two separate locations. The first sampled area was below Rock Creek Dam on September 22, 2008. A total of 45 spots were sampled along a 425-ft section of stream starting at Dry Creek Road. The site averaged 12.0 ft in width and 1.7 ft in depth, and was characterized as 50 percent riffle and 50 percent run habitat with 80 percent canopy cover. Instantaneous water temperature was 18.7 ºC.

The second sampled area was below Rock Creek Road, and sampling was conducted on September 22 and October 22, 2008. A total of 25 spots were sampled along a 350-ft section of stream at the time of the first sampling effort and 43 spots were sampled along a 500-ft section of stream during the second effort. The second sampling effort was to more thoroughly sample promising habitat that initially resulted in low catch. The site averaged 12 ft in width and 1 ft in depth and was characterized as 20 percent riffle, 30 percent pool, and 50 percent glide habitat with 80 percent canopy cover. Instantaneous water temperature at the site on the first sample event was 19.8 and 21.6 °C on the second event.

On September 22, 2008, both survey locations (RM 2.0 and 0.9) were sampled. During that effort, a single rainbow trout with a FL of 79 mm was collected in the Rock Creek Road sample area (RM 0.9). An additional sampling effort was conducted at the Rock Creek Road sample area on October 22, 2008. During the later October event, a total of eight fish representing three species were collected, which included: rainbow trout, mosquitofish, and pumpkinseed sunfish.

Figure WR-1. Length frequency for rainbow trout collected in Rock Creek Dam Reach over two sampling events on September 22 and October 22, 2008.



Determination of Fish Condition

Although the stream fish population study was qualitative in nature, collecting only four rainbow trout in 70 sampling locations indicates the population is extremely small. Additionally, there were no other native species collected at this site that would be expected to occur at this elevation. This does not indicate a healthy population. Therefore the Resource Agencies do not consider the fish in the Rock Creek Dam Reach to be in good condition.

Discussion of Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled in accordance with the FERC approved

Aquatic Macroinvertebrates Study Plan (January 2009) using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP). The site was not co-located with the Rock Creek Level I fish sampling sites (RM 2.0, 0.9). IBI and MMI scores were 34 and 36 respectively. The site ecozone classification was foothill and the dominant substrate was fines.

The Rock Creek Dam Reach aquatic invertebrate sampling site was approximately 0.32 mi. downstream of the Rock Creek Dam. The dominance of fines at the Rock Creek and Dry Creek sites possibly contributed to the lower IBI and MMI scores at these sites.

BMI Reference Information

For all project affected sites, the median IBI was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Discussion of Relevant Instream Flow Related Studies

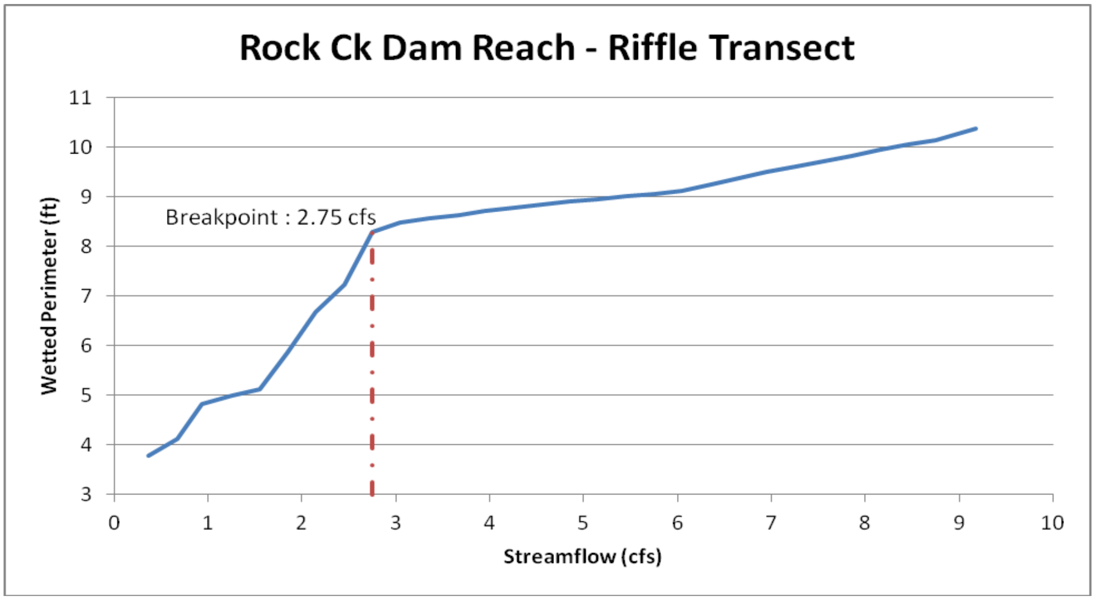
Licensee conducted several studies that are relevant for determining appropriate minimum streamflows for this reach. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) Channel Flow Response (CFR). Both studies are described below.

Mean unimpaired flows for Rock Creek below Rock Creek Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table RC-1. Synthesized mean unimpaired flows for the Rock Creek Dam Reach.

Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.7	0.7	0.7	0.8	1.2	1.9	1.2	0.8	0.5	0.2	0.2	0.2
Dry	0.6	1.0	1.0	1.1	1.7	3.0	3.0	1.6	0.8	0.5	0.3	0.3
Below Normal	0.4	0.7	1.4	1.8	3.1	5.2	4.2	2.7	1.1	0.7	0.4	0.4
Above Normal	0.6	1.8	3.3	6.8	6.4	8.1	6.2	4.4	1.8	1.0	0.7	0.6
Wet	0.8	1.8	5.9	10.0	14.0	11.4	10.1	8.2	3.0	1.5	0.9	0.8

Using the CFR hydraulic model developed by Licensee, the Resource Agencies determined the relationship between flow and wetted perimeter at the one riffle transect evaluated below Rock Creek Dam. This relationship is depicted below:



Note that the breakpoint in the flow versus wetted perimeter analysis occurs at approximately 2.75 cfs. The application of the breakpoint is intended to establish a summer low-flow standard.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on the following study information in an effort to enhance the condition of the fishery:

- The results of the wetted perimeter method presented above were used to establish a flow that maintains a living stream at all times (SWE-1);
- Emulating inter -annual flow variations to the extent feasible (SWE-2);

The following table presents the Resource Agencies determination of minimum streamflows that Licensee should release below Rock Creek Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table RC-1. Resource Agency initial minimum flow recommendation in Rock Creek below Rock Creek Dam

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1	1	1	1	1	3	1	1	1	1	1	1
Dry	1	1	1	1	1	3	1	1	1	1	1	1
Below Normal	1	1	1	1	1	3	1	1	1	1	1	1
Above Normal	2	2	2	2	2	4	2	2	2	2	2	2
Wet	3	3	3	3	3	5	3	3	3	3	3	3

Adjustment of Minimum Flows to Address Water Supply and Power Generation Interests

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation and water supply. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	1	1	1	1	2	3
Nov	Adult	1	1	1	1	2	3
Dec	Adult	1	1	1	1	2	3
Jan	Adult	1	1	1	1	2	3
Feb	Adult	1	1	1	1	2	3
Mar	Spawn	3	3	3	3	3	3
Apr	Adult	1	1	1	1	2	3
May	Adult	1	1	1	1	2	3
Jun	Adult	1	1	1	1	2	3
Jul	Adult	1	1	1	1	2	3
Aug	Adult	1	1	1	1	2	3
Sep	Adult	1	1	1	1	2	3

Conclusion

Fish population data collected in 2008 indicated low numbers of rainbow trout and an absence of other native species. The lack of a minimum streamflow along with high amounts of fine sediments in this reach is likely limiting overall production of rainbow trout populations. Competition with warm water species may also be limiting overall rainbow trout production. Having a year round minimum streamflow requirement will increase habitat and provide connectivity with Dry Creek. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting these species.

Auburn Ravine Below Wise Powerhouse (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition within Auburn Ravine, specifically including rainbow trout, and benthic macroinvertebrates. Additionally, flows in this reach should be provided to protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat conditions.

Existing Conditions, Problem Statement and Rationale

Existing Conditions

The California Department of Fish and Game conducted fish surveys in Auburn Ravine in 2004 and 2005. Steelhead trout (*Oncorhynchus mykiss*) dominated the catch in both years. Relative steelhead trout abundance estimate averaged 2,163 individuals per river mile. At the uppermost survey site, located near Wise Road at approximately RM 27.5, steelhead trout relative abundance was 337 individuals per river mile. These surveys also documented another anadromous species - Pacific lamprey (*Lampetra tridentata*) – in Auburn Ravine up to at least Bridge Lane (~RM 21) (CDFG 2008).

On March 19, 1998, the National Marine Fisheries Service (NMFS) listed the Central Valley steelhead distinct population segment (DPS) as a threatened species (63 FR 13347 (1998)). On September 8, 2000, pursuant to a July 10, 2000 rule issued by NMFS under Section 4(d) of the ESA (16 USC § 1533(d)), the take restrictions that apply statutorily to endangered species began to apply to Central Valley steelhead (65 FR 42421 (2000)). On January 5, 2006, NMFS reaffirmed the threatened status of the Central Valley Steelhead DPS (71 FR 834 (2006)).

NMFS designated critical habitat for Central Valley steelhead on September 2, 2005 (70 FR 52488 (September 2, 2005)). The critical habitat designation includes the Auburn Hydrologic Sub-area of American River Hydrologic Unit 5514, which encompasses Auburn Ravine (70 FR 52488 (September 2, 2005)).

Although there are more recent anecdotal accounts of Chinook (*O. tshawytscha*) in Auburn Ravine, there were documented runs in the west Placer streams area - including Auburn Ravine – during the 1960s. According to California Department of Fish and Game Marine Resources Administrative Report No. 65-2 (DFG 1964), there was an estimated run of 1,000 fall-run Chinook salmon in the west Placer creeks area, including: Secret Ravine, Miners Ravine, Antelope Creek, Auburn Ravine, Doty Ravine, and Coon Creek. The report states that "The run in Secret Ravine and Auburn Ravine was greater than in 1963; the other streams were about the same" indicating that previous runs occurred in these creeks.

Central Valley fall-run Chinook salmon is classified as a California State Species of Special Concern. At the federal level, it is considered a Species of Concern under ESA (69 FR 19975 (April 15, 2004)).

Auburn Ravine is considered to be essential fish habitat (EFH) for Central Valley fall-run Chinook salmon (NMFS Website). The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires that all federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect EFH. EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Magnuson-Stevens Act states that migratory routes to and from anadromous fish spawning grounds are considered EFH. The phrase "adversely affect" refers to the creation of any impact that reduces the quality or quantity of

EFH. Federal activities that occur outside of EFH, but which may have an impact on EFH must be considered in the consultation process.

Reach Length

The reach of the Auburn Ravine below the Wise Powerhouse is approximately 27 miles long, extending from the release of Wise Powerhouse down to East Side Canal. The Licensee designated the 1.2 mile long segment that extends from the Wise powerhouse at RM 27.6 to PCWA's Auburn Tunnel inflow at RM 26.4 as the upper section of Auburn Ravine. They designated the 26.4 miles section extending from PCWA's Auburn Tunnel to South Sutter Water District's East Side Canal at RM 0 as the lower section of Auburn Ravine. While there are currently no minimum streamflow requirements for Auburn Ravine in the existing FERC license, Auburn Ravine is used as a water conveyance route to move about 80 cfs (up to 180 cfs) during April through October to make consumptive water deliveries. Additionally, during November through April, PG&E often releases up to 80 cfs into Auburn Ravine from the South Canal due to a mismatch in capacities between the upstream powerhouses and the canal (Drum-Spaulding FLA).

Discussion of FERC approved Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

This information is presented in Technical Memorandum 3-1 and only applies to the 1.2 mile section of Auburn Ravine between Placer County Water Agency's (PCWA) Auburn Tunnel outlet and PG&E's Wise Powerhouse inflow (called the Wise Powerhouse Overflow Reach in Technical Memorandum 3-1). In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), the Licensee performed qualitative (Level I) fish population surveys in the Wise Powerhouse Overflow Reach, electrofishing according to standard fish population sampling protocols on April 22, 2009. The total length of stream sampled was 1,115 ft. Fifteen rainbow trout, 27 riffle sculpin, and one speckled dace were caught.

Discussion of FERC approved Benthic Macroinvertebrate Studies

Much of the following information is presented in more detail in Technical Memorandum 3-10: Benthic macroinvertebrates (BMIs) were sampled at one site in the upper Auburn Ravine section on August 29, 2009, in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009), using methods adopted for the California Surface Water Ambient Monitoring Plan (SWAMP)(see Technical Memorandum 3-10). The site was co-located with the Level I fish sampling site. IBI and MMI scores were 33 and 32 respectively. The site ecozone classification was foothill and the dominant substrate was coarse gravel.

BMI Reference Information

For all project affected sites, the median IBI score was 50, the mean IBI was 48.8, the median MMI was 58 and the mean MMI was 55.6. Additionally, two sites on the North Yuba River were sampled in June of 2009 as unregulated reference reaches in accordance with the FERC approved Aquatic Macroinvertebrates Study Plan (January 2009). The IBI scores for the Upper and Lower North Yuba sites were 66 and 61 respectively, while the MMI scores were 62 and 74. The dominant substrate for both sites was coarse gravel. The Upper site ecozone was classified as montane while the Lower site was classified as foothill.

Evaluation of Aquatic Biota Condition

Because the FERC approved studies were only conducted in the 1.2 mile section between Wise Powerhouse inflow and PCWA's Auburn Tunnel Outlet, this evaluation of condition applies just to that section. Only 15 rainbow trout were caught in the total 1,115 feet of stream sampled. Additionally, the benthic macroinvertebrate IBI and MMI scores were well below the median and mean for all project sites and substantially lower than those of the unregulated reference reaches. Given the above information, the Resource Agencies do not consider aquatic biota in this section of Auburn Ravine to be in good condition.

Discussion of FERC approved study plan for western Placer County streams

Early in the Preliminary Application Document commenting and study planning process, the Resource Agencies as well as NGO participants asked for studies throughout Auburn Ravine.

In the Licensee's Final Study Plan proposed to compile streamflow information for Auburn Ravine, summarize existing information regarding the Project's direct, indirect, and/or cumulative effects in Auburn Ravine, and then determine if additional studies needed to be conducted in Auburn Ravine.

On February 9, 2009, the Resource Agencies filed comments on the licensees' Revised Study Plans. In the comments, the resource agencies asked for additional study of Auburn Ravine below PCWA's Auburn Tunnel Outlet, stating that:

> Each of the reaches in the study plan is known to contain anadromous fish listed under the ESA, and the waters from the projects and/or operations of the projects are thought to be closely related to the effects on these fish. It is likely that scenarios that affect the current manner in which project waters affect each of these reaches will be analyzed during relicensing. The resource agencies believe it is essential to understand the direct, indirect, and cumulative effects (see 18 CFR Section 5.9(b)(5)) of these various scenarios, since species listed under the ESA are present in these drainages and affected by current operations. It is essential that this information be collected early as part of these studies so that the resource agencies can adequately assess the effects of alternatives during the collaborative process and not afterward during the biological assessment. The resource agencies also believe it is essential that FERC have this information to adequately address direct, indirect, and cumulative effects, both in the biological assessment and the environmental impact statement for the projects.

> …Additionally, the Licensee's study plan does not evaluate how far downstream the there are effects of project canal outages. Although incidents of anadromous fish stranding in lower Auburn Ravine have occurred throughout the projects' histories, there has not been an effort to isolate the cause during sudden low flows. The Licensee's study plan does not propose to assess the project hydrologic impacts to downstream fisheries resources during outage periods.

In addition to the hydrologic analysis of Auburn Ravine, the Resource Agencies asked FERC staff to approve:

- water temperature monitoring in Auburn Ravine below the Wise powerhouse,
- fish population surveys in Auburn Ravine below the Wise Powerhouse, and below the Auburn Tunnel,
- PHABSIM instream flow analysis in Auburn Ravine below the Wise powerhouse, and below the Auburn Tunnel, and
- Radio Frequency Identification (RFID) tracking of juvenile *O. mykiss* during project outages.

In FERC staff's study plan determinations, staff agreed with the Licensee's assessment of the extent of project effects on the Auburn Ravine, and that the Licensee should study those effects. Staff additionally stated that *"The joint agencies appear to confuse effects related to non-project consumptive water deliveries with Drum Spaulding project effects on the disputed streams."* FERC staff approved the Licensee's limited Auburn Ravine study, and the Western Placer Streams study plan which resulted in several Licensee studies that collected data for determining the Project effects on native species in the upper 1.2 miles of Auburn Ravine. These studies included: 1) an assessment of unimpaired hydrology (License Application Exhibit E, Appendix E12); 2) a PHABSIM-based instream flow study (Technical Memorandum 3-13, West Placer Streams); and 3) water temperature monitoring. The only study conducted in Auburn Ravine below PCWA's Auburn Tunnel Outlet (Tech Memo 3-13, Section 3.5) was a hydrologic analysis of the hydroelectric operation, and the operations of diverters in the lower reach. The FERC approved study plan for Western Placer County streams directed PG&E to determine whether the hydroelectric operations of the Drum- Spaulding Project are "a primary cause of adverse effects on critical habitat for anadromous fish."

The Resource Agencies believe that the study planning decisions made by FERC Staff to date have resulted in an inadequate record on which to base the Commission's findings regarding the Project's effects (direct, indirect and cumulative) on water quality and coldwater fish in the lower 26.4 miles of Auburn Ravine. Moreover, we believe that the information provided through the FERC approved studies will be inadequate for the State Water Resources Control Board (Water Board) to conduct a cumulative impact analysis for Auburn Ravine.

The Water Board is designated as the state water pollution control agency for all purposes stated in the Federal Water Pollution Control Act (33 U.S.C. § 1251, et seq.). (Wat. Code, § 13160.) The Water Board is authorized to provide water quality certification under Section 401 of the Clean Water Act and to exercise any powers delegated to the state by the Federal Water Pollution Control Act. (Ibid.) Water Code section 13383 authorizes the Water Board to establish monitoring and reporting "for any person who discharges, or proposes to discharge, to navigable waters" pursuant to the authority defined under section 13160. The operation of the Drum-Spaulding Project involves a discharge into navigable waters. In addition to the authority provided under Water Code section 13383, the Water Board has authority to require submission of monitoring and technical reports under sections 1051, 13165 and 13267 of the Water Code.

The Water Board is required to comply with the California Environmental Quality Act (CEQA) before it can issue water quality certification (Cal. Pub. Resources Code, § 21000 et seq.). The California Department of Fish and Game as Trustee Agency under CEQA (Section 14 CCR 15386, CEQA Guidelines), provides expertise to review and comment on environmental documents and makes recommendations regarding potential negative impacts to those resources held in trust for the people of California. Under CEQA, in addition to requiring evaluation of a range of alternatives as required by NEPA, requires adoption of alternatives or mitigation measures to reduce significant environmental impacts where feasible. Consequently, compliance with CEQA may require consideration of additional information that is not developed in the NEPA process. For this reason, the Water Board could request additional information or may consider additional information that has not yet been submitted in the FERC process to determine the Project's direct, indirect, and cumulative impacts on the biota in Auburn Ravine. FERC staff did not see the need to order studies in the 26.4 miles of Auburn Ravine extending from RM 26.4 to SSWD's East Side Canal at RM 0 to evaluate cumulative impacts under the NEPA process. However, the Water Board may consider additional information necessary, and may request additional studies as part of their water quality certification review.

The Water Board needs sufficient information to show that operation of the Project under a new Commission license will be consistent with water quality standards, including both water quality objectives and the protection of the beneficial uses designated for Auburn Ravine in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins, as well as those designated in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan). The Water Quality Control Plan Central Valley Region—Sacramento River and San Joaquin River Basins, Fourth Edition (hereafter Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin. The Basin Plan does not identify specific beneficial uses for Auburn Ravine, but does designate present uses for the Sacramento River, to which Auburn Ravine (via the East Side Canal and the Cross Canal) is tributary, and therefore beneficial uses apply under the "tributary rule". The beneficial uses for the Sacramento River from Colusa Basin Drain to the "I" Street Bridge are municipal and domestic supply, agricultural supply for irrigation, contact water recreation, other non-contact water recreation, warm and cold freshwater aquatic habitat, warm and cold fish migration habitat, warm and cold spawning habitat, wildlife habitat, and navigation.

The Licensee's Project operations, through water releases from Wise Powerhouse, influence water quantity and water quality throughout Auburn Ravine. Specifically, the Project controls the amount of water released into Auburn Ravine, and is therefore capable of influencing both water quality and freshwater habitat conditions downstream of the Project.

In their April 11, 2012 filing with FERC, the Licensee states that "a minimum streamflow obligation in a new Drum-Spaulding Project FERC License would not aid in enhancing habitat in

Lower Auburn Ravine, because PG&E's operations do not control flow in the relevant stream reaches and PG&E should not be required to mitigate for diversions by other parties. PG&E also has no storage facilities on Auburn Ravine and does not divert water from it." None of these statements is relevant to the Licensee's obligation to a minimum streamflow under a new FERC license, nor do these claims relieve the Licensee from a responsibility to meet that obligation.

First the licensee states that "PG&E's operations do not control flow in the relevant stream reaches". That is a correct statement only if the "relevant stream reaches" they refer to is [are] the stream reach with documented listed fish species. However, under existing conditions, the large amount of water used for power generation through the Licensee's Wise powerhouse is delivered at the top of the reach, where they have absolute "control" of the flow. The detailed gaged data graphs provided in Technical Memorandum 3-13 clearly show that even though many other diverters may put water into or take water out of Auburn Ravine at various times of year, if/when the Licensee turns off releases from the Wise Powerhouse, the river (as measured at gages AR-1 and HWY-65) can fluctuate from very high flow down to almost no flow during any season of the year. These steep and sudden changes in flow can affect migration, spawning, incubation, and survival of fish and other aquatic organisms. Under the existing conditions, when the flow is under the control of the Licensee at the top of the reach, the Licensee is impacting the "relevant stream reaches" all the way downstream to the HWY 65 gage at RM 14.3.

Second, the Licensee states that "PG&E should not be required to mitigate for diversions by other parties" and have extensively documented the delivery schedules, and locations of diversions in Auburn Ravine to show that they are not in control of the flow once it leaves their powerhouse, and that water may be diverted by a large number of entities downstream. Again this statement is irrelevant. The control point is the compliance point. Just because other parties (legal or illegal) may divert the water that PG&E uses to generate power at the Wise powerhouse, does not negate the fact that the licensee has an impact by releasing flow at the top of Auburn Ravine. Moreover, anyone who is diverting water below the Wise release is obligated to comply with Fish and Game Code 5937 and must maintain enough flow to maintain fish in good condition below their diversions. Additionally, many of the diversions in Auburn Ravine are claims of Riparian right, and since the water PG&E releases from Wise Powerhouse is largely comprised of water from foreign watersheds[4] it is not available for appropriation via a claim of Riparian right. The Resource Agencies are not asking PG&E to "mitigate for diversions

[4] In 1997 the Auburn Ravine/Coon Creek Coordinated Resource Management Plan (CRMP) Group was formed. Membership and signatories to the Memorandum of Understanding include County of Placer, cities of Lincoln and Auburn, Placer County Water Agency, South Sutter Water District, Nevada Irrigation District, Placer County Resource Conservation District, Ophir Area Property Owners Association, Placer Nature Center, several environmental groups, and a variety of landowners in the watersheds. The group received a grant from the CALFED Ecosystem Restoration Program to prepare an Ecosystem Restoration Plan (ERP) for the watersheds. This plan - The Auburn Ravine/Coon Creek Restoration Plan - can be found on the website for Placer County. They state that the primary goal of the ERP is to restore and protect water quality and fisheries habitat. The plan emphasizes the protection and restoration of riparian and aquatic habitats (including anadromous and native resident species). The CRMP Group states that "Implementation of the ERP for AR/CC will help improve habitat for anadromous fish including steelhead, spring-run chinook salmon, fall-run chinook salmon as well as other native fish species."

According to the Auburn Ravine/Coon Creek Ecosystem Restoration Plan, "The majority of water that flows down Auburn Ravine is imported from other watersheds. Currently, water from the [Middle Fork Yuba River, South Fork Yuba River], Bear River, and Auburn Ravine watersheds flows down the stream. Water from the American River is currently seasonally imported from a Bureau of Reclamation temporary pumping station and delivered to the Ravine via the Ophir Tunnel."

by other parties," there are other means, including the Water Board's ongoing authority over existing and established appropriative water rights, and under the public trust doctrine. If the public trust is not being protected, the Water Board can limit diversions so as to protect public resources. A minimum streamflow obligation in a new Drum-Spaulding Project FERC License would aid in enhancing and maintaining habitat in Auburn Ravine and should be required.

Last, the Licensee states that "PG&E also has no storage facilities on Auburn Ravine and does not divert water from it." While storage facilities and diversions have clearly recognized impacts to streams, they are not the only sources or cause of impact. The perfect example of another source of impact from within this project is the Bear Meadow within the Bear River stream reach (Measure No. 7 – Bear River Management Through Bear Valley). That is a clear case of impacts to public trust resources that were caused by something other than storage facilities and diversions. Just because they are not diverting from Auburn Ravine does not mean they are not impacting it by creating an altered hydrology.

It is generally recognized, and not disputed by the Licensee, that water delivered through the project has been responsible for the creation of conditions that attract salmonids to Auburn Ravine. Appendix E of the Drum-Spaulding FLA (pg E6.5-62) states: "Historically, low elevation streams such as Auburn Ravine likely were essentially dry during the summer and fall, at least in the foothill sections. Streams such as Auburn Ravine likely were not conducive to supporting significant or consistent fall-run Chinook salmon or steelhead populations. According to NMFS (2009) and Bailey (2003), project operations, through flow augmentation, may be what has attracted anadromous fish into what historically may have been ephemeral West Placer County Stream habitats."

The CEQA baseline for this project may be considered the existing condition. The existing condition is that there is habitat for steelhead below the Wise Powerhouse during the times that PG&E is generating electricity. When PG&E "turns off the faucet" they are taking an action that has an impact on habitat. This impact needs to be mitigated. A year-round minimum streamflow obligation in a new Drum-Spaulding Project FERC License would aid in maintaining the steelhead habitat in Auburn Ravine when the Licensee stops generating through the Wise powerhouse and should be required.

In October of 2011, CDFG staff began conducting a flow study on Auburn Ravine to look at flow-habitat relationships in the lower part of the river reach, downstream of the Licensee's study extent. The details of this study will be discussed below. Upon completion of the CDFG flow study, the CDFG staff will submit to FERC a summary report containing recommendations for flow requirements to protect all life stages of native and anadromous species by providing access to suitable habitats and by restoring fully functioning habitat conditions. Additionally CDFG staff will submit our flow recommendations to the State Water Resources Control Board under Public Resources Code Section 10001-10002 for use in water right investigations. The Water Board may also use CDFG's recommendations as it relates to its continuing duty to consider water rights in light of the public trust doctrine. Lastly, to the extent that the recommendations are available before the CEQA process is completed, CDFG will submit them to the Water Board when they make recommendations as Trustee Agency regarding potential negative impacts to those resources held in trust for the people of California.

Hydrologic Analysis Result from Technical Memorandum 3-13:

The FERC approved study plan for Western Placer County streams directed PG&E to determine whether the hydroelectric operations of the Drum-Spaulding Project are "a primary cause of adverse effects on critical habitat for anadromous fish." In Technical Memorandum 3-13 and later in their April 11, 2012 filing, the Licensee detailed their operations at Wise Powerhouse, as well as describing operations of other downstream facilities. The Licensee details water delivery and diversion points throughout the Ravine.

Water from Rollins Reservoir is diverted at the Bear River Canal Diversion Dam. This water passes through Bear River Canal, then Upper and Lower Wise Canals and into Wise No 1. or No 2 Powerhouse into South Canal. Additional water can be added to South Canal by Placer County Water Agency (PCWA), as they can pump water out of the American River through their Auburn Tunnel then through their new lift station located near Auburn's WWTP. The Licensee can release water into Auburn Ravine either right at the discharge of Wise Powerhouse (the most common operation) through gaging location YB-259, or water can be released where South Canal crosses Auburn Ravine at YB-132.

The City of Auburn's WWTP complex releases effluent (secondary treatment level) that typically ranges from 1 to 9 cfs and averages approximately 2 cfs at RM 26.95.

PCWA pumps water from the North Fork American River into Auburn Ravine via its Auburn Tunnel at RM 26.4. However, while Auburn Tunnel has the potential to convey fairly large amounts of water to Auburn Ravine, the most released at any given time since the Tunnel came on line in 2006 has been about 50 cfs. According to PCWA's EIR for the Auburn Tunnel, PCWA is restricted to releasing no more than 50 cfs during the irrigation season, and is precluded from releasing water in the non-irrigation season. During the season they are allowed to release water in to Auburn Ravine via the Auburn tunnel, PCWA is releasing a fraction of what PG&E is releasing out of Wise powerhouse.

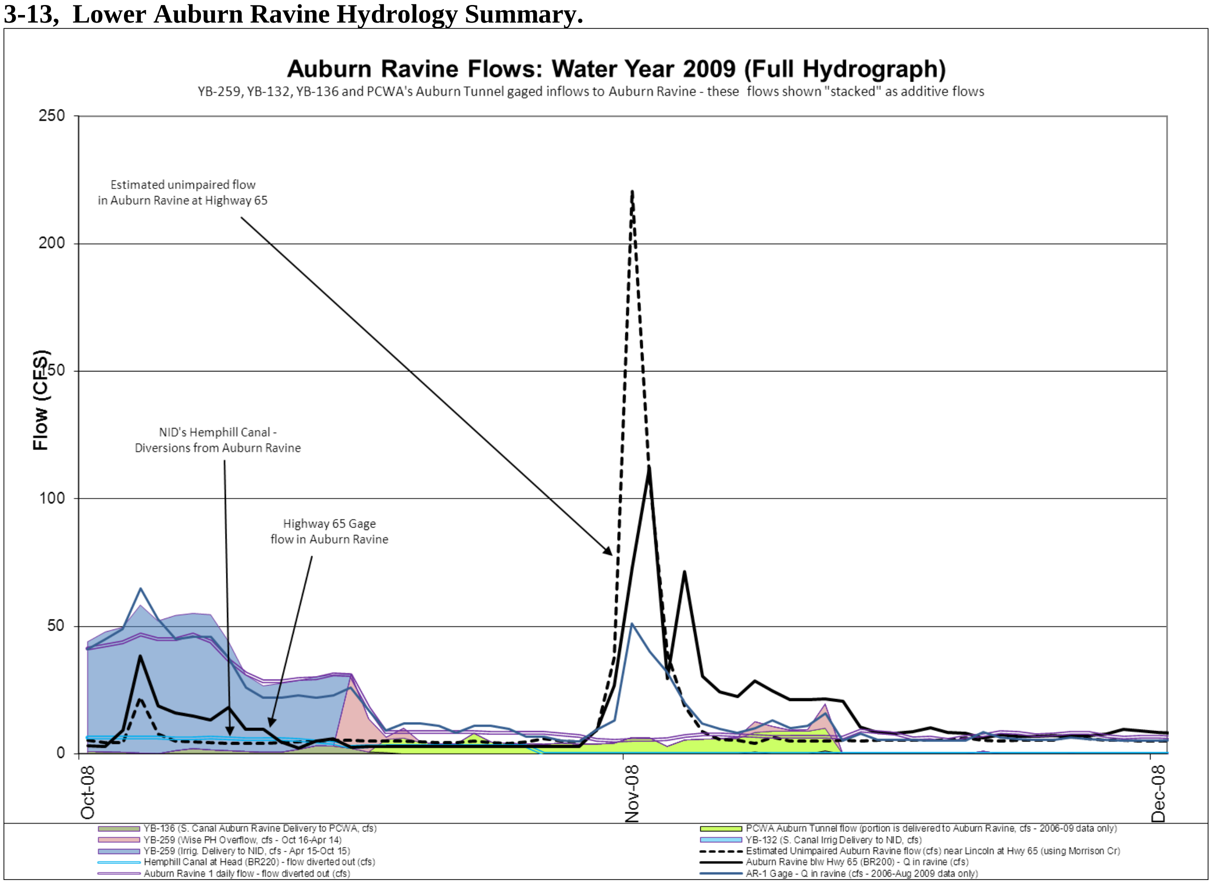
After documenting these delivery locations and the diversion points from the Ravine, the conclusion of the Licensee in Tech Memo 3-13 is that:

> "Overall, the information developed by the study demonstrates that the Project is not a primary cause of adverse effects because: 1) the Project does not withdraw any water out of Lower Auburn Ravine at any time; 2) the Project does not have any facilities on Lower Auburn Ravine, including any facilities that would serve as a barrier to anadromous fish; 3) there is no causal nexus between the hydroelectric project operations and the water deliveries that occur between approximately mid-April and mid-October each year because they occur solely for consumptive water delivery purposes; 4) periodic high flow spikes in Lower Auburn Ravine between early November and mid-April would occur irrespective of the hydroelectric operations of the Project; and 5) numerous entities contribute water into, or divert water out of, Lower Auburn Ravine."

The Resource Agencies disagree with this conclusion. We continue to assert that the Licensee is "a primary cause of adverse effects on critical habitat for anadromous fish." and therefore is responsible for providing flows into the reach that can maintain habitat and keep fish in good condition.

As described above, when the Licensee turns off releases from the Wise Powerhouse, the river (as measured at gages AR-1 and HWY-65) can go from very high flow down to almost no flow during any season of the year. These steep and sudden changes in flow can affect migration, spawning, incubation, and survival of fish and other aquatic organisms. Downstream diversions are of lesser importance during the times when the Licensee releases no water into the stream out of Wise Powerhouse. During these conditions, the streamflow drops in both "Upper" and "Lower" Auburn Ravine to flows that may be harmful to native and anadromous fish. The Licensee's tireless claim that other entities have the ability to contribute to cumulative impacts in the river does not detract from the fact that their project operations do in fact have a substantial direct impact on the river when PG&E greatly reduces or ends a discharge of water from project facilities into Auburn Ravine.

Figure AR-1 - Except from Auburn Ravine Hydrology Graph Presented as Attachment 3-13D to Tech Memo 3-13, Lower Auburn Ravine Hydrology Summary.

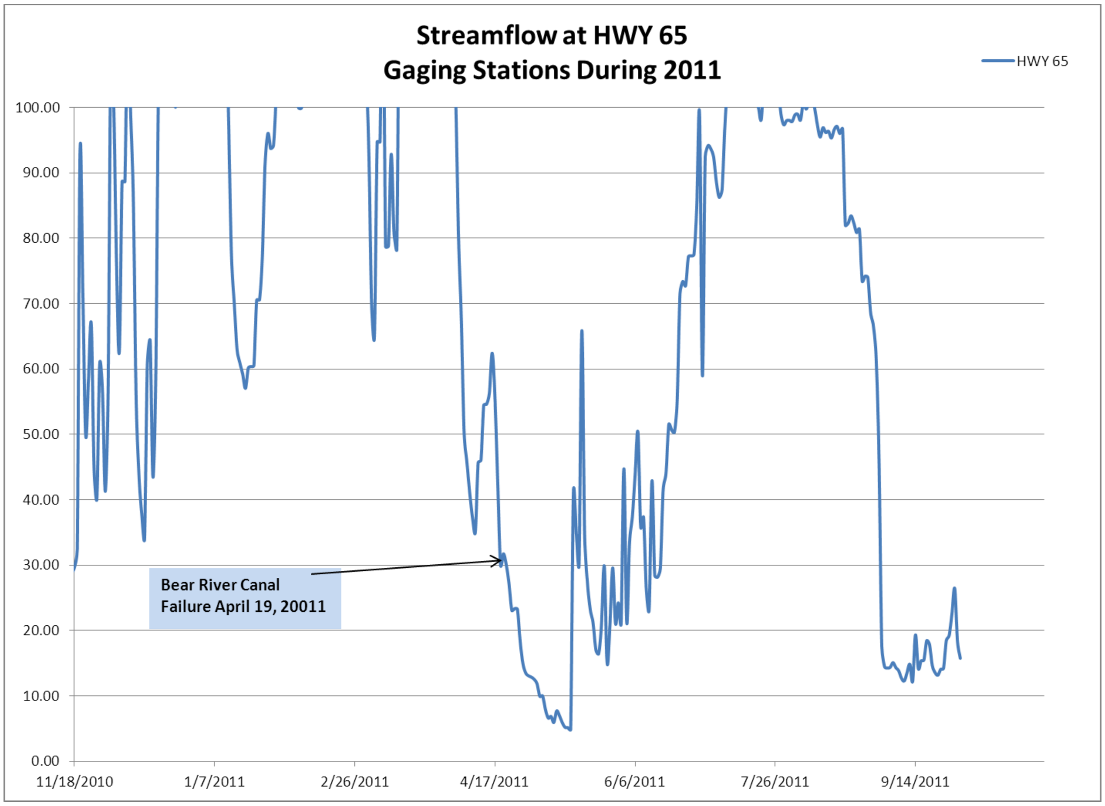


As indicated in the Licensee's April 11, 2012 Supplemental Information summary, it is difficult to parse out which entities impact each section of Auburn Ravine during each season. Part of the difficulty is the fact that the HWY 65 gaging station (operated by NID) has only been collecting data during irrigation season, not year round. However, during Water Year 2009, data was collected at this station to help the licensee determine hydrologic impacts in Auburn Ravine.

In Figure AR-1above, flows at HWY 65 (RM 14.3) within the range of Steelhead Critical Habitat, fell to 3 cfs (estimated by NID). At this time, water in the Ravine was provided by PCWA deliveries from the Auburn Tunnel, and NID. Water was also taken out of Auburn Ravine by NID at AR-1 and at Hemphill Diversion. Although it may be difficult to parse out the Licensee's impact as opposed to the diverters impacts, this example clearly illustrates that when the Licensee curtails generation at Wise Powerhouse, other entities have to begin to deliver water to Auburn Ravine to ensure that adequate flows remain in the stream for both irrigation deliveries and instream beneficial uses. Those entities are currently under no explicit obligation to provide these flows which may be needed to protect spawning, rearing or migrating anadromous fish that were attracted upstream into Auburn Ravine by artificially high flows discharged through Wise Powerhouse into Auburn Ravine.

The Bear River Canal failure in April of 2011 is another example of the negative impacts that PG&E has on Auburn Ravine when Wise powerhouse switches from generating power to not generating power (and effectively "turns off the faucet"). CDFG responded to many phone calls and emails from concerned citizens regarding stranded steelhead trout in the "lower" reach of Auburn Ravine. Flows at the HWY 65 gage the week before the canal failure where in the range of 50-60 cfs. After the canal failure on April 19th, the flow was about one tenth what it had been.

Figure AR-2: Streamflow measured in Auburn Ravine at River Mile 14.4 before and after PG&E's Bear River Canal failure in 2011.

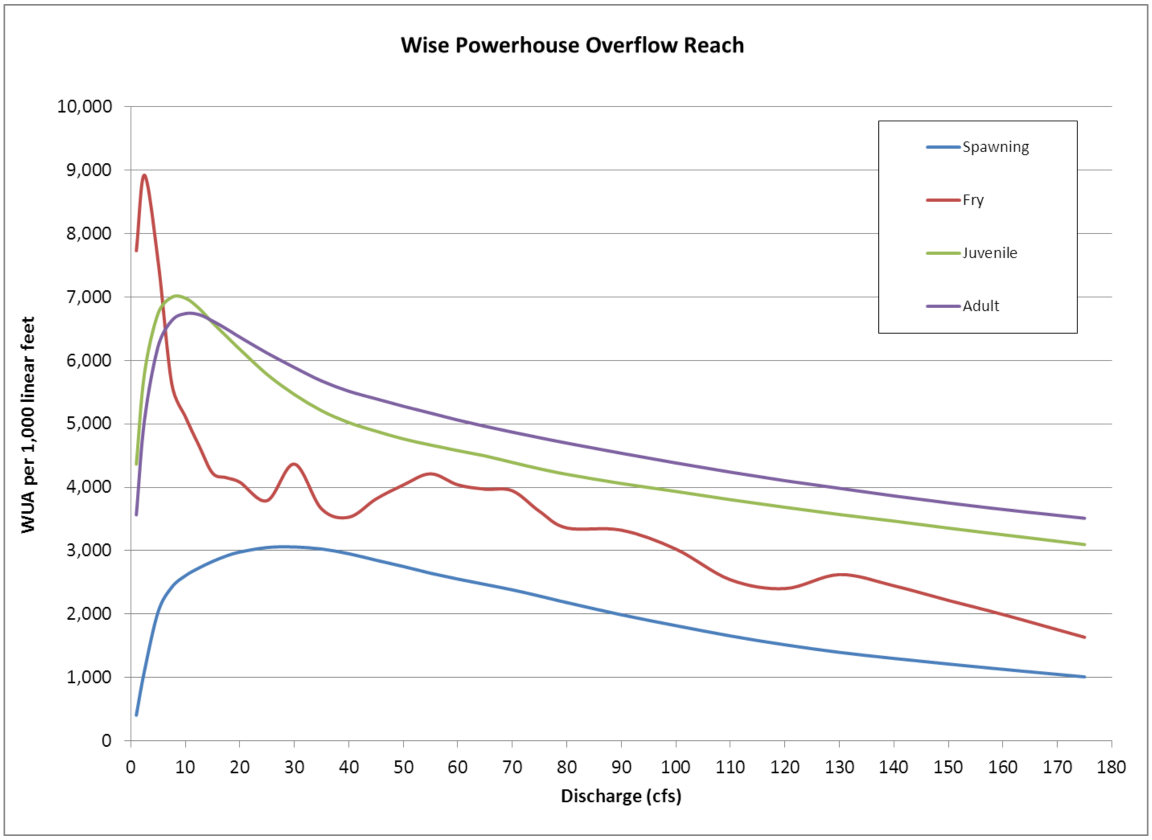


While the repairs were underway for the canal, PG&E requested relief from CDFG for the 5 cfs minimum streamflow in Mormon Ravine. CDFG agreed to let PG&E scale back their releases into the canal at the Newcastle Powerhouse header box. The mutual agreement to temporarily modify flow in Mormon Ravine (a reduction of approximately 6 cfs) was implemented with the understanding that PG&E would ask PCWA to release more water into Auburn Ravine (either from South Canal near Wise Powerhouse or from the Auburn Tunnel). NID agreed to not divert this water at their Goldhill and Hemphill Diversions, allowing it to bypass for instream beneficial uses. PG&E requested PCWA's concurrence, and requested that PCWA increase their discharge from Auburn Tunnel into Auburn Ravine. The pumping expenses for the increase were included in the pumping cost assistance that PG&E offered NID and PCWA during the canal repairs.

Habitat Study Results:

Information Used to Make Interim Flow Recommendations

The Licensee conducted a PHABSIM-type instream flow study in the reach between the Wise Powerhouse and above the Auburn Tunnel. Resource Agency staff participated in many aspects of this study, including transect selection, development of habitat suitability criteria, and calibration of the RHABSIM hydraulic models. The results of the study were used to generate the following flow vs. weighted usable area (WUA) relationship:



The most pertinent results of the PHABSIM study are presented in the table below, including flows that represent the 80 percent and 100 percent of the maximum weighted usable area (WUA) for adult and juvenile rainbow trout and for rainbow trout spawning in the Upper Auburn Ravine site location only.

Table AR-1 Eighty percent and 100% of the Maximum WUA for rainbow trout in the Auburn Ravine Study Site Area, Below Wise Powerhouse and Above the Auburn Tunnel Outlet

	80% Max WUA	100% Max WUA
Adult	4	10
Spawning	8	25
Juvenile	3	8

The PHABSIM study results in this “Upper” Auburn Ravine study area suggest that these flows would provide sufficient habitat for rainbow trout spawning and adult maintenance.

Stream water temperatures were recorded in 2008 and 2009 at two sites in the upper Auburn Ravine area: one site about 500 feet upstream of Wise Powerhouse and a second site in South Canal about 0.25 mile downstream of Wise Powerhouse near the City of Auburn’s Water Treatment Plant. Water temperatures in South Canal reflect the water temperatures released or spilled into Auburn Ravine. Results of water temperature monitoring in Auburn Ravine genereally show that water released from the Project will cool Auburn Ravine during summer months. The figures below are from Technical Memorandum 3-13.

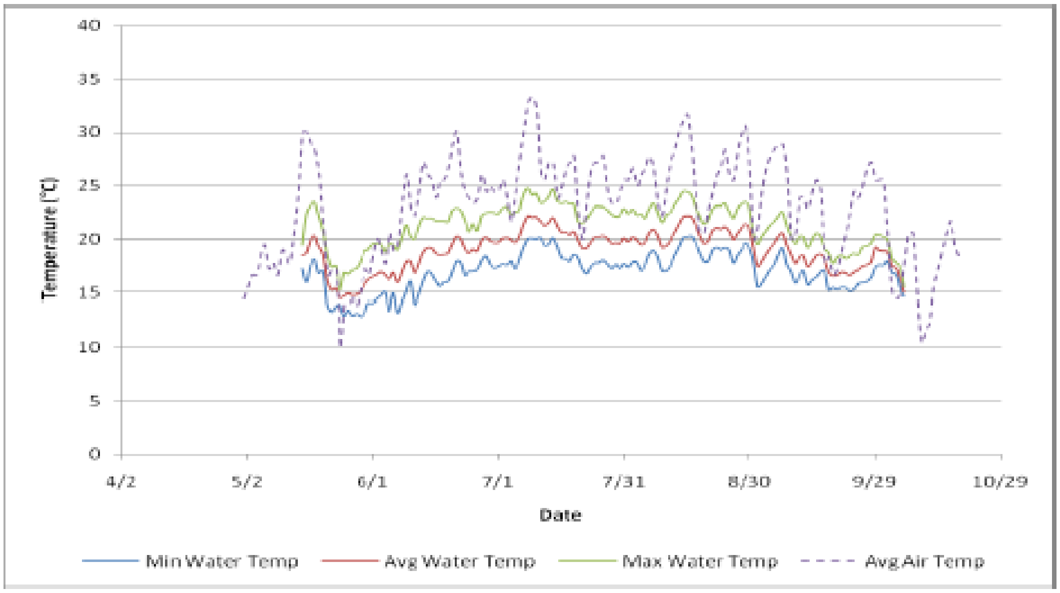


Figure 3.3-4. Daily minimum, average and maximum water temperatures in Auburn Ravine above Wise Powerhouse outflow and daily average air temperatures at CDEC station ADR, May-September 2008.

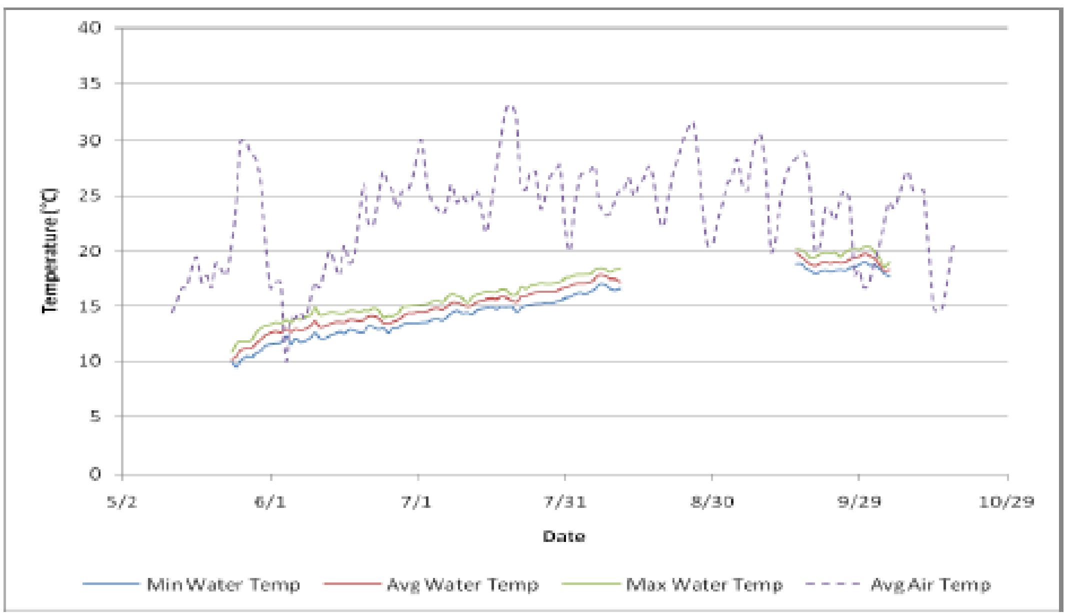


Figure 3.3-6. Daily minimum, average and maximum water temperatures in South Canal below Wise Powerhouse and daily average air temperatures at CDEC station ADR, May-September 2008.

Determination of Minimum Streamflows

Table AR-2 presents the Resource Agencies' determination of flows that should be released into Auburn Ravine to enhance the condition of the fishery and ensure adequate protection of aquatic biota.

Table AR-2. Resource Agencies initial minimum flow recommendation for Auburn Ravine below Wise Powerhouse and Above the Auburn Tunnel Outlet.

Water Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	8	8	8	8	8	10	10	10	8	8	8	8
Dry	8	8	8	8	8	10	10	10	8	8	8	8
Below Normal	10	10	10	10	10	10	10	10	10	10	10	10
Above Normal	10	10	10	10	10	25	25	25	10	10	10	10
Wet	10	10	10	10	10	25	25	25	10	10	10	10

Once the minimum streamflows were evaluated using the HEC-ResSim model, adjustments were made to the flows in individual months and water year types to address site-specific considerations at various locations and to balance the minimum streamflows with other objectives, including hydroelectric generation, and water supply. Table AR-3 presents the minimum streamflows agreed to by the Resource Agencies and the Licensees "for the narrow and focused purpose of enhancing the habitat for resident rainbow trout immediately below South Canal" (PG&E Amended FLA, p. E7-44). Table AR-4 shows the rainbow trout weighted usable area associated with the negotiated streamflows.

Table AR_3 Negotiated Streamflows

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	2	2	4	4	4	4
Nov	Adult	2	2	4	4	4	4
Dec	Adult	2	2	4	4	4	4
Jan	Adult	2	2	4	4	4	4
Feb	Adult	2	2	4	4	4	4
Mar	Spawn	2	4	6	6	15	20
Apr	Spawn	2	4	6	6	15	20
May	Spawn	2	2	4	4	4	4
Jun	Adult	2	2	4	4	4	4
Jul	Adult	2	2	4	4	4	4
Aug	Adult	2	2	4	4	4	4
Sep	Adult	2	2	4	4	4	4

Table AR-4. Rainbow trout weighted usable area associated with the negotiated streamflows.

Month	Life-Stage	EC	CD	D	BN	AN	W

Oct	Adult	60%	60%	80%	80%	80%	80%
Nov	Adult	60%	60%	80%	80%	80%	80%
Dec	Adult	60%	60%	80%	80%	80%	80%
Jan	Adult	60%	60%	80%	80%	80%	80%
Feb	Adult	60%	60%	80%	80%	80%	80%
Mar	Spawn	20%	50%	70%	70%	93%	93%
Apr	Spawn	20%	50%	70%	70%	97%	97%
May	Spawn	20%	20%	50%	50%	50%	50%
Jun	Adult	60%	60%	80%	80%	80%	80%
Jul	Adult	60%	60%	80%	80%	80%	80%
Aug	Adult	60%	60%	80%	80%	80%	80%
Sep	Adult	60%	60%	80%	80%	80%	80%

These negotiated flows are intended only to provide interim protection of beneficial uses in the upper 1.2 miles of Auburn Ravine. Results of future studies (described below) will detail flow required for protection of beneficial uses throughout Auburn Ravine, during all seasons and including during planned and unplanned outages.

Submittal of Revised Recommendations

In October of 2011, CDFG staff began conducting a flow study in Auburn Ravine. The purpose of the study is to evaluate flow-habitat relationships in the lower part of the river reach, downstream of the Licensee's study extent. The CDFG study includes four reaches in Auburn Ravine. In the top three reaches, which extend from the Auburn Tunnel Outlet to the Goldhill Diversion (Auburn Ravine 1), from Goldhill Diversion to the Hemphill Diversion, and from the Hemphill Diversion to the HWY 65 road crossing, PHABSIM studies are being conducted. From the HWY 65 road crossing to the confluence with East Side Canal a critical riffle analysis is being conducted. CDFG staff intend to finish data collection during the low flow months after irrigation season ends in 2012. The goal is to complete data analysis and report writing during early 2013.

Upon completion of the CDFG flow study, the CDFG will submit the summary report to FERC as revised flow recommendations. Additionally CDFG will submit flow recommendations to the Water Board for evaluation in the 401 process and under Public Resources Code Section 10001-10002. The revised flow recommendations will be intended to protect, conserve, enhance, and recover native anadromous fishes and their habitats by providing access to suitable habitats and by restoring fully functioning habitat condition.

Specific Canal Outage Flows

In the Licensee's amended License Application, they suggested a minimum stream flow in Auburn Ravine during canal outages consisting of the "natural flow". This is not acceptable to the Resource Agencies. At many other places on this Project, flows during planned and unplanned outages are allowed to be dropped to lower flows or to natural flow. However, at most of these places infrastructure does not exist to deliver additional required flow if Project facilities are unable to bring water to the stream segments below, and fish and other aquatic organisms may not be permanently damaged by short-term loss of additional Project flows. On this section of Auburn Ravine, ”natural flow” may not be adequate to protect migrating fish from reaching suitable habitat, or may not be sufficient to maintain suitable spawning, rearing or outmigrating flows as compared to high Project flows that exist during normal operations, and could result in take of a listed species. Additionally, this is one place in the Project where the Licensee ***does*** have the ability to deliver additional flows to Auburn Ravine. There is infrastructure in place to provide flow, as was done during the Bear River Canal failure.

Downstream of this location, NID has the ability to deliver water from Lake Combie through an NID canal system to North Ravine, which is a tributary to Auburn Ravine. NID has stated that it typically delivers 3-6 cfs (and up to 15 cfs in an emergency) to North Ravine for the purpose of meeting NID demand at NID’s Auburn Ravine 1 Diversion Dam at RM 23.8 in Auburn Ravine. PCWA can deliver water either through pumping from the American River into the South Canal or from pumping from the American River through the Auburn Tunnel. Either of these options can provide a safe, reliable source for water delivery during Project canal outage.

Mormon Ravine Below Newcastle Powerhouse Header Box (Drum-Spaulding Hydroelectric Project

Stream Reach Specific Objectives

The Resource Agencies’ interest in this reach is to ensure sufficient minimum flow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish and benthic macroinvertebrates in good condition.

Existing Conditions, Problem Statement, and Rationale

This segment of Mormon Ravine is approximately 0.3 mi long and extends from the point where water from the Newcastle Powerhouse header box joins Mormon Ravine down to Folsom Reservoir. Mormon Ravine is tributary to the Middle Fork American River, upstream of the main body of Folsom Lake's Middle Fork Arm, but within the reservoir high water mark. The reach has an average elevation of 520 ft and a channel gradient of 6.7 percent. The upstream watershed has an area of 1.44 square miles above the location where Licensee adds water to Mormon Ravine.

Impaired and unimpaired hydrology was not calculated by Licensee for this section of Mormon Ravine. The current FERC license was amended in 1990, and Article 63 of the license states that “Licensee shall maintain a minimum flow of 5 cubic feet per second at the gaging station located at Mormon Ravine above Newcastle Powerhouse. No minimum flow is required during the annual South Canal outage. This minimum flow may be temporarily modified if required by operating emergencies beyond the control of Licensee and for short periods upon mutual agreement with the California Department of Fish and Game” Licensee maintains a low-flow only compliance gage at Newcastle Powerhouse (YB-292).

Discussion of Fish Population Studies

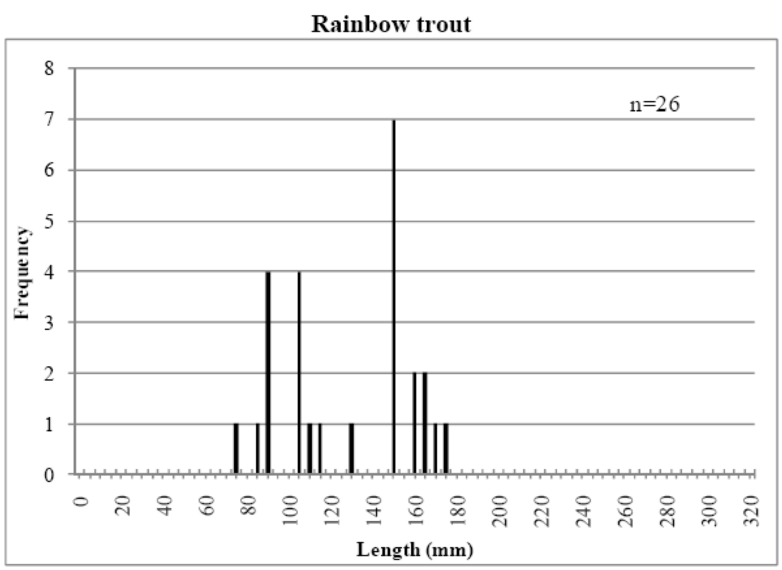
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the “Evaluation of Aquatic Biota Condition” section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Fifty-two potential fish habitat spots were sampled along a 407-ft section of stream starting at the in-stream flow gage above Folsom Lake on October 23, 2008. Reach characteristics were visually estimated. Instantaneous water temperature was 14.5 ºC.

A total of 33 fish were collected, represented by two species; rainbow trout and riffle sculpin (a native species). Rainbow trout were the most abundant species accounting for 79 percent of the total number of fish collected.

Figure MR-1. Length frequency for rainbow trout collected in Mormon Ravine Reach, October 23, 2008.



<u>Determination of Fish Condition</u>

The cold water fish population in Mormon Ravine, although small, was surprisingly healthy considering the length and low elevation of this reach and comprised two native species – rainbow trout and riffle sculpin.

According to the University of California – California Fish Website:

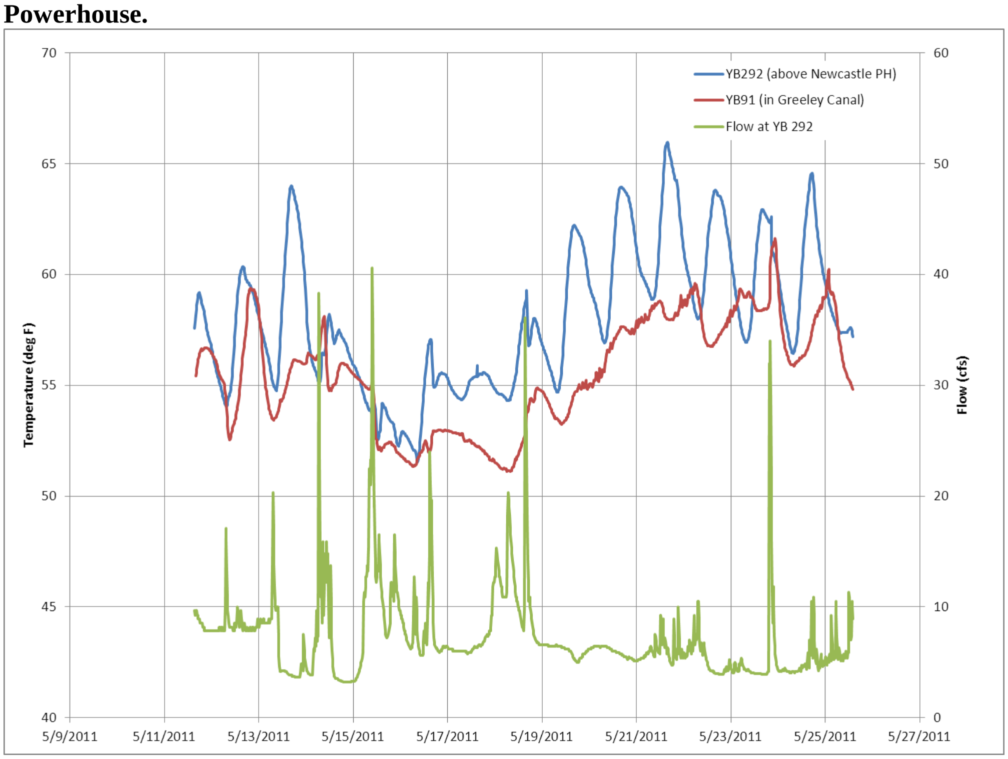
> "Riffle sculpins are found in headwater streams with cold water and rocky or gravelly substrate. They prefer permanent streams where the water does not exceed 25-26°C, and where ample flow keeps the dissolved oxygen level near saturation…These fish have similar habitat requirements similar to those of rainbow trout and are often found in association with them."

Multiple age classes of rainbow trout were caught, indicating some breeding in this reach. Given this, and the cold water species assemblage, the Resource Agencies note that the populations in this reach appear to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee did not conduct any instream flow studies that are relevant for determining appropriate minimum streamflows for this reach. Hydrologic information was not calculated by Licensee for Mormon Ravine. However, during the upstream Bear River Canal failure in early summer of 2011, flow from Mormon Ravine was reduced, in consultation with The Department of Fish and Game staff, in order to attempt to provide additional water to Auburn Ravine. During this time, Licensee collected some flow and temperature information that is relevant to determining appropriate instream flows for this reach.

Figure MR-2. Summary of flow and temperature information collected during Bear Canal Outage in 2011, when flows were reduced in Mormon Ravine. YB-92 temperatures are in the South Canal above the Newcastle Powerhouse Header Box and YB-292 is downstream in Mormon Ravine, just above Newcastle Powerhouse.



Determination of Minimum Streamflows

Because fish in this reach appeared to be in good condition, the Resource Agencies' evaluation of minimum streamflows focuses on maintaining existing habitat conditions that have been created by Licensee's current flow requirement to maintain 5 cfs year-round at YB-292.

In the Figure MR-2 above, temperatures in Mormon Ravine, measured near gage YB-292 rose up to a max daily temperature of 66^{o}F. Temperatures at this location are impacted by upstream temperature in South Canal, as well as temperature in upstream Mormon Ravine. Although a maximum daily temperature during the event above only reached 66^{o}F, air temperature on that day measured at a nearby CDEC station at California State University measured a maximum air temperature of 82^{o}F. Summer temperatures in the Sacramento area can frequently reach highs of well over 100^{o}F, so temperatures in Mormon Ravine can be expected to get much warmer than shown above in Figure MR-2 during summer. Given that Mormon Ravine is a small, low elevation tributary, the existing license requirement of 5 cfs in this short reach is likely the reason that the existing trout and sculpin populations are able to survive summer temperatures.

In the extreme critical water year type, the Resource Agencies recognize that water is in short supply for summer irrigation deliveries and instream flow releases out of the Bear River Canal, Wise Canal and South Canal to Auburn Ravine, Dry Creek, and Rock Creek. Therefore, it was agreed that in the extreme critical water year type, when Newcastle Powerhouse is not operating, Licensee will be allowed to reduce the flow in Mormon Ravine to 1 cfs. It was further recognized that given its location at the end of the South Canal, Newcastle Powerhouse often operates even in low water years by using any water remaining in the South Canal. For this reason, even when extreme critical water year conditions exist, while Newcastle Powerhouse is operating using the excess canal water, Licensee shall continue their 5 cfs release as specified in all other water year types.

Conclusion

Fish population data collected in 2008 indicated multiple age classes of rainbow trout, and relatively good numbers for the length and elevation of the reach and as well as a small population of riffle sculpin. The flows provided under the existing license appear adequate to maintain fish in good condition in this short reach. However, this reach occasionally experiences much higher flows for various reasons including canal outages, which could have had a detrimental effect on the populations. Additionally, because flows during future extreme critical water year types will be allowed to drop to 1 cfs, qualitative monitoring of fish populations should occur in this reach to inform our understanding of how the streamflow measures are affecting these species.

RATIONALE FOR FLOW MEASURES – FLOW SETTING (DRUM-SPAULDING HYDROELECTRIC PROJECT)

The purpose of this measure is to provide reasonable compliance criteria at 16 remote upper-elevation stream reaches where safe access to the Project dams, particularly during the winter, is challenging. The measure is generally divided into three sections. The flow requirements and the compliance criteria for the 16 locations in this measure were collaboratively developed by relicensing participants.

This measure applies to the following reaches:

- Texas Creek Below Upper Rock Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Texas Creek Below Lower Rock Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Unnamed Creek Below Culbertson Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Lindsey Creek Below Middle Lindsey Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Lindsey Creek Below Lower Lindsey Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Fall Creek Below Feeley Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Fall Creek Below Carr Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Rucker Creek Below Blue Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Rucker Creek Below Rucker Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Unnamed Creek Below Fuller Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Unnamed Creek Below Meadow Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- White Rock Creek Below White Rock Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Bloody Creek Below Sterling Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Unnamed Tributary Below Kidd Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Cascade Creek Below Lower Peak Reservoir Dam (Drum-Spaulding Hydroelectric Project)
- Sixmile Creek Below Kelly Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Specific Reach Rationale

Texas Creek Below Upper and Lower Rock Lake Reservoir Dams (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in these reaches is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. This reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Upper Rock Lake Dam Reach is approximately 0.1 mi long and extends from Lower Rock Lake (RM 4.9) to Upper Rock Lake Dam (RM 5.0). The reach has an average elevation of 6,666 ft and a channel gradient of 13 percent (Technical Memorandum 3-1). The watershed above Upper Rock Lake Dam is approximately 0.23 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 0.8 cfs. Upper Rock Lake Reservoir has usable storage of 207 acre-feet. The existing minimum streamflow requirement in this reach is a target flow of 0.25 cfs with an allowable minimum of 0.1 cfs between July 1 and September 30 of each year (Drum-Spaulding PAD).

The Lower Rock Lake Dam Reach is approximately 4.1 miles long and is separated into two subreaches: Subreach No. 1 is approximately 3.6 miles long and extends from Texas Creek's confluence with Lindsey Creek to Lower Rock Lake Dam. This reach has an average elevation of 6,011 ft and a channel gradient of 10.6 percent. Subreach No. 2 is approximately 0.5 miles long and extends from the Lindsey Creek confluence with Texas Creek to the Bowman-Spaulding Conduit. The reach has an average elevation of 5,560 ft and a channel gradient of 10.6 percent (Technical Memorandum 3-2). The watershed above Lower Rock Lake Dam is approximately 0.36 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 1.3 cfs. Lower Rock Lake Reservoir has usable storage of 48 acre-ft. The existing minimum streamflow requirement in the Lower Rock Lake Dam Reach is a target flow of 0.25 cfs with an allowable minimum of 0.1 cfs between July 1 and September 30 of each year (Drum-Spaulding PAD).

<u>Discussion of Fish Population Studies</u>

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in the reach below Upper Rock Lake Dam. Licensees sampled 25 potential fish habitat spots (accessed at RM 5.0) along the entire length of the reach on September 10, 2008. Three small rainbow trout were caught.

Licensee also performed qualitative sampling in the two subreaches of Lower Rock Lake Dam reach on September 10, 2008 and caught 10 rainbow trout and 60 brown trout.

<u>Discussion of Benthic Macroinvertebrate Studies</u>

No benthic macroinvertebrate studies were conducted in this reach.

<u>Discussion of Foothill Yellow-legged Frog Surveys</u>

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

Three rainbow trout were caught in Texas Creek below Upper Rock Lake and 10 rainbow trout were caught in Texas Creek below Lower Rock Lake which does not indicate a viable population in either reach. Therefore the Resource Agencies do not consider the fish in Texas Creek below Upper Rock Lake Dam or below Lower Rock Lake Dam to be in good condition.

Determination of Minimum Streamflows

Because fish in these reaches were determined not to be in good condition, the Resource Agencies considered available storage, current flow requirements, and unimpaired hydrology and determined a year-round minimum streamflow of 0.25 cfs below Upper Rock Lake in most year types with 0.1 cfs during Critically Dry water years should enhance conditions for the aquatic biota. The flows below Lower Rock Lake are a pass-through of the flows from Upper Rock Lake.

The table below presents the flows that were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for both Texas Creek below Upper Rock Lake and Lower Rock Lake.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Nov	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Dec	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Jan	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Feb	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Mar	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Apr	Adult	0.1	0.1	0.25	0.25	0.25	0.25
May	Spawn	0.1	0.1	0.25	0.25	0.25	0.25
Jun	Spawn	0.1	0.1	0.25	0.25	0.25	0.25
Jul	Spawn	0.1	0.1	0.25	0.25	0.25	0.25
Aug	Adult	0.1	0.1	0.25	0.25	0.25	0.25
Sep	Adult	0.1	0.1	0.25	0.25	0.25	0.25

Monitoring of rainbow trout populations will also occur in these reaches and will inform our understanding of how the streamflow measures are affecting aquatic resources .

Unnamed Creek Below Culbertson Lake Reservoir Dam

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Culbertson Lake Dam Reach is approximately 0.2 mi long and extends from the Confluence with Texas Creek to Culbertson Lake Dam. The reach has an average elevation of 6,420 ft and a channel gradient of 5.3 percent (Technical Memorandum 3-1). The watershed above Culbertson Lake Dam is approximately 0.44 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 2.1 cfs. Culbertson Lake Reservoir has usable storage of 953 acre-feet. The existing year round minimum streamflow requirement in this reach is a target flow of 0.75 cfs with an allowable minimum of 0.3 cfs (Drum-Spaulding PAD).

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in the reach below Culbertson Lake Dam. Licensees sampled 28 potential fish habitat spots along a 620 ft section of the reach on September 10, 2008. Two rainbow trout were caught.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

Only two rainbow trout were caught in the Unnamed tributary to Texas Creek below Culbertson Lake Dam. Therefore the Resource Agencies do not consider the fish in this reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies considered available storage, current flow requirements, and unimpaired hydrology. Table CL-1 presents the Resource Agencies' determination of flows that Licensee should release from Culbertson Lake Dam to enhance the condition of the fishery and ensure adequate protection of the aquatic biota.

Table CL-1. Resource Agencies' initial minimum flow recommendation in the Unnamed Creek below Culbertson Lake Dam

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Dry	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Below Normal	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Above Normal	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
Wet	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2

Adjustment of Minimum Streamflows

After further discussions with the Relicensing Participants taking into account modeled lake level results, and reservoir recreation interests, the flows during AN and Wet years were reduced. These flows were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for the Unnamed tributary to Texas Creek below Culbertson Lake Dam.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.3	0.3	0.75	0.75	1.5	1.5
Nov	Adult	0.3	0.3	0.75	0.75	1	1
Dec	Adult	0.3	0.3	0.75	0.75	1	1
Jan	Adult	0.3	0.3	0.75	0.75	1	1
Feb	Adult	0.3	0.3	0.75	0.75	1	1
Mar	Adult	0.3	0.3	0.75	0.75	1	1
Apr	Adult	0.3	0.3	0.75	0.75	1	1
May	Spawn	0.3	0.3	0.75	0.75	1	1
Jun	Spawn	0.3	0.3	0.75	0.75	1.5	1.5
Jul	Spawn	0.3	0.3	0.75	0.75	1.5	1.5
Aug	Adult	0.3	0.3	0.75	0.75	1.5	1.5
Sep	Adult	0.3	0.3	0.75	0.75	1.5	1.5

Monitoring of rainbow trout populations will occur in this reach and will inform our understanding of how the streamflow measures are affecting the aquatic resources.

Lindsey Creek Below Middle Lindsey and Lower Lindsey Reservoir Dams

Stream Reach Specific Objectives

The Resource Agencies' interest in these reaches is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Middle Lindsey Lake Dam Reach is approximately 0.3 mi long and extends from Lower Lindsey Lake to Middle Lindsey Lake Dam. The reach has an average elevation of 6,336 ft and a channel gradient of 12.9 percent (Technical Memorandum 3-1). The watershed above Middle Lindsey Lake Dam is approximately 0.41 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 1.7 cfs. Middle Lindsey Lake Reservoir has usable storage of 110 acre-feet. Additionally, Upper Lindsey Lake is located 450 feet upstream of Middle Lindsey Reservoir and has usable storage of 18 acre-feet. The existing minimum streamflow requirement in this reach is a target flow of 0.25 cfs with an allowable minimum of 0.1 cfs between July 1 and September 30 of each year (Drum-Spaulding PAD).

The Lower Lindsey Lake Dam Reach is approximately 1.4 miles long and extends from the confluence of Lindsey Creek with Texas Creek to Lower Lindsey Lake Lake Dam. This reach has an average elevation of 5,940 ft and a channel gradient of 7.1 percent (Technical Memorandum 3-2). The watershed above Lower Lindsey Lake Dam is approximately 0.91 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 4.0 cfs. Lower Lindsey Lake Reservoir has usable storage of 293 acre-feet. The existing year round minimum streamflow requirement in this reach is a target flow of 0.5 cfs with an allowable minimum of 0.2 cfs (Drum-Spaulding PAD).

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in the reach below Middle Lindsey Lake Dam. Licensees sampled 20 potential fish habitat spots along a 1,025 ft section of the reach on September 9, 2008. No fish were caught, although the stream was difficult to access which possibly affected sampling success.

Licensee also performed qualitative sampling in the Lower Lindsey Lake Dam reach. Licensees sampled 20 potential fish habitat spots along a 425-ft section on September 9, 2008, and caught 39 brown trout and no rainbow trout.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

No rainbow trout were caught in Lindsey Creek below Middle Lindsey Lake and only brown trout were caught below Lower Lindsey Lake which does not indicate a viable population of native species in either reach. Therefore the Resource Agencies do not consider the fish in Lindsey Creek below Middle Lindsey Lake Dam or below Lower Lindsey Lake Dam to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies considered available storage, current flow requirements, and unimpaired hydrology and determined a year-round minimum streamflow of 0.25 cfs below Middle Lindsey Lake in most year types with 0.1 cfs during Critically Dry water years would enhance the condition of aquatic biota. They also determined that 1.0 cfs in BN, AN, and Wet years types, 0.5 in Dry year types and 0.2 during critically dry year types would enhance the condition of native aquatic biota in the reach below Lower Lindsey Lake. Additionally, during periods when the usable storage in Lower Lindsey Reservoir has been exhausted, all reservoir inflow would be released from Lower Lindsey Lake..

Adjustment of Minimum Streamflows

After further discussions with the Relicensing Participants, and taking into account modeled lake level results, the flows were reduced. The flows in the chart below were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for Lindsey Creek below Middle Lindsey Lake Dam.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Nov	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Dec	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Jan	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Feb	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Mar	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Apr	Adult	0.1	0.1	0.1	0.2	0.2	0.2
May	Spawn	0.1	0.1	0.1	0.2	0.2	0.2
Jun	Spawn	0.1	0.1	0.1	0.2	0.2	0.2
Jul	Spawn	0.1	0.1	0.1	0.2	0.2	0.2
Aug	Adult	0.1	0.1	0.1	0.2	0.2	0.2
Sep	Adult	0.1	0.1	0.1	0.2	0.2	0.2

The flows in the chart below were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for Lindsey Creek below Middle Lindsey Lake Dam.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Nov	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Dec	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Jan	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Feb	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Mar	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Apr	Adult	0.2	0.2	0.5	0.7	0.7	0.7
May	Spawn	0.2	0.2	0.5	0.7	0.7	0.7
Jun	Spawn	0.2	0.2	0.5	0.7	0.7	0.7
Jul	Spawn	0.2	0.2	0.5	0.7	0.7	0.7
Aug	Adult	0.2	0.2	0.5	0.7	0.7	0.7
Sep	Adult	0.2	0.2	0.5	0.7	0.7	0.7

Monitoring of rainbow trout populations will also occur in these reaches and will inform our understanding of how the streamflow measures are affecting the aquatic resources.

Fall Creek Below Carr Lake and Feeley Lake Reservoir Dams

Stream Reach Specific Objectives

The Resource Agencies' interest in these reaches is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Feeley Lake Dam Reach on Lake Creek, is approximately 0.1 mi long and extends from Carr Lake to Feeley Lake Dam. The reach has an average elevation of 6,694 ft and a channel gradient of 4.7 percent. The watershed area above Feeley Lake Dam is approximately 0.4 square miles. The mean annual unimpaired flow is 1.9 cfs. Feeley Lake Reservoir has usable storage of 739 acre-feet. The existing minimum streamflow requirement in this reach is a year-round target flow of 0.5 cfs with an allowable minimum of 0.2 cfs (Drum-Spaulding FLA).

The Carr Lake Dam Reach is approximately 3.5 miles long and is separated into two subreaches: Subreach No. 1 is approximately 2.2 miles long and extends from Lake Creek's confluence with Fall Creek to Carr Lake Dam. The reach has an average elevation of 6,112 ft and a channel gradient of 10.0 percent. Subreach No. 2 is on Fall Creek, is approximately 1.3 miles long and extends from the Lake Creek confluence with Fall Creek to the Bowman-Spaulding Conduit. The reach has an average elevation of 5,420 ft and a channel gradient of 3.2 percent. The watershed area is approximately 0.48 square miles at Carr Lake Dam. The mean annual unimpaired flow is 2.2 cfs. Carr Lake Reservoir has a usable storage of 150 acre-feet. The existing minimum streamflow is 0.5 cfs with an allowable minimum of 0.2 cfs (Drum-Spaulding FLA).

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

Much of the following information is presented in more detail in Technical Memorandum 3-1: In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed qualitative (Level I) and quantitative (Level II) representative fish population surveys in the reaches below according to standard fish population sampling protocols. These sites were sampled using backpack electrofishing techniques.

Feeley Lake Dam Reach

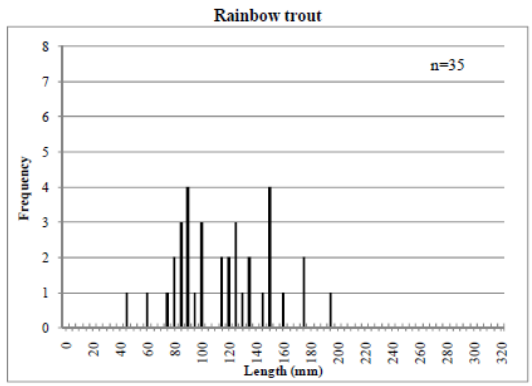
Licensees sampled 15 potential fish habitat spots along a 205-ft section of stream on September 8, 2008. Dense overhanging brush and vegetation made sampling difficult. Much of the reach was inaccessible and limited the field crew's ability to sample the required 25 habitat spots. All accessible habitats were thoroughly sampled; however, no fish were capture or observed in this reach.

Carr Lake Dam Reach No. 1 – Level I (Qualitative)

Licensees sampled 35 potential fish habitat spots along a 370-ft section of stream, starting approximately 1.46 mi upstream of Bowman Lake Road on September 8, 2008. A total of 35 rainbow trout and 20 brown trout were collected.

As can be seen in the figure below, the rainbow trout population included multiple age classes and exhibited a somewhat typical age class distribution.

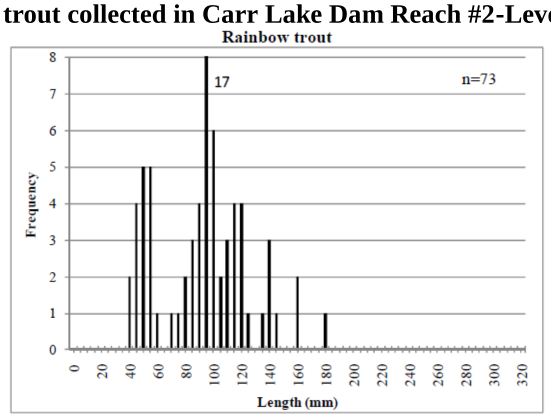
Figure CL-1 Length frequency for rainbow trout collected in Carr Lake Dam Reach #1 Level I, September 8, 2008.



Carr Lake Dam Reach No. 2 – Level I

Licensees sampled 65 potential fish habitat spots along a 757-ft section of stream, starting approximately 0.2 mi downstream of Bowman Lake Road on September 8, 2008. The site was situated below mining activity, but included habitat above the Fall Creek Diversion at the Bowman-Spaulding Conduit. Seventy-three rainbow trout and 9 brown trout were collected in this reach. As can be seen in the figure below, the rainbow trout population included multiple age classes and exhibited a somewhat typical age class distribution.

Length frequency for rainbow trout collected in Carr Lake Dam Reach #2-Level I, September 8, 2008

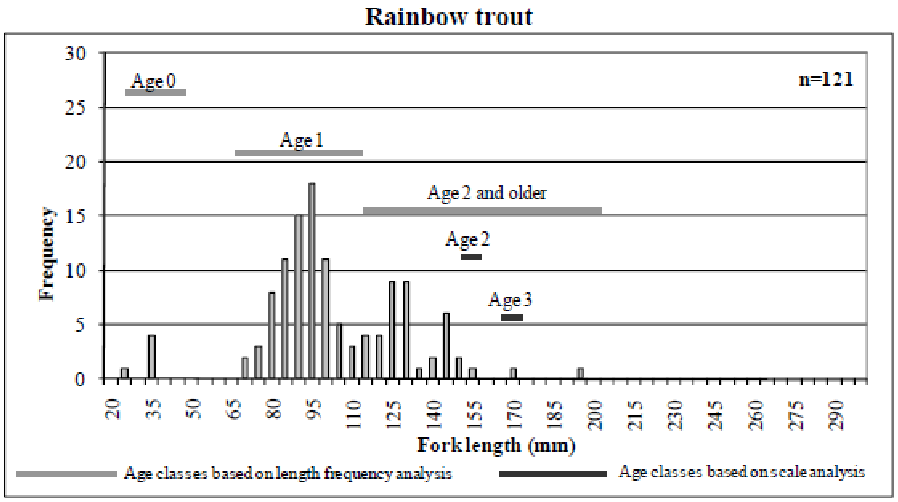


Carr Lake Dam Reach No. 2 – Level II (Quantitative)

This site, on Fall Creek, was 337 ft long and was comprised of four habitat types: low- and high-gradient riffle, run, and pool. Sampling was conducted by electrofishing on July 27, 2009. The Fall Creek diversion dam is located just downstream of the site and presents a barrier to upstream fish migration. One hundred and twenty-one rainbow were collected at this site.

Estimates of rainbow trout per mile were 1,943, rainbow trout biomass was 30.0 lbs/acre, and the Fulton's condition factor averaged 1.14. As can be seen in the figure below, multiple age classes were present and the population exhibited a somewhat typical age class distribution.

Rainbow trout length-frequency distribution and ages for Carr Lake Dam Reach #2 (Fall Creek, RM 2.1) Level II quantitative site, July 27, 2009. From Figure 3.4-4 in Technical Memorandum 3-1.



Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

There were no fish caught in Lake Creek below Feely Lake Dam. Therefore the Resource Agencies do not consider the fish in this reach to be in good condition.

The rainbow trout population in Lake Creek and Fall Creek below Carr Lake exhibited a relatively good age class structure in 2008 considering the number of fish caught. Based on the Level 1 sampling, the population included multiple age classes including age-0, especially the population in Fall Creek downstream of the confluence with Lake Creek (Reach No. 2). This is not unexpected since Fall Creek at this point is unregulated. Given the qualitative nature of the sampling, the Resources Agencies consider the fish in Lake Creek downstream of Carr Lake Dam (Reach No. 1) to be in somewhat good condition.

The 2009 quantitative sampling in Fall Creek (Reach No. 2) indicated that the biomass was slightly low compared to the average North Sierra stream of this width, which is 33 lbs/acre (see Gerstung 1973). There were also few young of the year caught during 2009, which could in part be due to earlier season sampling than in the 2008 Level I sampling. Considering both the 2008 (Level 1) and 2009 (Level II) sampling in this reach, the Resource Agencies consider the fish in Fall Creek between the Bowman-Spaulding Conduit and the confluence with Lake Creek to be in relatively good condition.

<u>Determination of Minimum Streamflows</u>

Because fish in Lake Creek below Feeley Lake Dam were determined not to be in good condition, the Resource Agencies considered available storage in Feeley Lake, current flow requirements, and unimpaired hydrology and determined a year-round minimum streamflow of 1.0 cfs below Feely Lake Dam in BN, AN, and Wet water year types, 0.5 in Dry water years, and 0.2 in CD water years would enhance the condition of aquatic biota in this reach.

Given the minor increase in watershed area between Feeley Lake Dam and Carr Lake Dam, and given the comparatively small increase in usable storage available in Carr Lake Reservoir, the Resources Agencies applied the same flow regime below Carr Lake Dam. This flow regime should enhance the condition for the aquatic biota in Lake Creek below Carr Lake Dam.

The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.2	0.2	0.5	1	1	1
Nov	Adult	0.2	0.2	0.5	1	1	1
Dec	Adult	0.2	0.2	0.5	1	1	1
Jan	Adult	0.2	0.2	0.5	1	1	1
Feb	Adult	0.2	0.2	0.5	1	1	1
Mar	Adult	0.2	0.2	0.5	1	1	1
Apr	Adult	0.2	0.2	0.5	1	1	1
May	Spawn	0.2	0.2	0.5	1	1	1
Jun	Spawn	0.2	0.2	0.5	1	1	1
Jul	Adult	0.2	0.2	0.5	1	1	1
Aug	Adult	0.2	0.2	0.5	1	1	1
Sep	Adult	0.2	0.2	0.5	1	1	1

Monitoring of rainbow trout populations will occur in these reaches and will inform our understanding of how the new streamflow measures are affecting the aquatic resources.

Rucker Creek Below Blue Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to restore and enhance habitat for native aquatic species and ensure adequate protection of the aquatic resources. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement and Rationale

The Blue Lake Dam Reach is approximately 0.7 mi long and extends from Rucker Lake to Blue Lake Dam. The reach has an average elevation of 5,691 ft and a channel gradient of 9.5 percent (Technical Memorandum 3-2). The watershed above Blue Lake Dam is approximately 0.24 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 1.1 cfs. Blue Lake Reservoir has usable storage of 1,163 acre-feet. The existing year-round minimum streamflow requirement in this reach is a target flow of 0.5 cfs with an allowable minimum of 0.2 cfs (Drum-Spaulding PAD).

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in Rucker Creek below the Blue Lake Dam on September 5, 2008. Licensees sampled 30 potential fish habitat spots along a 517-ft section of stream. No fish were collected or observed (Technical Memorandum 3-1).

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

No fish were collected or observed in Rucker Creek below Blue Lake Dam. Therefore the Resource Agencies do not consider the aquatic resources in this reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies considered available storage, current flow requirements, and unimpaired hydrology and determined the flows in the chart below would ensure sufficient water to improve the aquatic resources in this reach. These flows were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for Rucker Creek below Blue Lake Dam.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Nov	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Dec	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Jan	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Feb	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Mar	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Apr	Adult	0.2	0.2	0.3	0.5	0.5	0.5
May	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
Jun	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
Jul	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
Aug	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Sep	Adult	0.2	0.2	0.3	0.5	0.5	0.5

Monitoring of benthic macroinvertebrate and fish populations will occur in this reach and will inform our understanding of how the streamflow measure is affecting the aquatic resources.

Rucker Creek Below Rucker Lake Reservoir (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

Rucker Creek below Rucker Lake Dam reach is 0.4 mi long and extends from the Bowman-Spaulding Conduit to Rucker Lake Dam. The Reach has an average elevation of 5,371 and a channel gradient of 2.8 (Technical Memorandum 3-2). The watershed above Rucker Lake Dam is approximately 1.65 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 7.4 cfs. The usable storage in Rucker Lake is 570 acre-feet. The existing year round minimum streamflow requirement in this reach is a target of 0.5 cfs with an allowable minimum of 0.2 cfs.

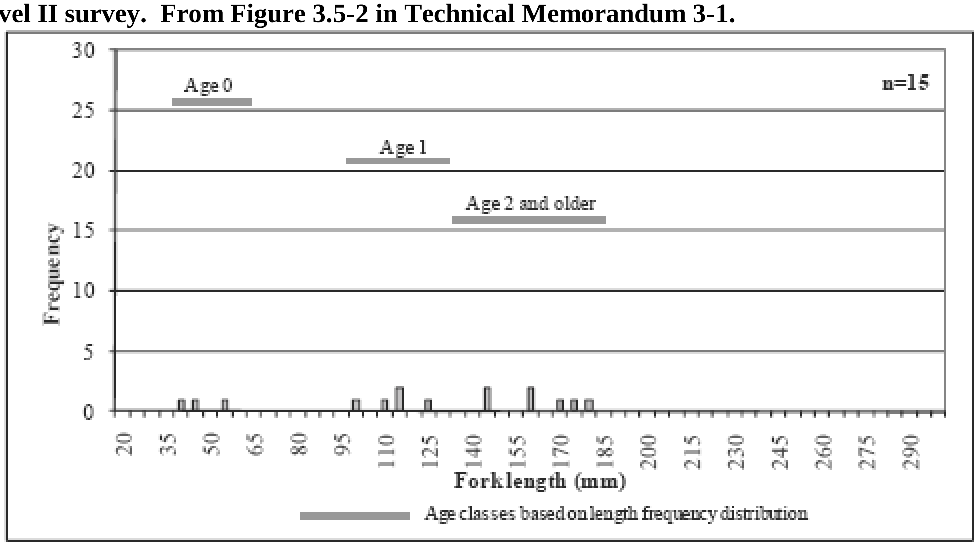
Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed both a quantitative (Level II) representative fish population survey in this reach in 2009 and a qualitative (Level I) survey in 2008. Licensees sampled 53 potential fish habitat spots along a 375-ft section of stream on September 5, 2008. Six brown trout and 4 green sunfish were caught.

The Level II survey was done on July 28, 2009. Both rainbow trout and brown trout were found in this location. Estimated rainbow trout per mile was 208 and the estimated biomass was 12.4 lbs per acre. As can bee seen in the chart below, there were multiple age classes present, but in very low numbers.

Rainbow trout length-frequency distribution and ages for the Rucker Creek below Rucker Lake Dam from the 2009 Level II survey. From Figure 3.5-2 in Technical Memorandum 3-1.



Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach because it is outside of their known elevation range, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

No native fish were collected in this reach in 2008. Although there were likely several age classes of rainbow trout present in 2009, only fifteen rainbow trout were caught. This indicates some breeding, but does not indicate a viable population in this reach. Additionally, biomass estimates of 12 lbs/acre were well below the average of 70 lbs/acre for a stream of this width (Gerstung 1973). Therefore the Resource Agencies do not consider the fish in Rucker Creek below Rucker Lake Dam to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies considered available storage, current flow requirements, and unimpaired hydrology. The following table presents the minimum streamflows agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process.

Month	Life-Stage	EC	CD	D	BN	AN	W
Oct	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Nov	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Dec	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Jan	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Feb	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Mar	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Apr	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
May	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
Jun	Spawn	0.2	0.2	0.3	0.5	0.5	0.5
Jul	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Aug	Adult	0.2	0.2	0.3	0.5	0.5	0.5
Sep	Adult	0.2	0.2	0.3	0.5	0.5	0.5

Monitoring of rainbow trout and benthic macroinvertebrate populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting these species and habitat quality.

Unnamed Creek Below Fuller Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement and Rationale

The Unnamed Creek is 1.0 mi long and extends from the Fuller Lake Dam downstream to the confluence of the Unnamed Creek and Jordan Creek. The reach has an average elevation of 4,960 ft and an average channel gradient of 14.5 percent (Technical Memorandum 3-1). The watershed above Fuller Lake Dam is approximately 0.55 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 2.4 cfs. Fuller Lake Reservoir has a usable storage of 1,127 acre-feet. There is no existing flow requirement in the Unnamed Creek below Fuller Dam.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in the "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in the Unnamed Creek below the Fuller Lake Dam on September 5, 2008. Licensees sampled 50 potential fish habitat spots along a 920-ft section of stream. Two rainbow trout were collected (Technical Memorandum 3-1).

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

Only two rainbow trout were collected in a 920 foot section of this creek. Therefore the Resource Agencies do not consider the aquatic resources in this reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies considered available storage, the fact that there is no current minimum streamflow in this reach and unimpaired hydrology, and determined the flows in the chart below should enhance conditions for the aquatic biota in this reach. These flows were agreed to by the Resource Agencies, Licensees, and other relicensing participants through the collaborative process for the Unnamed Creek below Fuller Lake Dam.

Month	EC	CD	D	BN	AN	W
Oct	0.25	0.25	0.25	0.25	0.25	0.25
Nov	0.25	0.25	0.25	0.25	0.25	0.25
Dec	0.25	0.25	0.25	0.25	0.25	0.25
Jan	0.25	0.25	0.25	0.25	0.25	0.25
Feb	0.25	0.25	0.25	0.25	0.25	0.25
Mar	0.25	0.25	0.25	0.25	0.25	0.25
Apr	0.25	0.25	0.25	0.25	0.25	0.25
May	0.25	0.25	0.25	0.25	0.25	0.25
Jun	0.25	0.25	0.25	0.25	0.25	0.25
Jul	0.25	0.25	0.25	0.25	0.25	0.25
Aug	0.25	0.25	0.25	0.25	0.25	0.25
Sep	0.25	0.25	0.25	0.25	0.25	0.25

Monitoring of benthic macroinvertebrate and fish populations will occur in this reach and will inform our understanding of how the streamflow measure is affecting the aquatic resources.

Unnamed Creek Below Meadow Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve any fish that potentially occur there in good condition, including providing spring habitat maintenance flows for the meadow. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Unnamed tributary below Meadow Lake Dam is approximately 1.4 mi long and extends from Fordyce Lake (elev. approx. 6,405 ft.) to Meadow Lake Dam (elev. Approx. 7,250 ft.). The reach has an average channel gradient of 11.9 percent (Technical Memorandum 3-1 and the FLA §6.2.1.2) and a mean annual flow of 8.9 cfs. The usable storage in Meadow Lake reservoir is 4,841 ACRE-FEET. There is no existing minimum streamflow requirement for this reach, and Licensee generally diverts all natural flow to storage in Meadow Lake reservoir for release in the fall (see Figure ML-1).

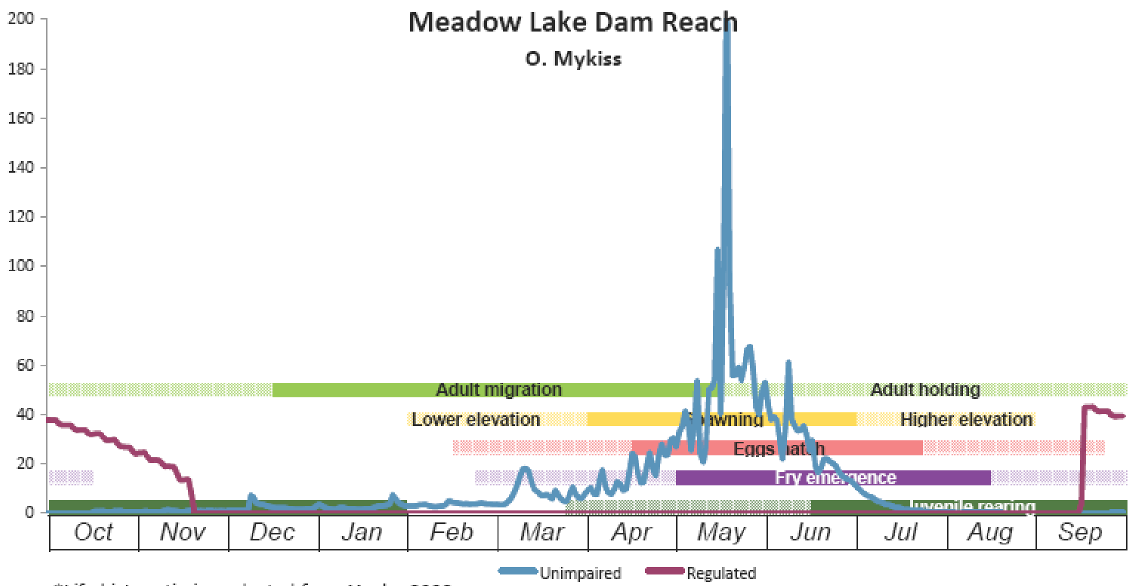
About 0.5 miles below the dam, the stream flows into a montane meadow and becomes braided for about 0.14 miles before continuing down a high gradient reach into Fordyce Lake. Montane meadows are the most botanically diverse in the Sierra Nevada and have high wildlife values because of their abundance of food and cover.[5] According to Purdy and Moyle (2006), these meadows represent less than 0.01 percent of the landscape in the Sierra Nevada, but are very important in their function and biodiversity and support more species of wildlife than any other habitat type in the Sierra Nevada.[6] Riparian conditions were not evaluated by Licensees.

Figure ML-1 shows synthesized unimpaired and simulated regulated releases for the Unnamed tributary below Meadow Lake Dam for 2005, which was an average water year with a typical hydrograph for the west slope Sierra Nevada range. Note that the stream is dry for much of the year.

Figure ML-1. Rainbow trout lifestage periodicity and the synthesized unimpaired and simulated regulated hydrographs for the Unnamed tributary below Meadow Lake Dam for 2005.

[5] http://www.sierraforestlegacy.org/FC_FireForestEcology/TH_MontaneMeadows.php

[6] Purdy, Sabra E., and Moyle, Peter B. Mountain Meadows of the Sierra Nevada: An integrated means of determining ecological condition in mountain meadows. Protocols and Results from 2006. UC Davis Center for Watershed Sciences.



Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Department evaluates individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed a qualitative (Level I) representative fish population survey in this reach. Licensee electrofished 54 potential fish habitat spots along a 623-ft section of the stream on September 23, 2008. No fish were collected or observed, although one brown trout was observed during the habitat mapping survey. Although this is a high elevation stream, the Resource Agencies concur with Licensee's statement that rainbow trout, brook trout, brown trout and cutthroat trout could potentially be present in this reach (see Table 6.3.1-4 of the FLA).

As noted above, there is no minimum streamflow requirement below Meadow Lake Dam. Figures 6.2-13 and 6.2-14 of the FLA (April 2011) indicate that no flows are released into this reach during much of the year. Further, according to the HEC ResSim operations model, Licensee generally releases flows only in the fall to draw down the reservoir.

Assessment of Aquatic Biota Condition

Based on the lack of fish collected during the Level I fish population survey, and since dewatering of historic habitat does not keep fish in good condition, the Resource Agencies do not consider fish in this reach to be in good condition.

Discussion of Relevant Instream Flow Related Studies

Licensee conducted two studies that are relevant for determining instream flows for this reach. These studies include: 1) an assessment of unimpaired hydrology, and 2) a channel flow response (CFR) analysis. Resource Agency staff also conducted a wetted perimeter analysis using the single riffle cross section of the CFR analysis and a Tennant Method analysis using the unimpaired hydrology. The pertinent results of the studies are described below:

Mean unimpaired flows for the Unnamed Creek below Meadow Lake Dam were synthesized using a combination of gage proration and gage summation as described in Exhibit B of the FLA. The following table presents the average monthly unimpaired flows, by water year type, for the reach.

Table ML-1. Synthesized mean unimpaired flows for the Unnamed Creek below Meadow Lake Dam

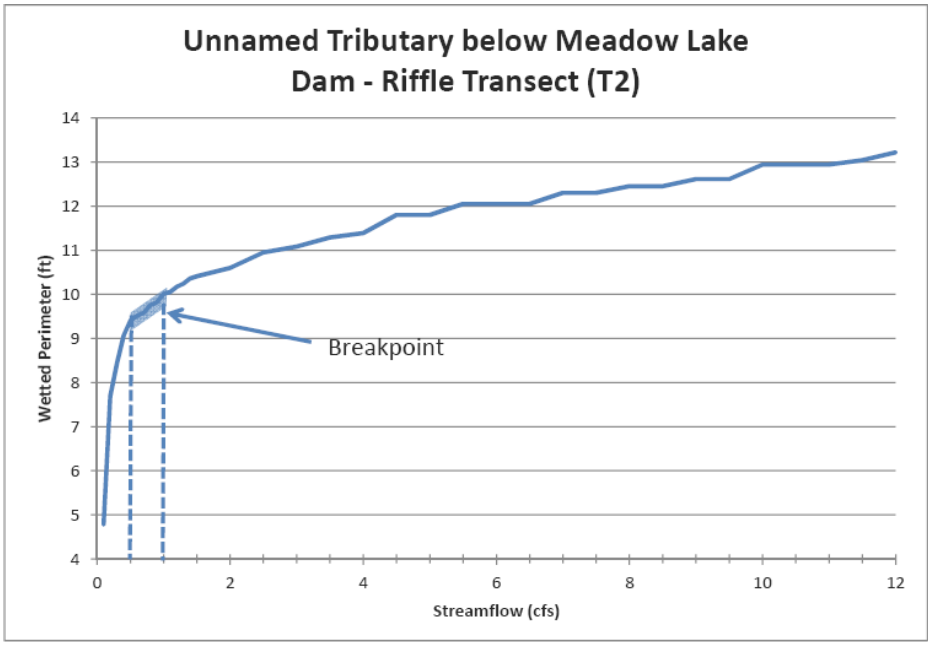
Mean Unimpaired Q (cfs)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Critically Dry	1.1	1.1	1.2	1.1	2.4	4.9	12.8	11.0	2.4	0.3	0.3	0.3
Dry	0.4	1.1	1.1	1.4	2.7	8.3	19.3	20.6	4.8	0.5	0.1	0.1
Below Normal	0.2	0.9	2.6	3.9	4.6	10.0	19.5	37.4	14.9	1.1	0.1	0.1
Above Normal	0.5	4.3	5.6	5.1	7.2	12.6	21.8	47.5	26.0	5.0	0.3	0.3
Wet	1.5	5.2	11.9	12.3	12.0	12.2	19.6	41.1	41.0	13.7	0.9	0.4

Resource Agency staff participated in several aspects of the CFR study, including selecting transects and observing stream conditions on July 29, 2009 during the 1.4 cfs, 5.7 cfs, and 11.3 cfs calibration flows (Technical Memorandum 3-2).

Photo of the Unnamed Tributary below Meadow Lake Dam - DFA Transect 2 at approximately 1.5 cfs.

Using the cross section geometry and the calibration flow data, Licensee developed an interactive profile spreadsheet model for the Meadow Lake Dam Reach (Technical Memorandum 3-2 Attachment 3-2I, Part 2). Using this spreadsheet model, Resource Agency staff compiled information on the relationship between flow and wetted perimeter at Transect 2 - Riffle. According to Annear et. al. (2004), the wetted perimeter method can be used to establish a low flow season recommendation. The method is applied to riffle habitats, and a relationship between flow and wetted perimeter is developed either empirically or through the use of hydraulic models. The breakpoint in the relationship between flow and wetted perimeter is assumed to protect benthic macroinvertebrate production at an acceptable level.

The following flow versus wetted perimeter relationship was developed from the information compiled from the interactive spreadsheet model:



As can be seen in the above figure, the breakpoint in the flow versus wetted perimeter relationship at the sampled riffle is between 0.5 and 1.0 cfs.

Resource Agency staff also performed a Tennant Method analysis using the synthesized unimpaired flows to further assess flow needs.[7] According to Annear et.al.: "Because of its robustness, this method is a reasonable starting point for quantifying instream flow needs to which refinements can be made if needed."

The following table is modified from Annear et.al.:

Description of flow[a]	Apr - Sept	Oct - Mar
Optimum range of flow	60-100%	60-100%
Outstanding habitat	60%	40%
Excellent habitat	50%	30%
Good habitat	40%	20%
Fair or degrading habitat	30%	10%

[7] The Tennant method uses percentages of the average annual flow (QAA) to get seasonally adjusted instream flow recommendations that have some hydrological relevance for maintaining natural habitat and geomorphological attributes of streams and rivers. This method applies various percentages of the QAA to two 6 month periods to obtain instream flow regimens. Then, Field data and photographs can be used to help verify recommendations or develop site-specific percentages/time periods.

Poor or minimum habitat[b]	10%	10%
Severe degradation	<10%	<10%

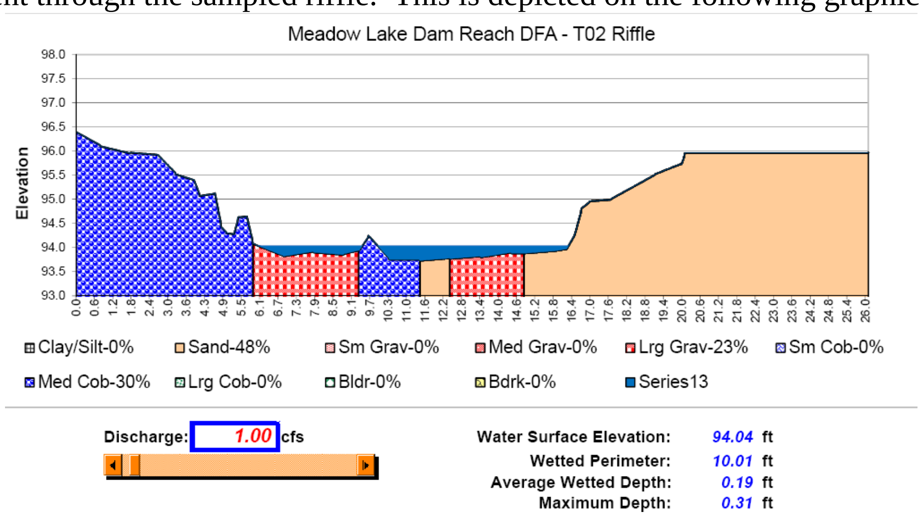
[a] For fish, wildlife, recreation, and related environmental resources
[b] This is only for short-term survival in most cases.

The following table shows the minimum streamflow thresholds to maintain habitat quality based on the percentages listed above and the average annual unimpaired flow of 8.9 cfs for this reach:

Description of flow[a]	**April – September cfs**	**October – March cfs**
Optimum range of flow	5.4 – 8.9	5.4 – 8.9
Outstanding habitat	5.4	3.6
Excellent habitat	4.5	2.7
Good habitat	3.6	1.8
Fair or degrading habitat	2.7	0.9
Poor or minimum habitat[b]	0.9	0.9
Severe degradation	<0.9	<0.9

As noted above, a flow equivalent to 30 percent to 40 percent of the mean annual flow throughout the summer provides fair to good habitat, respectively. This is equivalent to a flow of about 3 - 4 cfs.

Finally, further review of the depths reported on the interactive profile spreadsheet for the Meadow Lake Dam Reach indicate that a flow of 1.0 cfs would also provide additional depth for fish movement through the sampled riffle. This is depicted on the following graphic:



With regard to habitat maintenance flows, Department staff observed the level of meadow inundation at the three calibration flows during the July 29, 2009 site visit. The stream began to spread out into multiple channels beginning with the middle calibration flow, and began to inundate the vegetation during the high calibration flow (see photo below).

Figure ML-2. A section of the meadow inundated at approximately 11 cfs

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies evaluation of sufficient minimum streamflows focuses on the following study information in an effort to enhance the aquatic resources in this reach:

- The Resource Agency Tennent Method and wetted perimeter analyses, and Licensee's CFR study results were considered for the summer to maintain a living stream at all times (SWE-1) and to provide resident native fish migration, and rearing habitat (SWE-3);
- Resource Agency observations during meadow inundation to ensure appropriate habitat maintenance flows to sustain and enhance the montane meadow ecosystem. It is assumed that the habitat maintenance flows will enhance spawning habitat (SWE-3) and will somewhat emulate natural flow variation to the extent feasible (SWE-2).

As noted above, the Tennent Method analysis indicates a flow of 3-4 cfs would be needed to maintain good quality habitat. However, after observing the calibration flow releases, Resource Agency staff concluded that flows of about 10 percent or 1 cfs of the mean annual flow should be sufficient to maintain a living stream at all times (SWE-1) in the mostly bedrock and boulder dominated upper section of this reach. This is further supported by the wetted perimeter assessment, and a subsequent analysis of depths at the riffle transect.

Therefore, the Resource Agencies believe a year-round minimum streamflow of 1.0 cfs is warranted in this reach in all water year types. In addition, based on observations made during the July 29, 2009 site visit, additional flows of between 5.0 and 11 cfs are necessary to inundate the montane meadow during the spring to protect and enhance native riparian vegetation. These flows are also assumed to enhance the aquatic resources (including benthic macroinvertebrates and potentially fish) in the reach.

Table ML-2 presents the Resource Agency's determination of flows that should be released from Meadow Lake Dam to improve condition of the aquatic resources and protect the meadow resources in this reach. These flows were agreed to by Resource Agencies, Licensee, and other relicensing participants through a collaborative process.

Table ML-2. Resource Agencies minimum streamflow recommendation in the Unnamed Tributary below Meadow Lake Dam

WY type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun*	Jul	Aug
All	1	1	1	1	1	1	1	1	5/11/5/5	1	1

*The minimum streamflow is 1 cfs year round. As soon as access permits, Licensee will release a minimum streamflow of 5 cfs for one week, followed immediately by a minimum streamflow of 11 cfs for one week, followed immediately by a minimum streamflow of 5 cfs for two weeks.

Monitoring of aquatic macroinvertebrates and Level 1 monitoring of fish populations will also occur in this reach and will inform our understanding of how the streamflow measures are affecting the aquatic resources.

White Rock Creek Below White Rock Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

White Rock Lake Dam Reach is approximately 2.7 mi long and extends from White Rock Creek's confluence with North Creek to White Rock Lake Dam. The reach has an average elevation of 7,360 ft and an overall channel gradient of 6.5 percent. The watershed area at the White Rock Lake Dam is approximately 1.2 square miles. The mean annual unimpaired flow is 5.1 cfs. White Rock Lake Reservoir usable storage is 570 acre-feet. There is currently no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach

according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees electrofished 65 potential fish habitat spots along a 375-ft section of the stream on September 26, 2008. A total of 62 fish, representing both rainbow trout and brook trout, were collected. Two rainbow trout and 60 brook trout (non-native) were caught.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

Although the stream fish population study was qualitative in nature, collecting only two rainbow trout in 65 sampling locations indicates the population is extremely small. This does not indicate a healthy population in terms of abundance or productivity. Therefore the Resource Agencies do not consider the fish in the White Rock Lake Dam Reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' considered available storage, current flow requirements, and unimpaired hydrology and determined that a year-round flow minimum streamflow of 1.0 cfs in AN and Wet water year types, and a year-round minimum streamflow of 0.5 cfs in CD and Dry and BN water year types should enhance conditions for the aquatic biota.

The following table presents the flows that were agreed to by the Resource Agencies, Licensee and other relicensing participants through a collaborative process for White Rock Creek below White Rock Lake Dam.

Month	EC	CD	D	BN	AN	W
Oct	0.5	0.5	0.5	0.5	1	1
Nov	0.5	0.5	0.5	0.5	1	1
Dec	0.5	0.5	0.5	0.5	1	1
Jan	0.5	0.5	0.5	0.5	1	1
Feb	0.5	0.5	0.5	0.5	1	1

Mar	0.5	0.5	0.5	0.5	1	1
Apr	0.5	0.5	0.5	0.5	1	1
May	0.5	0.5	0.5	0.5	1	1
Jun	0.5	0.5	0.5	0.5	1	1
Jul	0.5	0.5	0.5	0.5	1	1
Aug	0.5	0.5	0.5	0.5	1	1
Sep	0.5	0.5	0.5	0.5	1	1

Conclusion

Fish population data collected in 2008 indicated very low numbers of rainbow trout. The lack of an existing minimum streamflow for this reach and competition with the non-native brook trout are likely limiting overall production of rainbow trout populations. Monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting the native aquatic resources.

Bloody Creek Below Lake Sterling Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Lake Sterling Dam Reach is approximately 0.3 mi long and extends from the high water pool of Fordyce Lake to Lake Sterling Dam. The reach has an average elevation of 6,695 ft and an overall channel gradient of 31.3 percent. The watershed area at the Sterling Lake Dam is approximately one square mile. Lake Sterling Reservoir usable storage is 1,764 acre-feet. The mean annual unimpaired flow is 4.5 cfs. There is currently no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach

according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensees electrofished 20 potential fish habitat spots along a 240-ft section of the stream starting approximately 0.1 mi downstream of Lake Sterling on September 2, 2008. Steep gradient prevented the sampling crew from extending the site further downstream and subsurface flow restricted the upstream end of the reach. Channel substrate within the stream section was comprised primarily of boulders (80 percent) with a lesser subdominant distribution of sand (10 percent) and cobble (10 percent).

Two brook trout and three California roach (a native species) were collected in this reach. One unidentified fish was inadvertently released before processing.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

Given the small number of fish collected during sampling, the Resource Agencies do not consider the fish in the Lake Sterling Reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' considered available storage, current flow requirements, and unimpaired hydrology and determined that a flow of 1.5 cfs in Wet years in June through October, with a flow of 1.0 cfs from November through May, a year-round flow minimum streamflow of 1.0 cfs in AN water year types, and a year-round minimum streamflow of 0.5 cfs in CD and Dry and BN water year types should enhance conditions for the aquatic biota.

The following table presents the flows that were agreed to by the Resource Agencies, Licensee and other relicensing participants through a collaborative process for White Rock Creek below White Rock Lake Dam.

Month	EC	CD	D	BN	AN	W

Oct	0.5	0.5	0.5	0.5	1	1.5
Nov	0.5	0.5	0.5	0.5	1	1
Dec	0.5	0.5	0.5	0.5	1	1
Jan	0.5	0.5	0.5	0.5	1	1
Feb	0.5	0.5	0.5	0.5	1	1
Mar	0.5	0.5	0.5	0.5	1	1
Apr	0.5	0.5	0.5	0.5	1	1
May	0.5	0.5	0.5	0.5	1	1
Jun	0.5	0.5	0.5	0.5	1	1.5
Jul	0.5	0.5	0.5	0.5	1	1.5
Aug	0.5	0.5	0.5	0.5	1	1.5
Sep	0.5	0.5	0.5	0.5	1	1.5

Having a year round minimum streamflow requirement will keep the channel wetted and provide connectivity between Lake Sterling and Fordyce Lake. Monitoring of trout populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting the aquatic resources.

Cascade Creek Below Lower Peak Lake Reservoir Area Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient water is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement, and Rationale

The Lower Peak Lake Dam Reach is approximately 1.1 mi long and extends from Cascade Creek's confluence with the South Yuba River to Lower Peak Lake Dam. The reach has an average elevation of 6,300 ft and an overall channel gradient of 9.6 percent. The watershed area at the Lower Peak Lake Dam is approximately one square mile. The mean annual unimpaired flow is 4.1 cfs. Lower Peak Reservoir usable storage is 494 acre-feet. There is currently no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population surveys in this reach according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensee electrofished 75 potential fish habitat spots along a 927-ft section of the stream on September 3, 2008. No fish were observed or collected.

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

No fish were observed or collected in this site. Therefore the Resource Agencies do not consider the fish in the Lake Sterling Reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' considered available storage, current flow requirements, and unimpaired hydrology and determined that a flow of 0.5 cfs year round in all water year types should enhance conditions for the aquatic biota.

The following table presents the flows that were agreed to by the Resource Agencies, Licensee and other relicensing participants through a collaborative process for Cascade Creek below Lower Peak Lake Dam.

Month	EC	CD	D	BN	AN	W
Oct	0.5	0.5	0.5	0.5	0.5	0.5
Nov	0.5	0.5	0.5	0.5	0.5	0.5
Dec	0.5	0.5	0.5	0.5	0.5	0.5
Jan	0.5	0.5	0.5	0.5	0.5	0.5
Feb	0.5	0.5	0.5	0.5	0.5	0.5
Mar	0.5	0.5	0.5	0.5	0.5	0.5

Apr	0.5	0.5	0.5	0.5	0.5	0.5
May	0.5	0.5	0.5	0.5	0.5	0.5
Jun	0.5	0.5	0.5	0.75	1	1
Jul	0.5	0.5	0.5	0.5	0.5	0.5
Aug	0.5	0.5	0.5	0.5	0.5	0.5
Sep	0.5	0.5	0.5	0.5	0.5	0.5

Having a year round minimum streamflow requirement will keep the channel wetted and provide connectivity between Lower Peak Lake and the South Yuba. Monitoring will occur in this reach that will inform our understanding of how the new streamflow measures are affecting the aquatic resources.

Sixmile Creek below Kelly Lake Reservoir Dam (Drum-Spaulding Hydroelectric Project)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum streamflow is provided to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition, specifically including rainbow trout, and benthic macroinvertebrates. The reach is designated as existing "cold freshwater habitat" and potential "warm freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin. However, according to the Basin Plan, "Any segments with both COLD and WARM beneficial use designations will be considered COLD water bodies for the application of water quality objectives."

Existing Conditions, Problem Statement and Rationale

The Kelly Lake Dam Reach is approximately 0.3 mi long and extends from Sun Flower Reservoir (a private reservoir) to Kelly Lake Dam. The reach has an average elevation of 5,820 ft and a channel gradient of 4.4 percent. (Technical Memorandum 3-2). The watershed area at Kelly Lake Dam is approximately 0.5 square miles. The mean annual unimpaired flow is 2.4 cfs. Kelley Lake Reservoir usable storage is 336 acre-feet. There is currently no existing minimum streamflow in this reach.

Discussion of Fish Population Studies

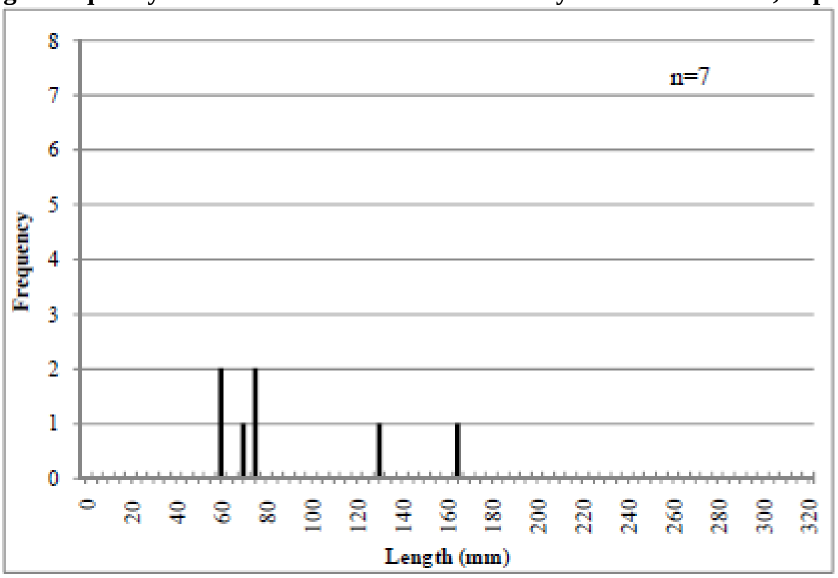
In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee performed one qualitative (Level I) representative fish population survey in this reach

according to standard fish population sampling protocols. This site was sampled using habitat spot check electrofishing.

Licensee sampled 35 potential fish habitat spots along an 867-ft section of stream, starting approximately 1,000 ft upstream of Snow Flower Reservoir on September 4, 2008. Seven rainbow trout and 10 green sunfish were caught.

Figure KL-1. Length frequency for rainbow trout collected in Kelly Lake Dam Reach, September 4, 2008.



Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged frog surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Aquatic Biota Condition

Although the stream fish population study was qualitative in nature, collecting only seven rainbow trout in 35 sampling locations indicates the population is extremely small. Therefore the Resource Agencies do not consider the fish in the Kelly Lake Dam Reach to be in good condition.

Determination of Minimum Streamflows

Because fish in this reach were determined not to be in good condition, the Resource Agencies' considered available storage, current flow requirements, and unimpaired hydrology and determined that a flow of 0.5 cfs year round in Wet, AN and BN water year types, and 0.2 cfs year round in Dry and CD water year types should enhance conditions for the aquatic biota.

The following table presents the flows that were agreed to by the Resource Agencies, Licensee and other relicensing participants through a collaborative process for Sixmile Creek below Kelly Lake Dam.

Month	EC	CD	D	BN	AN	W
Oct	0.2	0.2	0.2	0.5	0.5	0.5
Nov	0.2	0.2	0.2	0.5	0.5	0.5
Dec	0.2	0.2	0.2	0.5	0.5	0.5
Jan	0.2	0.2	0.2	0.5	0.5	0.5
Feb	0.2	0.2	0.2	0.5	0.5	0.5
Mar	0.2	0.2	0.2	0.5	0.5	0.5
Apr	0.2	0.2	0.2	0.5	0.5	0.5
May	0.2	0.2	0.2	0.5	0.5	0.5
Jun	0.2	0.2	0.2	0.5	0.5	0.5
Jul	0.2	0.2	0.2	0.5	0.5	0.5
Aug	0.2	0.2	0.2	0.5	0.5	0.5
Sep	0.2	0.2	0.2	0.5	0.5	0.5

Having a year round minimum streamflow requirement will keep the channel wetted and provide connectivity between Kelly Lake and the non-project Snowflower Reservoir. Level 1 monitoring of rainbow trout populations will also occur in this reach and will inform our understanding of how the new streamflow measures are affecting the aquatic resources.

RATIONALE FOR FLOW MEASURES – CANAL OUTAGES (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

The purpose of this measure is to specify streamflows that will be maintained during canal outages to protect resident aquatic species that reside in the streams affected by the canal outages.

RATIONALE FOR FLOW MEASURES – FORDYCE LAKE DRAWDOWN (DRUM-SPAULDING HYDROELECTRIC PROJECT)

This measure has several purposes:

- To provide recreational boating flows.
- To provide streamflows that continue to allow historic recreational four-wheel-drive opportunities including specified flows during the annual "Sierra Trek."

- To attempt to more closely follow the shape of the unimpaired hydrograph to improve habitat for aquatic species.

Relicensing participants recognized the recreational needs in the Fordyce area. Once aquatic species concerns were discussed, relicensing participants considered both the desire to provide recreational streamflows as well as continue to provide four-wheel-drive experiences in developing the flow regime. It was also an objective in developing this measure not to cause Lake Spaulding to spill.

The measure includes end of year target storage to meet minimum streamflow requirements. The measure provides a High Target Flow of 250-475 cfs, which will provide recreational boating flows earlier in the season (the timing is dependent on the water year type). The High Target Flow is maintained until Fordyce Reservoir reaches 29,000 acre-feet. Once that occurs, Licensee shall determine the subsequent release rates by calculating the difference between 29,000 acre-feet and the end of year target pool level of 7,500-10,000 acre-feet. This amount shall be apportioned equally and released until the end of year target pool level is reached. It is expected that this flow will provide recreational four-wheel-drive opportunities the remainder of the season. During the Sierra Trek, an annual special event with more than 40 years of history, flows shall be reduced to 50 cfs if flows are not at that level.

RATIONALE FOR FLOW MEASURES - WILSON CREEK DIVERSION DAM FLOW SETTING (YUBA-BEAR HYDROELECTRIC PROJECT)

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to ensure sufficient minimum is provided to restore and enhance habitat for native aquatic species including fish and benthic macroinvertebrates, restore connectivity, and provide tributary flow to the Middle Yuba River. The reach is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions, Problem Statement. and Rationale

The Wilson Creek Diversion Dam Reach is approximately 0.3 mi long and extends from the confluence of Wilson Creek and the Middle Yuba River to the Milton-Bowman Diversion Conduit. The reach has an average elevation of 5,665 ft and a channel gradient of 3.6 percent (Technical Memorandum 3-2). The watershed above the Wilson Creek Diversion Dam is approximately 0.9 square miles, it is a snowmelt driven system, and has an average unimpaired flow of 3.7 cfs. There is no existing minimum streamflow requirement in this reach (Yuba-Bear PAD).

Discussion of Fish Population Studies

In determining whether fish in a reach are in good condition, the Resource Agencies evaluate individual fish, the local fish population, and the local fish community according to the criteria listed in The "Evaluation of Aquatic Biota Condition" section above. Fish are not considered to be in good condition unless all three criteria are met.

In accordance with the FERC approved Stream Fish Population Study Plan (March 2008), Licensee attempted to perform a qualitative (Level I) representative fish population survey in Wilson Creek below the Wilson Creek Diversion Reach in September 2008, but the reach was dry (Technical Memorandum 3-1).

Discussion of Benthic Macroinvertebrate Studies

No benthic macroinvertebrate studies were conducted in this reach.

Discussion of Foothill Yellow-legged Frog Surveys

No formal surveys were conducted for foothill yellow-legged frogs in this reach, and no incidental sightings were made.

Discussion of Western Pond Turtle Studies

No formal surveys were conducted for western pond turtles in this reach and no incidental sightings were made.

Determination of Fish Condition

The reach of Wilson Creek below the Wilson Creek Diversion Dam was dry. Therefore the Resource Agencies do not consider the aquatic resources in this reach to be in good condition.

Determination of Minimum Streamflows

Because aquatic resources in this reach were determined not to be in good condition, the Resource Agencies considered watershed area and unimpaired hydrology and determined a year-round minimum streamflow of 0.25 cfs in Wilson Creek below Wilson Creek Diversion Dam should enhance conditions for the aquatic biota and Bigfoot.

During negotiations with the Resource Agencies, Licensee, and other relicensing participants through the collaborative process, flows for Wilson Creek below Wilson Creek Diversion Dam were set at 0.25 cfs or Natural Flow year round.

Monitoring of benthic macroinvertebrate populations will occur in this reach and will inform our understanding of how the streamflow measure is affecting the biota and habitat quality.

RATIONALE FOR FLOW MEASURES - CHICAGO PARK POWERHOUSE MOTORING (YUBA-BEAR HYDROELECTRIC PROJECT)

There is a small population of foothill yellow-legged frogs in the Bear River below Chicago Park Powerhouse (based on Technical Memorandum 3-6 Special Status Amphibians Foothill Yellow-legged Frog Surveys). In addition, Steephollow Creek flows into the Bear River within this reach. It is likely that frogs from Steephollow Creek enter the Bear River during their seasonal movements. The motoring measure maintains a minimum streamflow in the Bear River during non-routine planned powerhouse outages that occur from May through September. This is intended to protect frog egg masses/tadpoles and fish from dewatering and buffer the effects of large flow fluctuations for other lifestages.

RATIONALE FOR FLOW MEASURES – SPILL CESSATION

The spill cessation measures were for the Yuba-Bear and Drum-Spaulding projects were primarily developed to protect the aquatic lifestages of foothill yellow-legged frogs (*Rana boylii*). However, it is expected that measures developed to protect this frog species will protect native species (e.g., rainbow trout and aquatic macroinvertebrates) that have similar riverine habitat associations and similar timing of key ecological events, such as migration, spawning, and emergence. In addition, the flow levels at the beginning of each spill cessation schedule were designed to link to recreational whitewater boating flow measures and potentially provide additional boating opportunities as flows recede.

Foothill yellow-legged frogs lay eggs in the spring, and tadpoles develop during the late spring and summer of each year in a variety of stream environments from small creeks to large rivers (Wheeler and Welsh 2008). In the Sierra Nevada, foothill yellow-legged frogs are adapted to the predictability of the snowmelt recession and typically lay eggs, attaching them to rocky substrates in river margins, during the middle to the tail end of that period (Yarnell et al. 2010a). The primary risks to aquatic lifestages of foothill yellow-legged frogs from altered flow regimes are scouring and stranding of eggs and tadpoles (Kupferberg et al. 2009a and 2009b, Kupferberg et al. 2011, Kupferberg et al. 2012, Yarnell et al. 2010b). Scouring can occur if water flows fluctuate and increase substantially after eggs have been laid. Stranding can occur if the flow recession rate is too fast relative to the time it takes for eggs to develop and the water depth at which the eggs were laid. Egg development time is dependent on water temperature, but typically ranges from 2-3 weeks in mid-elevation Sierran rivers (based on S. Kupferberg 2008, unpublished data). Based on egg mass and tadpole habitat studies in the northern Sierra Nevada (including data from Yuba-Bear/Drum-Spaulding studies) upwards of half of all egg masses are laid at water depths of 1 foot or less (Nevada Irrigation District and Pacific Gas and Electric Company 2010, Yarnell et al. 2011). Thus, to protect egg masses from stranding and to reduce the risk of local population extinction, the recession rate would need to result in water depth (stage) decreases of less than 1 foot over 3 weeks, or one-third foot per week.

Snowmelt recession in unimpaired (unregulated) Sierra Nevada rivers averages an 8 percent per day decrease at the beginning of the recession period and a 4 percent per day decrease at the end of the recession period, (based on an analysis of eight unimpaired creeks and rivers in the region). For the period of record, 90 percent of time there was a less than 21 percent per day flow decrease and 70-80 percent of the time there was a less than 10 percent per day decrease during the snowmelt recession period (Epke 2011). At river cross-sections where frogs breed, gradual (9 percent to 3 percent) daily percent changes in flow translate to gradual changes in water depths that protect frog eggs from stranding and allow tadpoles to successfully develop through the summer (S. Yarnell, pers. comm., Lind and Yarnell 2011).

Based on available information from local foothill yellow-legged frogs surveys and habitat modeling, observed hydrology for the project area, and unimpaired hydrology from nearby unimpaired rivers, spill cessation and flow fluctuation measures were developed as follows:

- Review unimpaired hydrology from several Sierran rivers (Epke 2011)and determined the general pattern of unimpaired recessions during mid-May through June to be ~8 percent/day flow decrease initially gradually going down to ~ 5 percent/day flow decrease by late June/early July.
- Review observed hydrology (regulated) on relevant river to assess the flow starting point (cfs) for the recession.
- Review data on local timing of frog breeding/egg laying (Technical Memorandum 3-6 Foothill Yellow-legged Frog Surveys) to determine a starting date after which a spill cessation would be applied to any spills.
- Evaluate suitability of frog breeding/oviposition habitat using instream flow modeling data (Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling), to confirm that habitat was mostly unsuitable above potential starting flow (so breeding would not likely start before recession) and confirm that a small amount of habitat was becoming suitable at the start of the recession and that more habitat became suitable as flows receded.
- Build a "natural recession" based on the flow starting point, rate of change, targeting at least a three week recession, and allowing flow steps to be 2-3 days long, but not exceed a 20-25 percent decrease on any single flow step down.
- Evaluate project operational and safety constraints to determine how many steps and how long the steps could be while still mimicking the natural recession pattern.
- Evaluate water depth (stage) change downstream of the dam at known frog breeding sites (using data from Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling) to confirm that the threshold of "1 foot of stage decrease over 3 week period" was not exceeded.
- Evaluate proposed recreational whitewater boating measures to determine how to connect these flows (which were typically at or higher than the starting flows for cessation) and the cessation flow schedule.

Middle Yuba River Below Milton Diversion Dam (Yuba-Bear Hydroelectric Project)

This measure provides a three week period of stable and slowly receding flows following any spill after May 1 of each year. The cessation schedule starts at 300cfs and includes six steps to reach minimum streamflows in below normal, above normal, and wet water year types. An additional step is required to reach minimum streamflows in the dryer water year types, but spills are less likely to occur in those year types. To accommodate Licensee interest in making fewer flow adjustments, two of the six steps were allowed to exceed the maximum recommended step decrease (25 percent). However, because flows are held constant for three days, the decreases on a per-day basis are still reasonable. Stage change from the beginning to the end of the cessation schedule (as evaluated using data from Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling) is approximately 0.9 feet. Overall, this measure results in a stage change of less than one foot over a three week period and will be protective of foothill yellow-legged frog eggs masses. This measure also provides protection for foothill yellow-legged frog tadpoles by limiting flow fluctuations in the summer months (through September 30) following the spill cessation period, or after May 1 in non-spill years.

The first 5 days of this spill cessation schedule (at 300cfs) also provide a recreational whitewater boating opportunity.

Canyon Creek Below Bowman-Spaulding Canal Diversion (Yuba-Bear Hydroelectric Project)

This measure provides three weeks of slowly receding flows following any spill after April 1 of each year. The cessation schedule starts at 275cfs and includes nine steps to reach a 45 cfs and then another step to reach the minimum streamflow. Each individual step change is less than 25 percent with approximate daily decreases ranging from a maximum of 16 percent in the beginning of the schedule down to the equivalent of 4.5 percent at the end of the schedule. Stage change from the beginning to the end of the cessation schedule (evaluated using data from Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling) averages 1.7 feet. This stage drop is faster than the recommended one foot over a three week period. However, based on Canyon Creek-specific foothill yellow-legged frog data from 2008 and 2009 (Technical Memorandum 3-6 Special Status Amphibians Foothill Yellow-legged Frog Surveys), the majority of egg masses in this reach were laid at depths greater than 1.7 feet. Overall, this measure should be protective of foothill yellow-legged frog eggs masses. This measure also provides protection for foothill yellow-legged frog tadpoles by limiting flow fluctuations in the summer months (through September 30) following the spill cessation period, or after May 1 in non-spill years.

This cessation measure is linked to Measure No. 2/Condition No. 30 - Canyon Creek Below Bowman-Spaulding Diversion Dam (Bowman-Spaulding Diversion Dam Supplemental Flows for Whitewater Boating), which adds five days of stable flows (at 275cfs) to the beginning of this schedule.

South Yuba River Below Spaulding Reservoir Dam (Drum-Spaulding Hydroelectric Project)

This measure provides three weeks of slowly receding flows following any spill on/after May 2 of each year. The cessation schedule starts at 250 cfs and includes seven steps to reach minimum streamflows in below normal, above normal, and wet water year types. An additional step is required to reach minimum streamflows in the dryer water year types, but spills are less likely to occur in those year types. Each individual step change is less than 25 percent with approximate daily decreases ranging from 6 to 10 percent throughout the schedule. Stage change from the beginning to the end of the cessation schedule (as evaluated using data from Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling) is approximately two feet. However, based on South Yuba-specific foothill yellow-legged frog data from 2008 and 2009 (Technical Memorandum 3-6 Special Status Amphibians Foothill Yellow-legged Frog Surveys), the majority of egg masses in this reach were laid at depths greater than

1.5 feet. Overall, this measure should be protective of foothill yellow-legged frog eggs masses. This measure also provides protection for foothill yellow-legged frog tadpoles by limiting flow fluctuations in the summer months (through September 30) following the spill cessation period, or on/after May 2 in non-spill years.

This cessation measure also includes provisions for recreational whitewater boating flows prior to the start of the cessation which adds from two to six days (depending on water year type) of controlled flows (250 to 420 cfs) to the beginning of this schedule.

Bear River Below Dutch Flat Afterbay Dam (Yuba-Bear Hydroelectric Project)

This spill cessation measure provides different types of spill cessation approaches depending on how the spills occur (Licensee-caused versus not) and the duration of spills. Spill cessation is only required for Licensee-caused spills as defined in the Measure 2- Dutch Flat Afterbay Dam. For short duration (three days or less) Licensee-caused spills, Licensee provides transitional flows during the spill and then subsequently provides three days of decreasing flow steps to return to minimum streamflow releases. For spills lasting more than three days, this measure requires a three week period of decreasing flows such that flows are held at 75cfs, 50cfs, and 25cfs for one week each. Depending on the month and water year type, an additional step may then be required to reach the minimum streamflow. The rationale for this approach is that during short duration spills, it is unlikely that foothill yellow-legged frogs would lay eggs because suitable breeding habitat occurs in small patches when flows are in the 50 to 90 cfs range (based on data from Technical Memorandum 3-7 Special Status Amphibians Foothill Yellow-legged Frog Habitat Modeling). For longer duration spills, especially during the months of April through June, frogs may initiate breeding/egg laying, and the three week schedule of flows is intended to protect egg masses laid during the spill or during the spill cessation. This measure also provides protection for foothill yellow-legged frog tadpoles by limiting flow fluctuations in the summer months (through September 30) following the spill cessation period, or on/after May 1 in non-spill years.

FOREST SERVICE SPECIFIC RATIONALE FOR FLOW MEASURES – WATER TEMPERATURE IN SOUTH YUBA RIVER

The following rationale is for a Forest Service-specific Preliminary Section 4(e) Condition an dis not necessarily representative of the other Resource Agencies.

Stream Reach Specific Objectives

The Resource Agencies' interest in this reach is to improve the habitat, ensure adequate protection of the aquatic resources, and achieve fish in good condition by ensuring that streamflow and water temperatures are appropriate to support the aquatic resources in the reach, including rainbow trout and foothill yellow-legged frogs[8]. The entire reach from Spaulding Dam to Englebright Reservoir is designated as "cold freshwater habitat" in the Central Valley Regional Water Quality Control Board's Basin Plan for the Sacramento River Basin and the San Joaquin River Basin.

Existing Conditions

The South Yuba River below Spaulding Dam is approximately 41 mi long and extends from the outlet at Spaulding Dam (El. 4,740 feet) to Englebright Reservoir (El. 559 feet). Major tributaries include Fall Creek at RM 35.6, Canyon Creek at RM 32.5, Poorman Creek at RM 28.1 and Humbug Creek at RM 19.6. The watershed above Spaulding Dam is approximately 118 square miles with a mean annual unimpaired flow of 498 cfs. The watershed area at Langs Crossing (USGS 11414250), which is the current minimum flow compliance point for Spaulding Dam, is 120 square miles with a mean annual unimpaired flow of 508 cfs. The existing minimum flow requirement is 5 cfs at Langs Crossing.

Benthic Macroinvertebrates

The benthic macroinvertebrate IBI and MMI scores in Reaches #5 and #6, lower down in the system were the same or slightly lower than the median and mean for the all project affected sites and considerably lower than those of the reference sites. The scores below Spaulding No. 2 Powerhouse were higher than the mean and median scores for project affected sites and, with the exception of the mean MMI score, higher than the scores for the North Yuba River reference sites. However, less than a mile downstream – immediately downstream of the Jordan Creek confluence near Lang Crossing in Reach #1, the scores were the lowest of all the study sites. This was likely in part due to the dominant substrate of rough bedrock. The scores were brought down by a high percent tolerant species, and a low EPT (Ephemeroptera-Plecoptera-Trichoptera) (generally intolerant orders) index. These scores indicate that the habitat quality is generally low in the South Yuba River, and especially low in South Yuba River Reach #1 (see South Yuba River Below (see "Specific Rationale for Stream Reaches - South Yuba River Below Lake Spaulding Reservoir Dam Drum-Spaulding Hydroelectric Project" for more details). Aquatic species monitoring will be provide the information needed to assess benthic macroinvertebrate responses to new minimum flows and block flows.

Foothill Yellow-legged Frogs

Suitable breeding habitat exists but foothill yellow-legged frogs occur at low abundance compared to other regulated rivers and very low abundance compared to unregulated rivers. Relative abundance varies substantially within the survey area (Fall Creek ~ RM 35.6 to Purdon Creek ~ RM 11) (see "Specific Rationale for Stream Reaches - South Yuba River Below Lake Spaulding Reservoir Dam Drum-Spaulding Hydroelectric Project" for more details). Historic flow fluctuations and abrupt decreases in flows during the egg laying and tadpole rearing period have likely contributed to the relatively low abundance of foothill yellow-legged frogs in the

[8] Foothill yellow-legged frogs (FYLF) are designated as a species of special concern by the State of California, as a sensitive aquatic species by US Forest Service Region 5 and have recently been petitioned for listing under the Federal Endangered Species Act (Adkins Giese et al. 2012).

upper reaches of the SYR. Recent distributional and experimental studies indicate that foothill yellow-legged frog tadpoles require daily average water temperatures of at least 17^{o} C in July and August to grow and survive to metamorphosis. Currently the upstream distribution of foothill yellow-legged frogs in the South Yuba River extends to the area of the Fall Creek confluence (~RM 35.6), approximately 3.5 miles upstream of the Canyon Creek confluence. Increases in minimum flows and the proposed water temperature management measures for the South Yuba River in the new license will cool water temperatures at sites upstream of Canyon Creek and may result in distributional shifts in foothill yellow-legged frog populations. Aquatic species monitoring will be provide the information needed to assess foothill yellow-legged frog responses to new minimum flows and block flows.

Fish

Multiple age classes were present in Spaulding No. 2 Powerhouse Reach indicating some breeding had occurred. However, fish population and biomass estimates in this reach were well below those of Lavezzola Creek, and biomass was well below the average for a North Sierra stream of this width (see Gerstung 1973). Fish population and biomass estimates in South Yuba Reach #1 were well below those of the unimpaired reference reaches; however, biomass estimates during 2008 were about average for a North Sierra stream of this width. Similarly, fish population and biomass estimates for South Yuba Reach #5 were well below those of the unimpaired reference reaches, however biomass estimates were about average for a North Sierra stream of this width. A native assemblage of rainbow trout, Sacramento sucker and Sacramento pikeminnow occurred in South Yuba Reach #6. The numbers of all species were relatively low compared to the North Yuba River – Lower site, which was also a long, deep pool at a similar elevation even when adjusted for differences in reach length (see “Specific Rationale for Stream Reaches - South Yuba River Below Lake Spaulding Reservoir Dam Drum-Spaulding Hydroelectric Project” for more details).

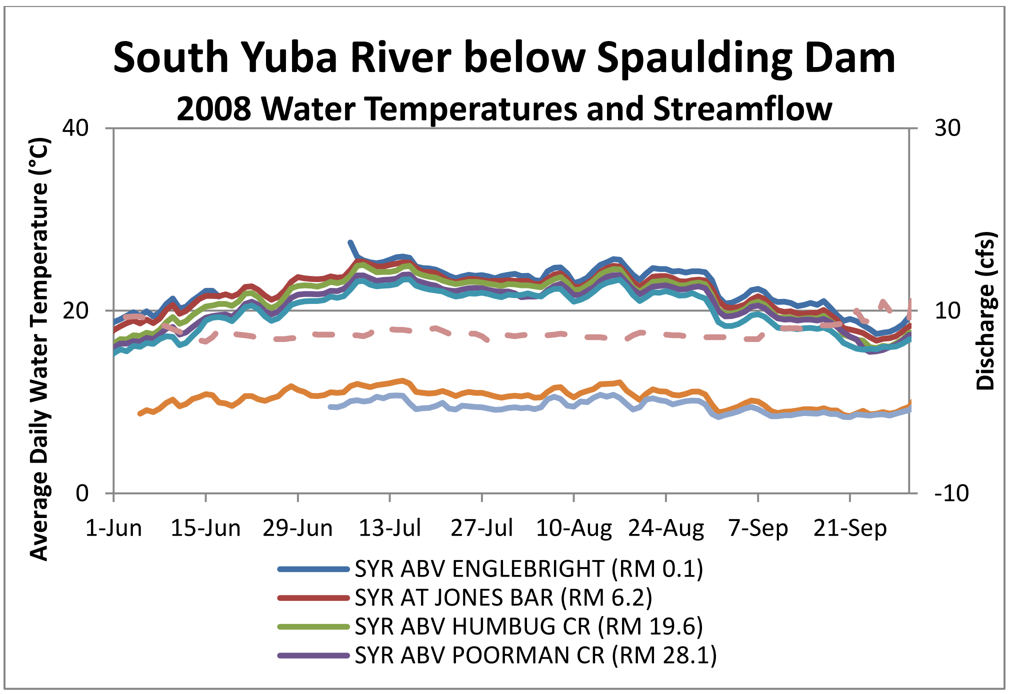
Flows in the South Yuba River below Spaulding Dam are in general far lower than the natural hydrograph, and in the spring, can drop abruptly to 5 cfs during critical spawning, egg hatching and fry emergence. This likely desiccates redds and strands fry and juvenile fish. Low flows also result in higher water temperatures and access to some colder water tributaries is limited. For example, in Canyon Creek, fish passage is potentially blocked by a 4-foott natural barrier 30 feet upstream from the confluence with the SYR, and a second 3-foot man-made barrier 150 feet upstream from the confluence. Water temperatures affect the distribution, growth and survival of fish populations in the South Yuba River. Migration barriers have frequently been reported for Pacific salmonids when water temperatures reach 21°C to 22°C (McCullough et al. 2001). For example, Kaya et al. (1977) reported that the upper avoidance water temperature for juvenile rainbow trout was measured at 20°C to 22°C. Increasing levels of thermal stress to this life stage may reportedly occur above the 18.3°C water temperature index value. Aquatic species monitoring will be provide the information needed to assess fish species responses to new minimum flows and block flows.

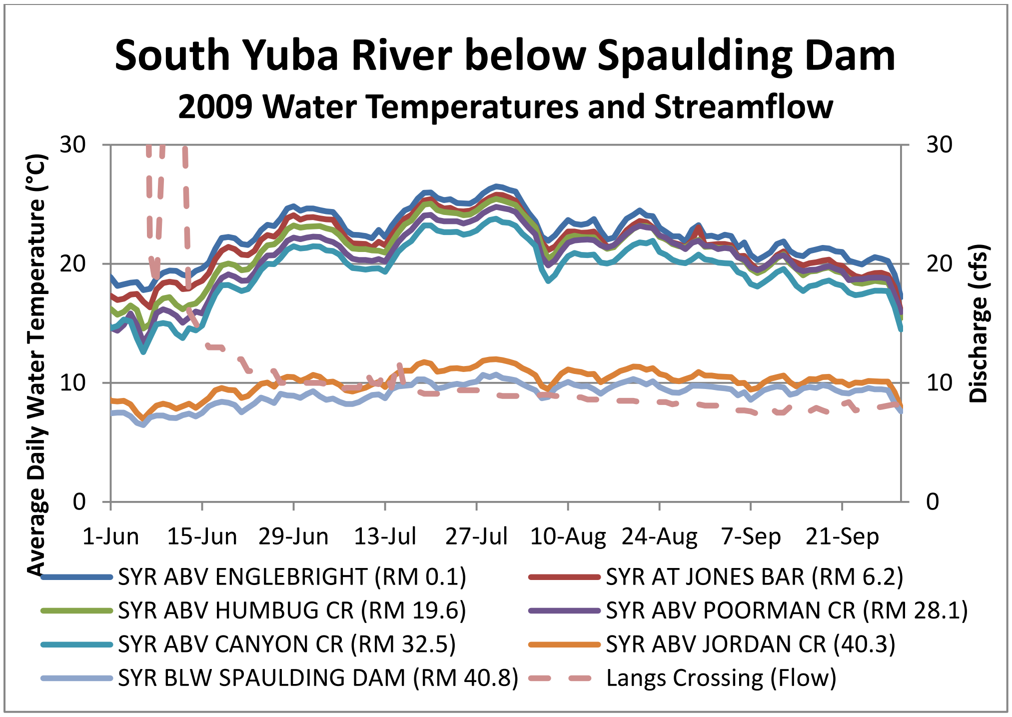
Water Temperature Monitoring In the Project Area

Licensee monitored water temperatures at several locations along the South Yuba River between Spaulding Dam and Englebright Reservoir during 2008 and 2009. The locations included:

- RM 40.8 – South Yuba River below Spaulding main dam (WT-26)
- RM 40.3 – South Yuba River above Jordan Creek (WT-25)
- RM 32.5 – South Yuba River above Canyon Creek (WT-22)
- RM 28.1 – South Yuba River above Poorman Creek (WT-20)
- RM 19.6 – South Yuba River above Humbug Creek (WT-18)
- RM 6.2 – South Yuba River at Jones Bar (WT-14)
- RM 0.1 – South Yuba River above Englebright Reservoir (WT-11)

The results were reported in Technical Memorandum 2-2, Water Temperature Monitoring. The following two figures show the average daily water temperatures for each of the seven monitoring locations for 2008 and 2009, respectively.





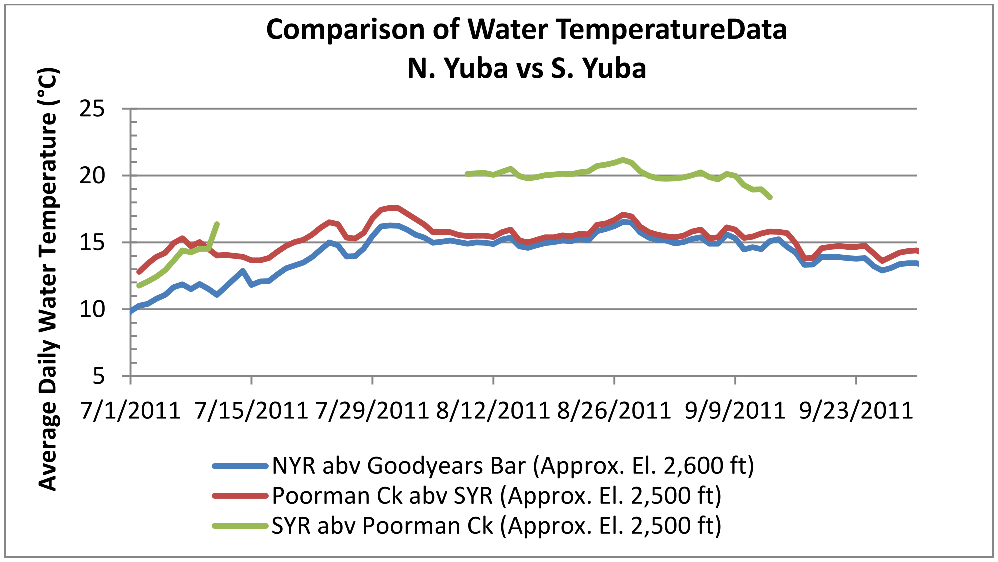
While average daily water temperatures remained around 10°C in the reach between Spaulding Dam and Jordan Creek, at flows of 5 to 10 cfs the average daily temperatures increased rapidly between Jordan Creek and Canyon Creek about 8 miles downstream. Between Canyon Creek and Englebright Reservoir, the average daily temperatures generally remained between 20°C and 25°C, although the temperature immediately above Englebright Reservoir exceeded 27°C in 2008. The following table lists the frequency that water temperatures exceeded 20°C during 2008 and 2009, the first and last day above 20°C each year, and the maximum average daily temperature.

Location	Year	No. Days above 20°C	Earliest Date above 20°C	Last Date above 20°C	Maximum Temperature
SYR above Jordan Ck	2008	0	n/a	n/a	12.4°C
	2009	0	n/a	n/a	12.0°C
SYR above Canyon Ck	2008	68	6/21/08	8/31/08	23.4°C
	2009	60	6/27/09	9/4/09	23.8°C
SYR above Poorman Ck	2008	72	6/21/08	9/8/08	24.0°C
	2009	78	6/24/09	9/13/09	24.8°C
SYR above Humbug Ck	2008	83	6/15/08	9/8/08	25.0°C
	2009	80	6/19/09	9/13/09	25.5°C
SYR at Jones Bar	2008	94	5/18/08	9/17/08	25.4°C
	2009	92	6/17/09	9/19/09	25.8°C
SYR above Englebright Res	2008	86[9]	5/17/08	9/18/08	27.5°C
	2009	104	6/16/09	9/28/09	26.5°C

[9] Water temperature data missing for the period June 18, 2008 through July 6, 2008.

Reference Reach Water Temperature Data

Although there is limited information available, the Resource Agencies used water 2011 temperature data collected through the Yuba River Salmon Forum to compare average daily water temperatures in the South Yuba above Poorman Creek to streams of comparable elevation, including the North Yuba River at Goodyears Bar and Poorman Creek above the South Yuba River. The following chart shows that average daily water temperatures in the North Yuba River at Goodyears Bar (approx. elev. 2,600 feet) were comparable to the temperatures in Poorman Creek above the South Yuba River (approx. elev. 2,500 feet).



The average daily water temperatures in the South Yuba River above Poorman Creek (approx. elev. 2,500 feet) were about 4°C or 5°C higher than the temps in the North Yuba and in Poorman Creek. It is important to note, however, that the water temps in the South Yuba River were quite close to 20°C during this wet water year. Establishing a 20°C objective in the South Yuba River above Canyon Creek is not unreasonable, given that this temperature was observed for most of August 2011 at Poorman Creek (downstream of Canyon Creek) during the 2011 wet year conditions.

Water Temperature Objective

Based on the 2008 and 2009 water temperature monitoring data presented above for the South Yuba River, more than thirty-two miles of potential good quality fish habitat exceeded the 20°C threshold for two months or longer during both water years. This is not consistent with the SWRCB's designation for this reach as cold freshwater habitat. While the FS does not believe it is realistic to cool the entire 32 miles of the South Yuba River to 20°C or less, the specific location for the application of this objective required additional analysis. Based on the available information on existing fish distributions and abundance, especially rainbow trout, existing foothill yellow-legged frog distribution and abundance, and existing and reference water temperature data, the FS believes that the application of a 20°C objective in the SYR just upstream of Canyon Creek is reasonable, appropriate and warranted. This would provide 8 miles of thermally suitable habitat for cold water species, including rainbow trout, while limiting effects on foothill yellow-legged frogs.

Water temperature modeling data for the project area was provided to relicensing participants by Licensee's consultant as graphs and spreadsheets (SYR_CC_080211_2008 flowscenarios_HFAMresults.xlsx, SYR_CC_080211_2009flowscenarios_HFAMresults.xlsx; HDR Engineering, Sacramento, CA). Review of that information indicates that flows higher than the minimum flows agreed to through the collaborative process may be needed in the dryer water year types during late-June, July and August during hot meteorological and river temperature conditions to maintain average daily water temperatures at or below 20°C just upstream of Canyon Creek.

Analysis of water temperature modeling data by California Department of Fish and Game staff indicates that with additional flow releases during heat events, it is possible to meet a threshold of 19^{o}C immediately above Canyon Creek (R. Hughes, pers. comm.). Only two water years were modeled (dry and below normal) and the amount of additional water required to meet this threshold ranged from 1370 to 1970 acre-feet (R. Hughes, pers. comm.). With a 20 °C threshold (instead of 19 °C), FS expectation is that potentially less water would typically be needed for these and wetter water year types. However, a greater volume of water may be needed in critically dry years or on occasions when heat events are more intense in any water year type. Thus the measure indicates that a maximum volume of 2500 acre-feet be made available, each year, for water temperature management.

Based on all the information provided above, FS is conservatively recommending a water temperature threshold of 20°C in the SYR above Canyon Creek until such time that future monitoring demonstrates that another threshold is appropriate. This threshold is consistent with prior determinations made by the Federal Energy Regulatory Commission.

In the Upper North Fork Feather River Project (FERC No. 2105) proceeding, Commission staff commented[10]:

> "The rainbow trout population depends upon adequate year-round flows, water temperatures below 20°C, suitable spawning gravels, and access to tributaries that provide quality spawning areas and juvenile rearing habitat."

In the Upper American River Project (FERC No. 2101) proceeding, Commission staff noted[11]:

> "We compare the mean temperature for each day (i.e., 24-hour period), which we refer to below as 'mean temperature', to 20.0°C as an indicator of whether thermal conditions fully support cold water fishes."

[10] Final Environmental Impact Statement for the Upper North Fork Feather River Project, Project No. 2105-089, Environmental Analysis, Section 3.3.2.1.
[11] Final Environmental Impact Statement for Hydropower License for the Upper American River Hydroelectric Project FERC Project No. 2101-084, and the Chili Bar Hydroelectric Project
FERC Project No. 2155-024, page 3-88.

In addition, the "Water Temperature in the South Yuba" measure requires Licensee to release water in a manner that maintains temporal and spatial connectivity of suitable habitat, especially water velocity, for foothill yellow-legged frog tadpoles during both increases and decreases in flow. Foothill yellow-legged frogs may be negatively affected by abrupt changes in water velocity (Kupferberg et al 2011).

RATIONALE FOR FLOW MEASURES - ROLLINS RESERVOIR ELEVATION CONTROL (YUBA-BEAR HYDROELECTRIC PROJECT)

This measure is intended to reduce flow fluctuations in the Bear River below Rollins Reservoir through management of reservoir levels and outflows. This measure also includes a provision to maintain a gradual reduction of flows during spill cessation, after May 1 of each year. The target stage change for the Bear River (as measured at USGS gage 11422500) during the spill cessation period is no more than a total of a one foot decrease in any three week period. The combination of a reduction in flow fluctuations and gradual flow decreases after spill events is expected to result in more stable flows, less dewatering of river margin habitats, and less variability in water temperatures in the Bear River. This should benefit a variety of aquatic species, including foothill yellow-legged frogs, native fishes, and aquatic macroinvertebrates.

RATIONALE FOR FLOW MEASURES - ROLLINS DAM LARGE WOODY MATERIAL MANAGEMENT (YUBA-BEAR HYDROELECTRIC PROJECT)

Large trees and snags that fall into streams play an important role in mountain stream channel complexity and habitat heterogeneity. Large woody material and aggregations of woody debris offer salmonids of all life stages hydraulic and thermal refuge, promote accumulation of spawning gravels, and create cover and refuge for juvenile rearing (Dolloff 1983; Bryant et al. 2005). LWM has been shown to have important impacts on channel morphology and bank stabilization when present in second to fifth order streams. When LWM is present it creates pools, deflects flow and causes sediments to be stored along the marginal edges of the channel (Ruediger and Ward 1996), forms and stabilizes gravel bars, can increase channel width, and provides for colonization of vegetation and further bar stabilization (Naiman et al. 2002).

Woody material also plays a significant role on energy flow, nutrient dynamics, and in shaping the biotic community in streams. Benthic macroinvertebrates and fish alike have seen direct benefit to placement of woody debris in stream ecosystems (Fischenich and Morrow 2000, Hilderbrand et al., 1997). Aquatic insects have been document utilizing woody materials in streams for refugia, and feeding on decaying woody material. Anderson et al 1978 showed that when woody debris is present there is an observed increase in aquatic insects from both Ephemeroptera and Plecoptera taxas (mayfly and stoneflies, respectively) which in turn provides increase if food availability to trout.

Several studies have documented significant benefits to adult trout populations by increasing pool habitat volumes. Berg et al. 1998 reported that the presences or absence of LWD was the primary factor in trout habitat selection and that trout tended to select habitat by volume and depth such as the heads of pools created by LWD. Because trout are visual feeders, pools created by LWD offer optimal cover for resting and predator avoidance near swift water feeding stations. The capacity for LWD to form complex habitat is long term and has been shown to more than triple pool habitat volume in treated streams two decades after woody debris was installed (White et al. 2011). This same study documented that LWD has a significant effect on fish abundance and biomass in high mountain streams. Treatment sections surveyed 21 years after instillation of LWD had on average 53 percent more adult trout than control sections and trout abundance and biomass had significantly increased compared to pre-treatment (White et al. 2011).

Consequences of decreased amounts of wood include loss of instream cover and structural complexity, decreased availability and abundance of habitat units, and reduced diversity of velocities and habitat.

Ruediger and Ward (1996) inventoried LWD in Streams in the Stanislaus National Forest. They defined LWD as:

> "all pieces of wood greater than 1 m long and 10 cm in diameter (at the large end)… Diameters were taken at each end, with diameter measured at the juncture of the bole and rootwad, if a rootwad was present. Average diameter was calculated from diameters at each end of the piece. Average diameters were grouped by diameter classes: small (10-30 cm), medium (31-60 cm), large (61-90 cm), and very large (>90 cm). LWD was considered stable if it was longer than the mean channel width or was buried at one or both ends."

They found that their plots in 5^{th} order streams had a mean density of 9.8 pieces of large woody material per 100 meters, with 2.4 mean stable pieces per 100 meters and that "stable pieces were larger than unstable pieces." Low gradient streams (0.1-1.5 percent) had a mean density of 15.6 pieces per 100 meters, with 5.5 stable pieces. The mean length of LWM in 5^{th} order plots was 4.6 m. The mean length and diameter of stable pieces overall was 8.9 m and 40 cm, respectively while unstable pieces were both shorter (3.0 m) and had smaller diameters (27 cm). They also found that LWD that influenced both pool formation and sediment retention had a mean diameter of 33 cm.

Bear River Canal Diversion Dam Reach is approximately 10.4 mi long and stretches from Lake Combie to the Bear River Canal Diversion Dam. The reach has an average channel gradient of 0.7 percent (Technical Memorandum 3-1). According to Technical Memorandum 1-1 Channel Morphology Attachment 1-1I (Large Woody Debris by Size and Diameter Class), no Large Woody Material of any size was found during habitat mapping of the Bear River below the Bear River Canal Diversion Dam.

Table 3.7-20 of Technical Memorandum 3-1 (Stream Fish Populations) indicates that the Bear River Canal Diversion Dam Reach - Upper fish population site at RM 8 was mostly run and low gradient riffle with a width of between 74 and 77 ft. The dominant substrate was cobble, the subdominant was boulder, and there were no large woody debris pieces during either 2008 or 2009.

Table 3.7-22 of Technical Memorandum 3-1 (Stream Fish Populations) indicates that the Bear River Canal Diversion Dam Reach - Lower fish population site at RM 3.4 was mostly run and low gradient riffle with a width of about 41 ft. The dominant substrate was bedrock, the subdominant was boulder/cobble and there were no large woody debris pieces during either 2008 or 2009.

According to Attachment 3-2A: Habitat Mapping and Channel Characterization Report (Bear R Can Div Dam GM and HM.doc), most of the habitat of the Bear River below the Bear River Canal Diversion Dam consists of:

> "Low gradient riffles and glides, with long mid-channel and lateral pools. Side channels separated from the main channel by vegetated islands are common. Little LWD nor other forms of overhead or instream cover are present within the active channel. Gravel-sized material is present in large patches within the active channel."

Large woody material is lacking and there is little habitat complexity in the Bear River below the Bear River Canal Diversion Dam. Additionally, fish populations in this reach are not considered by the Resource Agencies to be in good condition and the benthic macroinvertebrate metric scores indicated that the habitat quality was low (See Minimum Streamflow Rationale for this reach). Therefore, to attempt to increase LWM and habitat complexity in this reach, Licensee shall implement Measure No. 2 - Rollins Dam Large Woody Material Management measure.

RATIONALE FOR FLOW MEASURES - STEEPHOLLOW CREEK FOOTHILL YELLOW-LEGGED FROG MONITORING (YUBA-BEAR HYDROELECTRIC PROJECT)

Steephollow Creek has periodically received high flows (approximately once every 5 years; William Morrow, Nevada Irrigation District, pers. comm., April 2012) when Chicago Park Powerhouse goes into an unplanned outage. There is an apparently robust population of foothill yellow-legged frogs in Steephollow Creek (based on Technical Memorandum 3-6 Special Status Amphibians Foothill Yellow-legged Frog Surveys). This population may be negatively affected by future spills, depending on the seasonal timing and magnitude of the spills. This measure provides operational improvements for powerhouse, forebay, and conduit management, along with monitoring of the frog population in Steephollow Creek. The operational improvements should reduce the number and magnitude of spills. Monitoring of foothill yellow-legged frogs will establish baseline population information with additional surveys triggered following spill events. If substantial adverse effects of spills are documented, additional mitigation measures (including facility upgrades) may be required.

RATIONALE FOR FLOW MEASURES - MITIGATION FOR ENTRAINMENT (YUBA-BEAR HYDROELECTRIC PROJECT)

Canal Outages Fish Rescue Plan (Drum-Spaulding and Yuba-Bear Hydroelectric Projects)

OBJECTIVES ADDRESSED BY CANAL OUTAGES FISH RESCUE PLAN

Licensees routinely perform maintenance of Project canals, which requires partial or complete de-watering of the canal. Such activities have the potential to adversely affect fish in the canals. The goal of this plan is to safely recover these fish and relocate them into appropriate stream habitat.

INFORMATION USED TO ESTABLISH CANAL OUTAGES FISH RESCUE PLAN

- Drum-Spaulding and Yuba-Bear Final License Amendments
- Draft Yuba-Bear Canal Fish Rescue Plans
- Draft Drum-Spaulding Fish Protection and Management During Canal Outages Plan

RATIONALE FOR CANAL OUTAGES FISH RESCUE PLAN

The existing Yuba-Bear Project includes four diversion conduits: Milton-Bowman Conduit, Bowman-Spaulding Conduit, Dutch Flat No. 2 Conduit, and Chicago Park Conduit. The Applicant routinely performs maintenance of Project conduits, which requires partial or complete de-watering of the canal. This can have the potential to adversely affect fish in the canals. Licensee agreed to a Canal Outages Fish Rescue Plan through negotiations with Relicensing Participants, and Licensee developed this Plan in consultation with other Relicensing Participants.

The existing Drum-Spaulding Project includes eight canals: Lake Valley Canal, Drum Canal, Towle Canal, South Yuba Canal, Bear River Canal, Upper Wise Canal, Lower Wise Canal, and South Canal. The Applicant routinely performs maintenance of Project canals, which requires partial de-watering of the canal. This can have the potential to adversely affect fish in the canals. Licensee agreed to a Canal Outages Fish Rescue Plan through negotiations with Relicensing Participants, and Licensee developed this Plan in consultation with other Relicensing Participants.

However, final agreement on these plans among the Relicensing Participants were not reached as of the date Licensee filed their Amended Applications, of which the Canal Fish Rescue Plans are a part. The objective of the plans is to “assure minimum affect on fish that may be found in the Project’s water conveyance facilities when those facilities are dewatered.”

Licensee should consult with the FS, BLM, CDFG, and State Water Board to finalize the plans provided in the Final License Application Amendments and submit it for FS, BLM, CDFG, and State Water Board approval.

Gaging Plan (Drum-Spaulding and Yuba-Bear Hydroelectric Projects)

OBJECTIVES ADDRESSED BY GAGING PLAN

Natural Hydrograph
Recreation Streamflow
Aquatic Biota

INFORMATION USED TO ESTABLISH GAGING PLAN

DSYB Final License Application and Amendments

RATIONALE FOR GAGING PLAN

The Gaging Plan will specify how compliance with proposed license conditions and recommendations measures relating to streamflows and reservoir storage will be verified. The Gaging Plan will also provide useful information for interpretation of results of future monitoring efforts and will be used to determine the need for the implementation of adaptive management measures.

Modifications of 4(e) Conditions in the Event of Anadromous Fish Re-introduction (Drum-Spaulding and Yuba-Bear Hydroelectric Projects)

OBJECTIVES ADDRESSED BY MODIFICATIONS OF 4(E) CONDITIONS IN THE EVENT OF ANADROMOUS FISH RE-INTRODUCTION

- Aquatic Biota Objective
- Threatened, Endangered, and Sensitive Species Objective

INFORMATION USED TO ESTABLISH MODIFICATIONS OF 4(E) CONDITIONS IN THE EVENT OF ANADROMOUS FISH RE-INTRODUCTION

Applicable laws and policies

RATIONALE FOR MODIFICATIONS OF 4(E) CONDITIONS IN THE EVENT OF ANADROMOUS FISH RE-INTRODUCTION

Many relicensing participants were interested in providing protection measures for the potential re-introduction of anadromous fish to project-affected reaches. The Resource Agencies agreed to provide a specific reopener to address this interest.

Invasive Aquatic Species Management (Drum-Spaulding and Yuba-Bear Hydroelectric Projects)

OBJECTIVES ADDRESSED BY INVASIVE AQUATIC SPECIES MANAGEMENT

Aquatic invasive species objectives

INFORMATION USED TO ESTABLISH INVASIVE AQUATIC SPECIES MANAGEMENT

- BLM Manual 9015 (USDI Bureau of Land Management)
- FSM 2900—Invasive Species Manual (USDA Forest Service)
- Kirkwood et al. 2007

RATIONALE FOR INVASIVE AQUATIC SPECIES MANAGEMENT

Aquatic invasive species (e.g. quagga mussels, New Zealand mudsnails, and Eurasian watermilfoil) are a threat to water quality; irrigation, diversion and power structures; recreation; integrity of Wild and Scenic Rivers; and functioning aquatic ecosystems. Several high risk waterbodies occur on NFS lands in the project area. FSM 2900 - Invasive Species Manual supports national and regional FS policy to prevent and control the introduction and spread of aquatic and terrestrial invasive species (including noxious weeds) on the NFS lands. For BLM, Manual 9015 directs the BLM to integrate a management approach for managing noxious weeds.

Flow regulation by dams can create a stable flow environment preferable to *Didymosphenia geminata* (Kirkwood et al. 2007). It has a preference in lower discharge velocities and less variation in discharge. Its presence can result in dense algal blooms that block sunlight and disrupt ecological processes, causing a decline in native plant and animal life. The exact pathway is unknown, but it spreads easily through contaminated boats and fishing gear.

Terrestrial Protection Measures (Drum-Spaulding and Yuba-Bear Hydroelectric Projects)

OBJECTIVES ADDRESSED BY TERRESTRIAL PROTECTION MEASURES

- Non-Native Invasive Plant
- Vegetation Management and Fire Prevention
- Threatened, endangered, sensitive, and management indicator species

INFORMATION USED TO ESTABLISH TERRESTRIAL PROTECTION MEASURES

- Bais et al. 2003
- Bossard et al. 2000.
- California Essential Habitat Connectivity Project (Spencer et al. 2010)
- California Noxious and Invasive Weed Action Plan 2005
- DOI Departmental Manual 517
- Effectiveness of above-ground pipeline mitigation for moose (Alcea alces) and other large mammals (Dunne and Quinn 2009).
- Joint Resource Agency photographs of Licensee's crossings
- Restoring habitat permeability to roaded landscapes with isometrically-scaled wildlife crossings
- (Bissonette and Adair 2008).
- Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (USDA Forest Service 2004).
- Sierra Resource Management Plan (BLM)
- Special Status Species Management Policy (BLM 2008)
- Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006)
- Technical Memo 4-1 Special Status Wildlife—California Wildlife Habitat Relationships
- Technical Memo 4-2, Wildlife Movement
- Technical Memo 4-2, Wildlife Movement Metadata Obtained from Licensees
- Technical Memo 4-3 Wildlife—Bats
- Technical Memorandum 5-1 Special Status Plants
- Technical Memo 6-1 Riparian Habitat
- Technical Memo 7-4 California Endangered Species Act and California Fully Protected species—California Wildlife Habitat Relationships.
- Technical Memo 7-5 CESA Listed Wildlife—Bald Eagle
- USFS Region 5 Noxious Weed Management Strategy, 2000
- Wildlife Crossing Structure Handbook (Clevenger and Huijser 2011)
- Wolverine confirmation in California after nearly a century: native or long-distance immigrant? (Moriarty et al., 2009)

RATIONALE FOR TERRESTRIAL MEASURES - COMBINED VEGETATION AND INTEGRATED PEST MANAGEMENT PLAN (YUBA-BEAR HYDROELECTRIC PROJECT)

The Yuba-Bear Hydroelectric Project has divided the Invasive Plant Plan and the Vegetation Management Plan into separate documents. Due to the complexity of the two hydroelectric projects as well as the many areas where the projects overlap, the Resource Agencies believe it is necessary to have similar plans for both projects. The Yuba-Bear Hydroelectric Project plans need to be consolidated into a single plan reflective of the Drum-Spaulding Hydroelectric Project plan.

RATIONALE FOR TERRESTRIAL MEASURES - NON-NATIVE INVASIVE PLANT (NNIP)/INTEGRATED PEST MANAGEMENT PLAN (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

The integrated pest management plan, and its implementation, is necessary to comply with FS and BLM management plans.

Integrated pest management addresses target non-native invasive plant (NNIP) management and rodent control. Integrated pest management is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks (DOI Departmental Manual 517). NNIP management complies with national, regional, and forest land management direction and contributes to improved ecological condition. The purpose of rodent control is to protect the structural integrity of dams, to maintain system reliability, and to protect worker and public health and safety by preventing rodent infestations in structures.

Federal agencies are directed to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause (Executive Order 1311). The BLM has specific direction to reduce and control invasive species using early detection, rapid response, and prevention measures (Sierra RMP). Complete surveys of a management area are vital to the early detection, rapid reponse management strategy. With prompt detection and action, there is a high likelihood of control. Because of the ecological damage caused by established NNIP and the expensive and difficulty of eradication, frequent surveys of the Project are needed.

The surveys that were conducted as part of relicensing show that NNIP occur in the Project area. New problem NNIP arrive on NFS and BLM administered lands every year often, but not always, associated with disturbance. Increasingly, NNIP pose a threat to the integrity of resources due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). NNIP have the potential to affect native plant species through direct competition for nutrients, light, and water (Bossard et al. 2000) as well as indirectly through mycorrhizal interactions, soil biochemical alterations (Bossard et al. 2000), or allelopathy (Bais et al. 2003). NNIP infestations can also greatly reduce the recreational and aesthetic values.

The problems associated with NNIP introduction are expected to continue. In California, current inventories indicate that NNIP are spreading at an increasing rate (Region 5 Noxious Weed Management Strategy 2000). It is expected that California will be subject to even higher rates of NNIP introductions as human population and trade globalization continue to increase (California Noxious and Invasive Weed Action Plan 2005).

The Sierra Nevada Forest Plan Amendment Record of Decision (USDA 2004) requires the FS to control the spread of noxious weeds by incorporating weed prevention and control measures into ongoing management or maintenance activities that involve ground disturbance or the possibility or spreading weeds. The amendment also requires the FS to complete noxious weed inventories based on Regional protocols, evaluate treatment options relative to the risk of weed spread, and monitor noxious weed populations. The amendment also requires the FS to include weed prevention measures when amending or issuing or re-issuing permits. NNIP management will assist in meeting these requirements on NFS lands affected by the Project.

Pesticide use restrictions on NFS and BLM lands require BLM and FS to comply with law and policy. BLM policy requires that prior to application on BLM administered lands a Pesticide Use Permit must be prepared and submitted to BLM for analysis and review. After application on BLM administered land, a Pesticide Application Report must be completed within 24 hours and submitted to the BLM.

Implementation of the vegetation management plan is required to comply with FS and BLM management plans as well as federal law and policy. Policy requires that BLM ensure that BLM activities and BLM authorizations initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species in order to minimize the likelihood of and need for listing of these species (Special Status Species Management Policy BLM 2008). By law, federal agencies must take actions to recover federally protected species. Additionally, the BLM is required to conserve and restore oak woodland, conifer forest, chaparral, and riparian habitat to support long-term viability of native bird species, sensitive species, and the associated natural diversity of these habitats (Sierra RMP).

Licensees located 118 occurrences of 13 different Special-Status Plant Species (Technical Memo 5-1, p. ES-1)—44 within the Yuba-Bear Project, and 74 within the Drum Spaulding Project. Monitoring of populations ensures population health and viability. If special status species are unhealthy, the monitoring data can be used to craft, and measure the success of, adaptive management measures. Periodic surveys of the entire Project area will document new occurences of special status species some of which are have dynamic population cycles and long distance dispersal mechanisms. Surveys prior to O&M activities will ensure that activities do not impact special status species.

Management is implemented to ensure safe and effective operation of Licensee’s facilities by maintaining safe access to Project facilities including recreation facilities, protecting worker and public health and safety, and reducing fire hazards. It is BLM policy to reduce hazardous fuels to prevent catastrophic wildlife (Sierra RMP).

RATIONALE FOR TERRESTRIAL MEASURES - MONITORING ANIMAL LOSSES IN PROJECT CANALS (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Technical Memo 4-2, Wildlife Movement, documents over 75 miles of canals, ditches and flumes for these Projects—approximately 17 for the Yuba-Bear Project, and 60 for the Drum-Spaulding Project. There is no fencing installed anywhere along Project canals that are specifically designed to prevent wildlife from entering canals. Technical Memo 4-2 Wildlife Movement subjectively documented potential escape points along Project canals that include low-angled banks and vehicle ramps constructed for Licensee's access into canals. Although vehicle ramps may provide escape for wildlife, an unspecified number of these ramps angle back from the direction of flow in the canal, and are not likely to function as escape points. The Agencies' review of the metadata for the Technical Memo 4-2 showed that only a few vehicle ramps have "escape" devices installed--metal flashers on cables, designed with the intent of directing deer to swim towards a ramp to escape. A field review of some of these showed that flashers were in need of repair. We know of no scientific studies documenting the effectiveness of these scare devices, nor whether they work for a variety of wildlife species.

Technical Memo 4-2 Wildlife Movement documented 42 wildlife mortalities during 2009 for the five target species addressed in the study—bear, mountain lion, marten, fisher, and deer. There are a total of 77 reports for target and non-target species combined (p. ES-2), which include household pets and domestic livestock. The Resource Agencies are interested in mortality information collected along all Project features for several reasons. Identifying carcasses at points where Project trash racks are located is the best method to document mortality. These points may sample segments of canals that traverse both public and private ownerships, where the animal may have become entrained. Wildlife utilizes habitat irregardless of land ownership patterns, and animals that range off of public lands are a public resource that contributes to the sustainability of wildlife populations on public lands. It is important for the Agencies to understand the cumulative totals of mortality caused by Project canals. The Tech. Memo compares 2009 study data with reports for 2007, but the 2007 reports employed no systematic methodology for gathering and reporting these data. This is an inadequate time period to identify problem areas, identify and prioritize locations for needed improvements, or to draw conclusions regarding the Project effects from canals to wildlife. Long term monitoring of all wildlife mortality is needed that uses standardized methodology for gathering and reporting data. This would provide a better basis for comparison, in order to identify and prioritize needed improvements. During the life of this license, longer term changes in human development and land use surrounding these projects, have the potential to change wildlife patterns of use. Periodically reviewing these data will allow for problem areas to be identified and necessary changes for improvements during the course of the License.

Figure 4. "Escape" ramp on Drum Canal angles back from direction of flow.

Figure 5. View of escape ramp taken upstream near edge of canal, showing escape ramp is not visible on approach.

RATIONALE FOR TERRESTRIAL MEASURES – WILDLIFE CROSSINGS

Technical Memo 4-2, Wildlife Movement, documents over 75 miles of canals, ditches and flumes for these Projects—approximately 17 for the Yuba-Bear Project, and 60 for the Drum-Spaulding Project. There are no crossings specifically designed for wildlife to cross over project features, nor any that are designated to be maintained as wildlife crossings into the future. All crossings identified in Tech. Memo 4-2 are opportunistic on the landscape, consisting of natural features such as drainage bottoms beneath elevated flumes, or crossings developed for other human uses such as road bridges (constructed along infrequently used dead-end dirt roads to paved state highways) and walkways designed for human access. These structures comprise a wide variety of widths (1.5 feet to 50 feet) and designs, as well as surface substrates (i.e. dirt, open and closed metal grates, wood, concrete, pavement). The wide variety of crossings, in combination with the surrounding landscape, human developments, private housing, and the frequency of human use, affect the functioning of these crossings, ranging from not functional to fully functional.

NFS Lands and lands administered by BLM surrounding the Project are not continuous; rather they occur generally in a checkerboard pattern of public and private land. This complicates the ability of public land managers to manage functioning landscapes that can support the daily needs of wide-ranging species, and the migration and dispersal of individuals. Licensee-operated canals bisect an important north-south linkage on the west slope of the Sierra Nevada west of Lake Spaulding, and near the Bear River (Spencer et al. 2010[12], p 57). These canals are spatially situated next to major state and federal highways and private land that has variably been developed, that add to cumulative effects of fragmenting wildlife habitat in this area.

Numerous special status terrestrial species, or their habitat, are known to be present along Project conduits (Technical Memos: 4-1 Special-Status Wildlife—California Wildlife Habitat Relationships, Tables 3.0-4 and 3.0-5; 7-4 CESA and Protected Wildlife, Tables 3.0-4 and 3.0-5). Terrestrial species, for which segments of canals are barriers include: Sierra Nevada red fox, wolverine, American marten, Pacific fisher, mule deer, Sierra Nevada snowshoe hare, Western white-tailed jackrabbit, American badger, and Sierra Nevada mountain beaver. In 2006, a male wolverine was confirmed to be present in the Tahoe National Forest (Moriarty et al. 2009[13]). Camera detections have confirmed the presence of wolverine in 2006 through 2012, with locations within one mile of the following project Reservoirs: Fordyce, Sterling, Jackson Meadows and White Rock Lake. The variety of special-status species identified within and near the Project covers a wide range of sizes, behaviors, physical abilities, habitat needs, migration,

[12] Spencer, W.D., P. Beier, L. Penrod, L. Winters, C. Paulman, H. Rustigian-Romsos, J. Strittholt, M. Parisi, and A. Pettler. 2010. California Essential Habitat Connectivity Project: A strategy for conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration, pp. 55-58.

[13] Moriarty, K.M., W.J. Zielinski, A.G. Gonzales, T.E. Dawson, K.M. Boatner, C.A. Wilson, F.V. Schlexer, K.L. Pilgrim, J.P. Copeland, M.K. Schwartz. Wolverine confirmation in California after nearly a century: native or long-distance immigrant? 2009. Northwest Science 83:154-162.

daily and seasonal movement patterns, home ranges, and life history traits. It is our intent to manage across the diversity of the needs for numerous species in providing for wildlife movement.

Technical Memo 4-2 Wildlife Movement (pp. ES1-2) identifies three conduits in the Yuba-Bear Project, with segments that exceed a 0.5-mi. frequency of passage criteria established for the five species for which this study focused. The Resource Agencies disagree with Licensee's conclusions in Tech memo 4-2 that only the segments identified are barriers to wildlife. A review of the metadata for this study shows that numerous footbridges identified in the study as providing passage for each of the five target wildlife species, consist of metal, open-grated bridges. Field review identified metal grate openings as wide as 1 inch by 4 inches and human crosswalks as narrow as 1.5 feet by 20 feet long. Other crosswalks would require a deer to step up concrete steps, or with fencing or other structures visually appearing to block the end of the bridge. There is no scientific basis to assume that a deer could, or would willingly walk or jump onto an open grated bridge to cross over moving water in a canal. Furthermore, it is questionable whether grate openings of this size are even safe for adult deer, or a fawn, to safely walk across. Consequently, there are numerous structures identified in the study as providing crossing for all species, which are unlikely to function as crossings for all species. Therefore additional segments of conduits not identified in the study remain effective barriers to wildlife. We reviewed the metadata provided in conjunction with the Wildlife Movement study (Table 1 below) and conducted some additional field review (Figures below) to further identify lengths of conduits that are a concern. These specific lengths of conduits are addressed in Measure XXX.

The 0.5-mile distance used in the Wildlife Movement Study for characterizing distances, beyond which project features may serve as barriers to wildlife movement, is supported by Bissonette and Adair (2008)[14], who found that wildlife crossings placed at distances of <1 mi. provides for daily movements of the greatest number of species (71.2% of 72 species found in North America). Their data set was drawn from many communities that include small terrestrial mammals as well as larger ranging carnivores (foxes, wolves, lynx, coyotes, grizzly bears, and mountain lions) and ungulates (deer and others). This study is the scientific basis for the guideline used for this Project of providing crossing opportunities at least as frequently as every 0.75 miles, that consists of either natural landscape features (i.e. flumes elevated over drainages and draws) and human-constructed features (i.e. dirt roads, wooden covered vehicle bridges). In intermingled land ownerships, siting crossings only on NFS land does not result in the best distribution of crossings for wildlife, and does not provide us with an opportunity to meet the 0.75 mile criteria across the Project. However, since we have no jurisdiction over private land, nor control over the kinds of private land development that may occur in the future, where possible, we have identified the placement and numbers of crossings on public land that also considers the potential inability to maintain crossing on private land. Locating additional crossings on land owned by Pacific Gas and Electric, and wherever possible on other privately owned land, can help mitigate the cumulative effects of these Projects to wildlife that ranges across public lands through mixed ownerships.

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[14] Bissonette, J.A. and W. Adair. 2008. Restoring habitat permeability to roaded landscapes with isometrically-scaled wildlife crossings. Biological Conservation 141:482-488.

Clevenger and Huijser (2011) [15] provide general guidance for designing wildlife crossings, which meet multiple species needs. Although their focus is on highways, most Project canals range from 20 to 30 feet wide, approximately half the width of many 2-lane highways. They recommend a minimum width of 130 feet for single-use (no human use) wildlife overpasses (p. 56); while we have selected a minimum width of 12 feet for overpasses in this project. For underpasses, Clevenger and Huijser (2011) recommend a minimum width of 23 feet wide by 13 feet high for underpasses (p. 57). Dunne and Quinn (2009) [16] found that deer prefer to cross over pipelines using overpasses rather than underpasses, and they would rarely jump over a pipeline, even one with a ground to top distance of 3.3 to 3.6 feet. We selected minimum undercrosss dimensions of 10 feet by 10 feet for these Projects.

[15] Clevenger, A.P. and M.P. Huijser. Wildlife crossing structure handbook design and evaluation in North America. Western Transportation Institute, Bozeman, MT; 2011. Contract No. DTFH61-03-P-00398. 211p. Available from: FHWA, Washington, DC; FHWA-CFL/TD-11-003;http://www.cflhd.gov.

[16] Dunne, B.M. and M.S. Quinn. 2009. Effectiveness of above-ground pipeline mitigation for moose (Alces alces) and other large mammals. Biological Conservation 142:332-343.

Additional Information for Wildlife Crossings

Photographs of crossing structures.

Figure 1. Drum Canal Crossing (FSID73/ GPSID YDWMDC037). Technical Memo 4-2 Wildlife Movement metadata notes crossing substrate as "Open Grates," classifying crossing as suitable for deer. Grate openings are 1 in. by 4 in., which is representative of openings observed in field at other crossings.

Figure 2. Drum Canal Crossing (FS73/GPSID YDWMDC037). Technical Memo 4-2 metadata notes "planks placed over grate." Planks are not fastened to structure, and move when stepped on.

Figure 3. Drum Canal Crossing (FS73/GPSID YDWMDC037). Technical Memo 4-2 metadata notes "planks placed over grate." The current 9-inch width of planks does not meet recommended widths (>3-10M) (Clevenger and Huijser 2011, p. 110, 140) for crossings.

Figure 4. Drum Canal Crossing (GPSID No. YDWMDC037/FS73). Technical Memo 4-2 metadata for crossing notes "planks placed over grate." Planks do not span the entire length of bridge.

ble 1. Metadata to Technical Memo 4-2 Wildlife Movement showing FS point reference (FSID); whether passage is over or under conduit; the height and width of the passage; species rated in the study as being able to cross the conduit—American marten (AMMA), Pacific fisher (PAFI), Black bear (BLBE), Mountain lion (MOLI), Mule deer (MUDE); crossing substrate; comments; GPS location reference; FERC Project; and conduit name.

FS ID	Passage	Ht.	Width	Species	Substrate	Comments	GPSID	Project	Conduit
1	Over	0	30	All	Closed Grate	YDWMBC173	YDWMBC173	PGE	Bear River Canal
2	Over	0	30	AMMA, PAFI, BLBE, MOLI	Open Grate	YDWMBC182	YDWMBC182	PGE	Bear River Canal
3	Over	0	30	AMMA, PAFI, BLBE, MOLI	Open Grate	YDWMBC188	YDWMBC188	PGE	Bear River Canal
4	Over	0	25	All	Paved	YDWMBC189	YDWMBC189	PGE	Bear River Canal
5	Over	0	30	AMMA, PAFI, BLBE, MOLI	Open Grate	YDWMBC197	YDWMBC197	PGE	Bear River Canal
6	Over	0	25	All	Wood	YDWMBC199	YDWMBC199	PGE	Bear River Canal
7	Over	0	30	All	Closed Grate	YDWMBC200	YDWMBC200	PGE	Bear River Canal
8	Over	1.5	5	All	Other	YDWMBC204	YDWMBC204	PGE	Bear River Canal
9	Over	0	40	All	Other	YDWMDC003	YDWMDC003	PGE	Drum Canal
10	Over	0	30	AMMA, PAFI, BLBE, MOLI	Open Grate	YDWMDC006	YDWMDC006	PGE	Drum Canal
11	Under	20	10	All	Dirt	YDWMDC009	YDWMDC009	PGE	Drum Canal
12	Over	0	30	All	Wood	YDWMDC013	YDWMDC013	PGE	Drum Canal
13	Over	0	10	All	Dirt	YDWMDC002	YDWMDC002	PGE	Drum Canal
14	Over	0	30	AMMA, PAFI, BLBE, MOLI	Open Grate	YDWMLW002	YDWMLW002	PGE	Lower Wise Canal
15	Over	0	50	All	Paved	YDWMLW005	YDWMLW005	PGE	Lower Wise Canal
16	Over	0	25	All	Paved	YDWMLW010	YDWMLW010	PGE	Lower Wise Canal
17	Over	0	30	All	Wood	YDWMLW013	YDWMLW013	PGE	Lower Wise Canal
18	Over	0	20	All	Paved	YDWMLW014	YDWMLW014	PGE	Lower Wise Canal
19	Over	0	10	All	Dirt	YDWMLW016	YDWMLW016	PGE	Lower Wise Canal
20	Over	0	30	All	Paved	YDWMLW017	YDWMLW017	PGE	Lower Wise Canal
21	Over	0	30	All	Paved	YDWMLW018	YDWMLW018	PGE	Lower Wise Canal
22	Over	0	30	All	Paved	YDWMLW030	YDWMLW030	PGE	Lower Wise Canal
23	Over	0	60	All	Paved	YDWMLW031	YDWMLW031	PGE	Lower Wise Canal
24	Over	0	30	All	Paved	YDWMLW033	YDWMLW033	PGE	Lower Wise Canal
25	Over	0	20	All	Wood	YDWMLW039	YDWMLW039	PGE	Lower Wise Canal
26	Over	2.5	5	All	Other	YDWMLW043	YDWMLW043	PGE	Lower Wise Canal
27	Under	15	10	All	Other	YDWMSC001	YDWMSC001	PGE	South Canal
28	Over	0	20	All	Wood	YDWMSC005	YDWMSC005	PGE	South Canal
29	Over	0	10	All	Wood	YDWMSC008	YDWMSC008	PGE	South Canal
30	Over	0	20	All	Paved	YDWMSC009	YDWMSC009	PGE	South Canal
31	Over	0	10	All	Paved	YDWMSC032	YDWMSC032	PGE	South Canal
32	Over	0	0	All	Paved	YDWMSC033	YDWMSC033	PGE	South Canal
33	Over	0	30	All	Paved	YDWMSC010	YDWMSC010	PGE	South Canal
34	Over	0	15	All	Closed Grate	YDWMSC011	YDWMSC011	PGE	South Canal
35	Over	0	20	All	Paved	YDWMSC013	YDWMSC013	PGE	South Canal
36	Over	0	20	All	Wood	YDWMSC016	YDWMSC016	PGE	South Canal

37	Over	0	20	All	Paved	YDWMSC017	YDWMSC017	PGE	South Canal
38	Over	0	20	All	Wood	YDWMSC020	YDWMSC020	PGE	South Canal
39	Over	0	20	All	Paved	YDWMSC022	YDWMSC022	PGE	South Canal
40	Over	0	20	All	Wood	YDWMSC023	YDWMSC023	PGE	South Canal
41	Over	0	25	All	Wood	YDWMSC025	YDWMSC025	PGE	South Canal
42	Over	0	20	All	Wood	YDWMSC026	YDWMSC026	PGE	South Canal
43	Over	0	20	All	Paved	YDWMSC024	YDWMSC024	PGE	South Canal
44	Under	15	10	All	Paved	YDWMSC029	YDWMSC029	PGE	South Canal
45	Over	0	20	All	Paved	YDWMSC030	YDWMSC030	PGE	South Canal
46	Under	20	6	All	Other	YDWMTC003	YDWMTC003	PGE	Towle Canal
47	Over	0	10	All	Wood	YDWMTC007	YDWMTC007	PGE	Towle Canal
48	Under	0.5	8	AMMA, PAFI	Other	YDWMTC008	YDWMTC008	PGE	Towle Canal
49	Under	20	8	All	Other	YDWMTC011	YDWMTC011	PGE	Towle Canal
50	Through	0	8	MUDE, MOLI, BLBE	Other	YDWMTC015	YDWMTC015	PGE	Towle Canal
51	Over	0	10	All	Wood	YDWMTC019	YDWMTC019	PGE	Towle Canal
52	Over	0	10	All	Dirt	YDWMTC020	YDWMTC020	PGE	Towle Canal
53	Over	0	250	All	Paved		YDWMCP001	NID	Chicago Park Conduit
54	Under	15	20	All	Other		YDWMCP002	NID	Chicago Park Conduit
55	Under	2	20	AMMA, PAFI, BLBE, MOLI	Dirt		YDWMCP003	NID	Chicago Park Conduit
56	Under	5	20	All	Dirt		YDWMCP005	NID	Chicago Park Conduit
57	Under	4	20	All	Dirt		YDWMCP006	NID	Chicago Park Conduit
58	Under	4	20	All	Dirt		YDWMCP007	NID	Chicago Park Conduit
59	Under	20	20	All	Dirt		YDWMCP008	NID	Chicago Park Conduit
60	Under	2	20	AMMA, PAFI, BLBE, MOLI	Dirt		YDWMCP009	NID	Chicago Park Conduit
61	Under	5	20	All	Dirt		YDWMCP010	NID	Chicago Park Conduit
62	Under	6	20	All	Dirt		YDWMCP011	NID	Chicago Park Conduit
63	Under	10	20	All	Dirt		YDWMCP012	NID	Chicago Park Conduit
64	Under	3	20	All	Dirt		YDWMCP013	NID	Chicago Park Conduit
65	Under	4	20	All	Dirt		YDWMCP014	NID	Chicago Park Conduit
66	Over	0	40	All	Dirt		YDWMCP016	NID	Chicago Park Conduit
67	Over	0	0	All	Dirt	OP OF PENSTOCK AT CHICAGO PARK FOREBAY	YDWMCP018	NID	Chicago Park Conduit
68	Under	10	12	All	Dirt		YDWMDC014	PGE	Drum Canal
69	Over	0	15	All	Dirt		YDWMDC017	PGE	Drum Canal
70	Over	0	15	All	Paved	BANDONED ROAD CROSSING	YDWMDC022	PGE	Drum Canal
71	Over	0	20	All	Paved	BANDONED ROAD CROSSING	YDWMDC023	PGE	Drum Canal
72	Over	0	5	All	Open Grate		YDWMDC029	PGE	Drum Canal
73	Over	0	5	All	Open Grate	WOOD PLANKS PLACED OVER GRATE	YDWMDC037	PGE	Drum Canal

74	Over	0	80	All	Paved	HWY 20	YDWMDC039	PGE	Drum Canal
75	Over	0	5	All	Open Grate		YDWMDC041	PGE	Drum Canal
76	Over	0	4	AMMA, PAFI, BLBE, MOLI	Open Grate		YDWMDC044	PGE	Drum Canal
77	Over	0	5	All	Open Grate		YDWMDC047	PGE	Drum Canal
78	Under	3	8	AMMA, PAFI	Dirt		YDWMDF008	NID	
79	Over	0	10	All	Other	Start passage at segment start END PASSAGE SEGMENT	YDWMLV002	PGE	Lake Valley Canal
80	Over	0	8	All	Dirt	ROAD OVER CANAL	YDWMLV005	PGE	Lake Valley Canal
81	Under	3.5	8	All	Dirt		YDWMDF009	NID	
82	Under	1	8	AMMA, PAFI	Dirt		YDWMDF010	NID	
83	Under	2	8	AMMA, PAFI	Dirt		YDWMDF011	NID	
84	Under	2	8	AMMA, PAFI	Dirt		YDWMDF013	NID	
85	Under	2.5	8	All	Dirt		YDWMDF014	NID	
86	Under	10	8	All	Dirt		YDWMDF015	NID	
87	Under	10	8	All	Dirt		YDWMDF016	NID	
88	Under	10	8	All	Dirt		YDWMDF018	NID	
89	Under	15	8	All	Dirt		YDWMDF019	NID	
90	Under	6	8	All	Dirt		YDWMDF020	NID	
91	Under	10	8	All	Dirt		YDWMDFP002	PGE	
92	Under	2.5	8	All	Dirt		YDWMDFP003	PGE	
93	Over	0	10	All	Paved	BOWMAN ROAD	YDWMYC004	PGE	halk Bluff/South Yuba Canal
94	Over	0	10	All	Paved	HWY 20	YDWMYC006	PGE	halk Bluff/South Yuba Canal
95	Over	0	2.5	All	Wood		YDWMYC047	PGE	halk Bluff/South Yuba Canal
96	Over	0	2	All	Wood		YDWMYC054	PGE	halk Bluff/South Yuba Canal
97	Over	0	20	All	Wood	BLBE+MUDE PRINTS	YDWMYC059	PGE	halk Bluff/South Yuba Canal
98	Under	30	0	All	Dirt		YDWMYC061	PGE	halk Bluff/South Yuba Canal
99	Under	30	0	All	Dirt		YDWMYC063	PGE	halk Bluff/South Yuba Canal
100	Under	10	0	All	Dirt		YDWMYC067	PGE	halk Bluff/South Yuba Canal
101	Over	0	0	All	Wood		YDWMYC068	PGE	halk Bluff/South Yuba Canal
102	Over	0	5	All	Wood		YDWMYC068	PGE	halk Bluff/South Yuba Canal
103	Over	0	3	All	Closed Grate		YDWMYC072	PGE	halk Bluff/South Yuba Canal
104	Over	0	15	All	Wood		YDWMYC073	PGE	halk Bluff/South Yuba Canal
105	Under	10	0	All	Dirt		YDWMYC079	PGE	halk Bluff/South Yuba Canal
106	Over	0	3	All	Closed Grate		YDWMYC090	PGE	halk Bluff/South Yuba Canal

107	Under	50	0	All	Dirt		YDWMYC093	PGE	halk Bluff/South Yuba Canal
108	Over	0	6	All	Wood		YDWMYC095	PGE	halk Bluff/South Yuba Canal
109	Over	0	2	All	Closed Grate		YDWMYC096	PGE	halk Bluff/South Yuba Canal
110	Over	0	6	All	Wood		YDWMYC098	PGE	halk Bluff/South Yuba Canal
111	Under	30	0	All	Dirt		YDWMYC102	PGE	halk Bluff/South Yuba Canal
112	Over	0	6	All	Wood		YDWMYC105	PGE	halk Bluff/South Yuba Canal
113	Under	20	0	All	Dirt		YDWMYC107	PGE	halk Bluff/South Yuba Canal
114	Over	0	3	All	Wood		YDWMYC112	PGE	halk Bluff/South Yuba Canal
115	Under	30	0	All	Dirt		YDWMYC113	PGE	halk Bluff/South Yuba Canal
116	Over	0	8	All	Closed Grate		YDWMYC115	PGE	halk Bluff/South Yuba Canal
117	Over	0	6	All	Wood		YDWMYC118	PGE	halk Bluff/South Yuba Canal
118	Under	20	0	All	Dirt		YDWMYC119	PGE	halk Bluff/South Yuba Canal
119	Over	0	6	All	Wood		YDWMYC121	PGE	halk Bluff/South Yuba Canal
120	Under	20	0	All	Dirt		YDWMYC124	PGE	halk Bluff/South Yuba Canal
121	Over	0	6	All	Wood		YDWMYC128	PGE	halk Bluff/South Yuba Canal
122	Under	20	0	All	Dirt		YDWMYC129	PGE	halk Bluff/South Yuba Canal
123	Under	50	0	All	Dirt		YDWMYC135	PGE	halk Bluff/South Yuba Canal
124	Under	15	0	All	Dirt		YDWMYC139	PGE	halk Bluff/South Yuba Canal
125	Over	0	6	All	Wood		YDWMYC141	PGE	halk Bluff/South Yuba Canal
126	Over	0	6	All	Wood		YDWMYC144	PGE	halk Bluff/South Yuba Canal
127	Over	0	2	All	Wood		YDWMYC145	PGE	halk Bluff/South Yuba Canal
128	Over	0	3	All	Closed Grate		YDWMYC146	PGE	halk Bluff/South Yuba Canal
129	Over	0	1.5	All	Wood		YDWMYC009	PGE	halk Bluff/South Yuba Canal
130	Over	0	3	All	Closed Grate		YDWMYC019	PGE	halk Bluff/South Yuba Canal
131	Over	0	3	All	Open Grate		YDWMYC020	PGE	halk Bluff/South Yuba Canal
132	Under	5	10	All	Dirt		YDWMYC030	PGE	halk Bluff/South Yuba Canal
133	Under	5	10	All	Dirt		YDWMYC033	PGE	halk Bluff/South Yuba Canal
134	Under	6	10	All	Dirt		YDWMYC035	PGE	halk Bluff/South Yuba Canal
135	Over	0	4	All	Closed Grate		YDWMYC040	PGE	halk Bluff/South Yuba Canal
136	Under	15	10	All	Dirt		YDWMYC041	PGE	halk Bluff/South Yuba Canal

137	Over	0	4	All	Wood		YDWMYC044	PGE	halk Bluff/South Yuba Canal
138	Over	0	4	All	Wood		YDWMYC045	PGE	halk Bluff/South Yuba Canal
139	Over	0	3	All	Wood		YDWMBS004	NID	
140	Over	0	25	All	Wood		YDWMBS009	NID	
141	Over	0	25	All	Wood		YDWMBS010	NID	
142	Over	0	20	All	Wood		YDWMBS014	NID	
143	Over	0	30	All	Wood		YDWMBS023	NID	
144	Over	0	3	AMMA, PAFI, BLBE, MOLI	Open Grate		YDWMBS037	NID	
145	Under	50	0	All	Dirt		YDWMBS043	NID	
146	Over	0	25	All	Paved		YDWMBS049	NID	
147	Over	0	15	AMMA, PAFI, BLBE, MOLI	Open Grate		YDWMBS056	NID	
148	Under			All		Siphon	YDWMDF003	NID	
149	ootbridge			All	closed grate		YDWMTC018	PGE	Towle Canal
150	Bridge			All	Wood		YDWMTC014	PGE	Towle Canal
151	Under			All			YDWMMBT006	NID	
152	Over			All			YDWMMBT007	NID	
153	Under			All			YDWMMBT008	NID	
154	Over			All			YDWMMBT011	NID	
155	Over			All			YDWMMBT002	NID	
156	ootbridge			All			YDWMBS071	NID	
157	Road			All			YDWMBS073	NID	
158	nder Siphon			All			YDWMBS076	NID	
159	Over			All			YDWMBS078	NID	
160	Under			All			YDWMBS081	NID	
161	Under			All			YDWMBS082	NID	
162	Under			All			YDWMBS083	NID	
163	Under			All			YDWMBS084	NID	
164	Under			All			YDWMBS085	NID	
165	Under			All			YDWMBS086	NID	
166	Over			All		Added per NSR comments	NA	PGE	Lake Valley Canal
167	Under	15	0	All	Dirt		YDWMYC026	PGE	halk Bluff/South Yuba Canal
168	Under			All				PGE	Towle Canal
169	ootbridge			All			YDWMBC002	PGE	Bear River Canal
170	ootbridge			All			YDWMBC003	PGE	Bear River Canal
171	Under			All				PGE	Bear River Canal
172	Over			All			YDWMBC013	PGE	Bear River Canal
173	Over			All			YDWMBC017	PGE	Bear River Canal
174	Over			AMMA, PAFI, BLBE, MOLI			YDWMBC028	PGE	Bear River Canal

175				MUDE, MOLI			YDWMBC029	PGE	Bear River Canal
176	Over			All			YDWMBC034	PGE	Bear River Canal
177				AMMA, PAFI, BLBE, MOLI				PGE	Bear River Canal
178				All			YDWMBC042	PGE	Bear River Canal
179				All				PGE	Bear River Canal
180				All			YDWMBC047	PGE	Bear River Canal
181	Under			All				PGE	Bear River Canal
182				All			YDWMBC053	PGE	Bear River Canal
183				All			YDWMBC057	PGE	Bear River Canal
184				AMMA, PAFI, BLBE, MOLI			YDWMBC071	PGE	Bear River Canal
185				All			YDWMBC078	PGE	Bear River Canal
186				AMMA, PAFI, BLBE, MOLI			YDWMBC091	PGE	Bear River Canal
187	Under			All				PGE	Bear River Canal
188	Over			All			YDWMBC103	PGE	Bear River Canal
189				All			YDWMBC105	PGE	Bear River Canal
190	Under			All				PGE	Bear River Canal
191	Over			All			YDWMBC116	PGE	Bear River Canal
192	Over			All			YDWMBC127	PGE	Bear River Canal
193	Over			All			YDWMBC136	PGE	Bear River Canal
194	Over			AMMA, PAFI, BLBE, MOLI			YDWMBC141	PGE	Bear River Canal
195				All			YDWMBC151	PGE	Bear River Canal
196				All			YDWMBC167	PGE	Bear River Canal
197				All			YDWMUW004	PGE	Upper Wise Canal
198	Over			All			YDWMUW005	PGE	Upper Wise Canal
199	Over			All			YDWMUW009	PGE	Upper Wise Canal
200				All			YDWMUW011	PGE	Upper Wise Canal
201				All			YDWMUW024	PGE	Upper Wise Canal
202				MUDE, MOLI, BLBE			YDWMUW026	PGE	Upper Wise Canal
203				All			YDWMUW027	Not	
204	Under			All			YDWMUW029	Not	
205				MUDE, MOLI, BLBE			YDWMUW030	Not	
206				AMMA, PAFI, BLBE, MOLI			YDWMUW031	Not	
207				All				PGE	South Canal
208				All				PGE	South Canal
209				All		Garmin		PGE	South Canal
210				All				PGE	halk Bluff/South Yuba Canal
211	Under	10	0	All	Dirt	.	YDWMYC083	PGE	halk Bluff/South Yuba Canal

212	Under	10	0	All	Dirt		YDWMYC084	PGE	halk Bluff/South Yuba Canal

Figure 5. South Yuba Canal (Metadata FSID210; no GPSID). Crossing classified in Technical Memo 4-2 as providing crossing for all species. Crossing is <3 feet wide; fencing on south side visually obstructs opening.

Figure 6. Bowman-Spaulding Canal (GPSID YDWMBS023, FSID143) Existing road crossing is likely to function for a wide array of wildlife movement across canal, but future upgrades or road barriers could change its present function.

Wildlife Crossings—Yuba Bear Project: Bowman-Spaulding Canal

In addition to the species listed in the general rationale above, the Bowman-Spaulding Canal is located within critical deer summer range for the Nevada City Deer Herd (Technical Memo 4-2, P.21).

A segment of the Bowman-Spaulding Canal from the end of the Bowman tunnel to the Clear Creek tunnel is approximately 3 miles long with only 1 crossing on NFS land (Figure 6). A second crossing located on NFS land (FSID 145) has a flume entering from the east that is not mapped in Tech. Memo 4-2, raising a question regarding the functioning of this crossing, if animals crossing the Bowman-Spaulding Canal are subsequently blocked by this unmapped flume. There is a need to identify crossings that are structures that wildlife may use opportunistically on the landscape as "wildlife crossings", so that they can be maintained into the future as such. Should a crossing not meet the minimum specifications for a wildlife crossing, the Resource Agencies may still agree to sufficient retrofitting of the existing structure, but the specific retrofitting and maintenance could be developed site-specifically along with any necessary monitoring.

A second segment from the Clear Creek Tunnel to Fuller Lake is 4 miles long, with no crossings identified on NFS land in the SW ¼ of Section 6, T 17N, R12E. Because we have no jurisdiction over private land, we are requesting a crossing be located on NFS land. However, upon agreement by the Resource Agencies, should Licensee sufficiently retrofit the existing crossing located nearby within Section 7 on private land just to the south, and identify it to be maintained as a "wildlife crossing" for the future, installation of a new structure on NFS land may not be necessary, provided the structure remains functional through the life of the License.

Wildlife Crossings - Drum, South Yuba, and Towle Conduits (Drum-Spaulding Hydroelectric Project)

Technical Memo 4-2 Wildlife Movement (pp. ES1-2) identifies six of eight conduits in the Drum-Spaulding Project with segments that exceed a 0.5-mi. frequency of passage criteria established in this study. The South Yuba and Towle Canals combined contain 3 segments where specific "wildlife crossings" should occur on NFS land to meet specified standards, as identified in the conditions. Additionally, because no crossings are identified specifically as a "wildlife crossing," there is a need to map specific crossings as wildlife crossings for this Project, insure that they that meet certain specifications so they can function for wildlife, and that they are maintained for wildlife use into the future.

Pacific Gas and Electric Company is the primary property owner of private lands for a twelve-mile length of private land that bisects the Tahoe National Forest west of Lake Spaulding, interrupting north to south connectivity of the National Forest. Maintaining connectivity is especially important for wide-ranging animals such as the Pacific fisher, American marten, wolverine, and mule deer. Populations of fishers that have persisted in southern California are presently isolated from populations in northern California. The Drum Canal is entirely contained within PG&E-owned land, and it lies within one mile of NFS lands and lands administered by BLM. Only through the cooperation of private property owners, can connectivity be restored and maintained across this area. Although the Technical Memo 4-2 identifies 15 crossing points along the entire 10 mile length, the metadata shows that only 6 are likely to provide movement for all species in the study, and these crossing points are not evenly distributed along its length. Remaining crossings identified in the study as crossing for all species include open grated structures with questionable functionality. Another is State Hwy 20 (Metadata Table FSID24), a busy, paved, 2-lane highway connecting with Interstate 80 three miles to the north. These crossings are insufficient in providing wildlife movement across the Drum Canal. Drum Canal, in combination with other canals and major highways, add cumulative effects to fragmenting wildlife habitat that affects continuity of the west-slope Sierra Nevada. Licensee should prepare a plan for placing wildlife crossings along the segments identified in the Measure, to allow wildlife to cross the Drum Canal.

Wildlife Crossings - Bear and South Canals (Drum-Spaulding Hydroelectric Project)

Under the current license, there is a long history of correspondences with FERC and Licensee regarding concern over the effects to the local deer herd from the Bear River Canal and deer mortality. Technical Memo 4-2 Wildlife Movement identified relatively high wildlife mortality in the Bear River and South Canals during the year of the study. Subsequent meetings with Licensee identified reports of similar mortality prior to, and following, study completion. In 2011, Licensee filed a Bear River and South Canals Deer Assessment Plan, which is currently in progress. Pending the results from this study, the Resource Agencies and Licensee plan to work together to address issues surrounding wildlife mortality and movement across these canals.

RATIONALE FOR TERRESTRIAL MEASURES – CONSULT WHEN REPLACING WILDLIFE ESCAPE AND WILDLIFE CROSSING FACILITIES (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

The body of scientific knowledge regarding wildlife use of crossings and escape structures will change during the course of the license. Changes in road use, road improvements or decommissioning, and private land development will occur over the term of the new FERC license. Consultation with the Resource Agencies will provide us the opportunity to review additional information, and to collaborate with Licensee regarding the potential design, or to use opportunities for re-locating more effective structures into the future.

RATIONALE FOR TERRESTRIAL MEASURES - BEAR RIVER MANAGEMENT THROUGH BEAR VALLEY (DRUM-SPAULDING HYDROELECTRIC PROJECT

Bear River Reach #2 was rated as "Functional, At Risk" in Technical Memo 6-1 Riparian Habitat (Pg. ES-1). This Study also documented this Reach as having an incised channel with some localized bank failures; a headcut migration from the main channel; an incised main channel with vertical banks that are susceptible to failure; and additional small, localized failures.

Although the Study compared historical photos from 1977 through 2005 that showed that riparian vegetation has increased in some areas, this Study was a qualitative assessment of riparian condition, and no quantitative data that included monumenting transects was completed that could be used as baseline information or to compare additional quantitative transect data against in the future.

This reach is used to convey Project spills during winter storms, and to convey water into the Bear River watershed during the winter and spring of wetter water years. Technical Memo 6-2 also documents that under unimpaired conditions, there would generally be little flow through this reach, and states that "Observed regulated flows and synthesized unimpaired flows indicate that Project releases through this reach have exceeded estimated unimpaired values" (pg. 39). It goes on to say that "between 1993 and 1997 peak flows were higher, more frequent, and sustained longer than unimpaired conditions, with six high flow events that ranged from just over 300 cfs to nearly 580 cfs."

There is a need to restore flows within the Bear River that more closely meet unimpaired conditions, so that the hydrologic function better sustains functioning ecological conditions along the reach and within Bear Valley Meadow. To achieve this, Licensee needs to determine how to better release flows in a manner that addresses resource concerns and develop a restoration plan that includes mapping, identification of specific problem areas, and includes corrective actions to restore the ecological function of the River and its adjacent meadow habitats. This needs to include a sufficient assessment of channel morphology and riparian vegetation with quantitative assessments that can be used for baseline information, as well as comparing trend over time. While this is being completed, interim flows are identified that move them towards their unimpaired condition.

RATIONALE FOR TERRESTRIAL MEASURES - SPECIAL-STATUS SPECIES (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Any development of new project features (i.e. new campgrounds, buildings, facility development) that may occur during the term of the new license has not necessarily been analyzed for its potential effects to special-status species. For example, new campground developments that are proposed under this License, especially those proposed in areas where facilities are not currently present, would not be analyzed for their potential effects to Federally Threatened, Endangered, or Proposed species, Critical Habitat, or to FS and BLM Sensitive Species. This measure insures that all new developments proposed throughout the period of the license would be reviewed for their compliance with the applicable laws, policy, and regulation at that time, and that any necessary surveys, analysis, and reports would be completed at that time.

RATIONALE FOR TERRESTRIAL MEASURES - ANNUAL REVIEW OF SPECIAL-STATUS SPECIES LISTS AND ASSESSMENT OF NEW SPECIES ON FEDERAL LAND (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Because the status of species changes on a recurrent basis, this Condition allows the Resource Agencies to annually evaluate the potential project effects to new species in context with their most recent state, federal, and agency designation, and that there is an opportunity to conduct any additional studies that may be needed to inform the FS and BLM regarding Project effects, that appropriate consultation is conducted with the U. S. Fish and Wildlife Service for newly-listed species, and that any additional requirements are incorporated into other Measures, as needed. This will insure that the Project complies with the current laws, policy, and regulation throughout the terms of the license.

RATIONALE FOR TERRESTRIAL MEASURES - PROJECT POWERLINES (DRUM-SPAULDING HYDROELECTRIC PROJECT)

There is no information regarding the risk that the current design of project powerlines may present in causing raptor electrocutions, and no assessments have been made. This measure would insure that as powerlines are replaced, Licensee utilizes Suggested Practices for Avian Protection on Power Lines: *The State of the Art in 2006* (APLIC 2006) to guide the structure and design of new powerlines to reduce the potential for adverse effects to raptors.

RATIONALE FOR TERRESTRIAL MEASURES - RAPTOR COLLISIONS (DRUM-SPAULDING HYDROELECTRIC PROJECT)

There is no information regarding whether Project powerlines have resulted in avian collisions or electrocutions. There is a need to compile and annually report this information during the term of the new license. This would provide the Resource Agencies with an opportunity to periodically review the information to determine if additional actions are needed to reduce Project-related impacts.

RATIONALE FOR TERRESTRIAL MEASURES - BOWMAN-SPAULDING TRANSMISSION LINE AVIAN PROTECTION (YUBA-BEAR HYDROELECTRIC PROJECT)

There is no information regarding whether Project powerlines have resulted in avian collisions or electrocutions. There is a need to compile and annually report this information during the term of the new license. This would provide the Resource Agencies with an opportunity to periodically review the information to determine if additional actions are needed to reduce Project-related impacts.

There is also no information regarding the risk that the current design of project powerlines may present in causing raptor electrocutions, and no assessments have been made. This measure would insure that as powerlines are replaced, Licensee utilizes Suggested Practices for Avian Protection on Power Lines: *The State of the Art in 2006* (APLIC 2006) to guide the structure and design of new powerlines to reduce the potential for adverse effects to raptors.

RATIONALE FOR TERRESTRIAL MEASURES - BALD EAGLE MANAGEMENT PLAN (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Technical Memo 7-5 (CESA Listed Wildlife - Bald Eagle) documented numerous historic bald eagle sightings occurring at most Project Reservoirs. During 2009, the year of the study, sightings at five Yuba-Bear Project Reservoirs with one nest at Rollins; and at seven Drum-Spaulding Project Reservoirs, with one nest at Lake Spaulding. Technical Memo 7-5 also documented the occurrence of immature bald eagles, and historic nesting at Reservoirs where nests were not found during 2009. Because the location of active bald eagle territories, nests, and winter night roosts will change over the course of the license, the Bald Eagle Management Plan addresses periodic monitoring to understand bald eagle use of the Project throughout the license period.

Technical Memo 7-4 (California Endangered Species Act and California Fully Protected Species—California Wildlife Habitat Relationships) Table 3.0-4 lists numerous project locations where routine maintenance, including vegetation management, hazard tree removal, and recreation activities have the potential to disturb bald eagles. Bald eagles continue to be protected under the Migratory Bird Treaty Act of 1918 and the Bald and Golden Eagle Protection Act, which prohibit take without a permit. The regulatory definition of "disturb" (USDI Fish and Wildlife Service 2007a; 72 FR 31132), including the final rule (located at 50 CFR 22.3) states: "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior". In addition to immediate impacts, the USFWS specified that this definition also covers impacts that result from human-caused alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment (USDI Fish and Wildlife Service 2007a; 72 FR 31132). The Bald Eagle Management Plan addresses actions to reduce the potential for adverse effects from Project-related activities, and helps to insure that activities are in compliance with applicable laws.

RATIONALE FOR TERRESTRIAL MEASURES - BAT MANAGEMENT (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Technical Memo 4-3 identified nine special-status bat species in the vicinity of Drum-Spaulding and Yuba-Bear Hydroelectric Project facilities as follows: Western red bat (FS Sensitive Species), Yuma myotis (BLM Sensitive), long-eared myotis (BLM Sensitive), fringed myotis (BLM Sensitive), western small-footed myotis (BLM Sensitive), spotted bat (BLM Sensitive, California Species of Special Concern), Townsend's big-eared bat (BLM and FS Sensitive, California Species of Special Concern), pallid bat (BLM and FS Sensitive, California Species of Special Concern), and western mastiff bat (BLM Sensitive and California Species of Special Concern). Technical Memo 4-3 (pg. 33) reports six Yuba-Bear Project structures—Dutch Flat Afterbay Dam low-level outlet tunnel, penstock tunnel at the base of Rollins Reservoir, having signs of bat use, with bats actively present at three of those. The employee house at the base of Bowman Dam had an estimated 250 individuals in the attic, and the breeding condition of captured bats in the area indicates this is likely a maternity roost. Eight Drum-Spaulding Project structures had signs of bat use (Tech. Memo 4-3, pg. 34). This measure would reduce adverse impacts to bats by insuring that Licensee document and report all roosts and utilize humane exclusion techniques that minimize impacts to bats during reproductive times or during the winter hibernation season.

RATIONALE FOR TERRESTRIAL MEASURES - CONSULTING WHEN REPLACING CANAL WILDLIFE ESCAPE AND CROSSING FACILITIES (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

The body of scientific knowledge regarding wildlife use of crossings and escape structures will change during the course of the license. Changes in road use, road improvements or decommissionings, and private land development will occur over the next 40 years. Consultation with the Resource Agencies will provide us the opportunity to review additional information, and to collaborate with Licensee regarding the potential design, or to use opportunities for re-locating more effective structures into the future.

RATIONALE FOR TERRESTRIAL MEASURES – CLEAR AND TRAP CREEKS STABILIZATION PLANS (YUBA-BEAR HYDROELECTRIC PROJECT)

The Clear Creek Diversion Reach is approximately 0.9 mi long and extends from Clear Creek's confluence with Fall Creek (RM 0.0) to the Bowman-Spaulding Conduit and the Clear Creek Diversion (RM 0.9). The reach has an average elevation of 5,280 feet and a channel gradient of 3.7 percent. Channel substrate within the reach was comprised of gravel (5 percent), cobble (80 percent), and boulders (15 percent). The reach averaged 10-foot in width and 1-foot in depth and was characterized by an even distribution of riffle and glide habitats. Canopy covered 90 percent of the channel. In-stream cover was provided by surface turbulence (10 percent), in-stream objects (i.e., boulders or LWD) (50 percent), undercut banks (10 percent), and overhanging vegetation (70 percent). Instantaneouswater temperature was 15ºC. The Trap Creek Diversion Reach is approximately 1.2 mi long and extends from Trap Creek's confluence with Fall Creek (RM 0.0) to the Bowman-Spaulding Conduit (RM 1.2). The reach has an average elevation of 4,480 feet and a channel gradient of 27.6 percent.

Licensee's Final License Application (NID, FLA, Appendix E4, April 2011) identifies existing resource damage and provided initial study results and a stabilization plan for Clear and Trap Creeks below the Bowman-Spaulding Canal. The identified resource damage includes stream channel instability, stream bank failure, and erosion downstream of the canal as a result of high flow releases from the canal. In Trap Creek the identified instability extends over 3000 ft. downstream from the canal, corresponding to the upper 66 percent of the studied stream reach. For Clear Creek about 25 percent of the studied stream reach was identified as unstable.

For aquatic species in Clear Creek, the reach was sampled below the conduit and 21 rainbow trout and 11 brown trout were collected at 2.8 fish/minute. The rainbow trout population did not exhibit a typical age class distribution, in part due to the low number of fish caught. This indicates that, although there is at least some spawning in some years, there may not be good quality habitat available for all life history stages during times that each stage would require it. This does not indicate a viable population in terms of abundance or productivity. Therefore the FS does not consider the fish in these reach to be in good condition. Licensees attempted to sample potential fish habitat spots along this section of Trap Creek in September 2008, but were unable to because the entire reach was dry.

The Record of Decision for the FS Pacific Southwest Region includes Standard and Guideline No. 106 (USDA FS 2004, p. 64), which states: "Cooperate with Federal, Tribal, State and local governments to secure in stream flows needed to maintain, recover, and restore riparian resources, channel conditions, and aquatic habitat. Maintain in stream flows to protect aquatic systems to which species are uniquely adapted. Minimize the effects of stream diversions or other flow modifications from hydroelectric projects on threatened, endangered, and sensitive species." Standard and Guideline No. 102 (USDA FS 2004, P. 63) states: "Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs."

There is no existing minimum instream flow requirement in either reaches under the current FERC license. Historical project operations (Bowman-Spaulding Conduit Spills) have caused mass wasting and resource damage on both Clear and Trap Creeks. Based on the lack of fish collected during the Level I fish population surveys in both Creeks, and since dewatering of historic habitat does not keep fish in good condition, the FS does not consider either: 1) individual fish, 2) the fish populations, or 3) the fish community in these reach's to be in good condition.

Maintaining and restoring healthy riparian habitats is important in sustaining healthy avian and small rodent prey that support FS Sensitive raptors along these creeks. Field review of these drainages show a need to restore and stabilize streambanks, in order to allow for the recovery of riparian vegetation. Terrestrial FS Sensitive Species are also present within the immediate vicinity of Clear and Trap Creeks. Specifically, there are documented nest territories for the California spotted owl and northern goshawk adjacent to each of these creeks identified as follows: (1) California spotted owl (Territory No. NV009), and (2) northern goshawk territories ("Trap"). These are noted in Technical Memo 4-1 Special Status Wildlife—California Wildlife Habitat Relationships, Table 3.0-4, [Clear Creek, p. 21; Trap Creek, p. 22]). The 300-acre Protected Activity Center is centered along Trap Creek, and historically was centered along Clear Creek. The associated 1000-acre Home Range Core Area for the California spotted owl is centered along both Clear and Trap Creeks, on National Forest System lands. The 200-acre Northern Goshawk Protected Activity Center is centered along the Trap Creek drainage on National Forest System lands.

MONITORING PROGRAM (DRUM-SPAULDING HYDROELECTRIC PROJECT AND YUBA-BEAR HYDROELECTRIC PROJECT)

Objectives Addressed by Monitoring Program

- Aquatic Biota
- Fisheries
- Macroinvertebrates
- Reservoir Levels
- Natural Hydrograph
- Flow Fluctuations
- Geomorphology
- Riparian Habitat
- Threatened, Endangered, and Sensitive Species and Management Indicator Species
- Recreation Streamflow
- Resource Protection
- Hydropower Operations
- Connectivity
- Water Quality
- Water Temperature
- Sediment Management
- Large Woody Debris

- Recreation Management

Information Used to Establish Monitoring Program

- Recent environmental agreements (from other projects) containing adaptive management elements
- All information items listed in other sections of this Rationale Report for the conditions related to streamflows
- Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (USDA 2004)
- Water Quality Control Plan (Basin Plan) (CVRWQCB 1998)
- Didymosphenia in Western Streams (US EPA 2005)
- Dartmouth Toxic Metals Research Program (Center of Environmental Health Sciences 2005)
- Water Quality Standards; Numeric Criteria for Priority Toxic Pollutants for the State of California (USEPA 2000)
- Tahoe National Forest Land and Resource Management Plan (USDA 1990)
- Literature on the Natural Flow Regime (Poff et al. 1997) and Ecology and Management of the Spring Snowmelt Recession (Yarnell et al. 2010).
- Technical information for target species from recent research papers (Kupferberg et al. 2009, 2012, Power et al. 1996, Rehn 2009). Technical information on monitoring designs (Thompson et al. 1998, Urquhart et al. 1998)

Rationale for Monitoring Program

The Monitoring Program is designed to determine if the measures implemented provide the desired resource protection. It is limited to items considered to be essential for determining if the resource objectives are being met. The Monitoring Plan covers monitoring to be conducted during the term of the license. The methods and frequency of monitoring are designed to measure the response of resources to adjustments in streamflow and other conditions over the period of the license.

The large project area, with multiple stream reaches of varying width, length, and degrees of change in streamflow under new license conditions, requires a variety monitoring approaches. Large stream reaches downstream of the major reservoirs or diversions are the primary focus of the monitoring program. Aquatic species (e.g., fish and frog populations) and habitat monitoring (e.g., streamflow, water temperature, and channel morphology) occur in these reaches. This will make it possible to relate trends in focal species distribution and abundance to changes in project-induced habitat conditions. Monitoring in smaller, upper elevation stream reaches is less intensive because streamflow conditions will generally not change as much under the new license conditions. The monitoring program is proposed to include a combination of annual monitoring at a small subset of sites and periodic monitoring at a broader set of sites. This approach will provide data on trends in species distributions and abundances for the entire project area while also documenting and accounting for inter-annual variability in populations (Urquhart et al. 1998). Moyle et al. (1998) and Platts and Nelson (1988) studied stream trout populations and found that they are variable in their biomass and numbers from year-to-year and within a year. Because of these fluctuations, it is important to have multiple years of monitoring data to improve confidence with the results.

When dams are first built, there are first-order impacts, for example, reductions in peak flow, entrapment of sediment load, reduction in suspended sediment load, induced erosion immediately below the dam, and channel changes. These induce second-order impacts, such as changes in channels and invertebrate populations, taking place over a longer period after construction--perhaps as long as 50 years (Petts 1980). The information collected through this monitoring program will assist in gaining a better understanding of the changes to the ecosystem that are a result of the longer term impacts caused by dams and their effects on important ecological processes.

Monitoring shall be conducted to determine if the applicable ecological resource objectives are achievable and being met. Future management decisions shall be based on monitoring results and other scientific information and a determination that the applicable ecological resource objectives will likely not be met.

LARGE WOODY DEBRIS (DRUM-SPAULDING HYDROELECTRIC PROJECT AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Objectives Addressed by Large Woody Debris

- Large Woody Debris
- Aquatic Biota
- Macroinvertebrates
- Water Quality
- Geomorphology
- Riparian Habitat
- Fisheries Production
- Natural Hydrograph
- Hydropower Operations
- Flow Fluctuations
- Recreational Streamflow
- Threatened, Endangered, and Sensitive Species and Management Indicator Species

Information Used to Establish Large Woody Debris

- Diversity of juvenile anadromous salmonid assemblages in coastal Oregon basins with different levels of timber harvest (Reeves et al. 1993)
- Technical Memorandum 1-1: Channel Morphology, Attachment 1-1I (Large Woody Debris by Size and Diameter Class)
- Technical Memorandum 3-2, Instream Flow Attachment 3-2A Habitat Mapping and Channel Characterization Repor
- Technical Memorandum 3-1, Stream Fish Populations

Rationale for Large Woody Debris

Large trees and snags that fall into streams play an important role in forming pools, metering sediment, trapping spawning gravels, and creating a more complex stream environment. Heavier pieces require higher flows for mobilization, and longer pieces are more likely to be caught by the stream bank and its vegetation. Reeves et al. (1993) found "that wood is a primary element influencing habitat diversity and complexity in streams. Consequences of decreased amounts of wood include loss of cover (for aquatic species) and structural complexity, decreased availability and abundance of habitat units, and reduced varieties of current velocities and other hydraulic features."

ANNUAL REVIEW OF ECOLOGICAL CONDITIONS (DRUM-SPAULDING HYDROELECTRIC PROJECT AND YUBA-BEAR HYDROELECTRIC PROJECT)

Objectives Addressed by Annual Review of Ecological Conditions

- Aquatic Biota
- Large Woody Debris
- Natural Hydrograph
- Fluvial Geomorphology
- Riparian Habitat
- Connectivity
- Water Quality
- Water Temperature
- Threatened, Endangered, and Sensitive Species and Management Indicator Species

Information Used to Establish Annual Review of Ecological Conditions

See information in other ecological sections.

Rationale for Annual Review of Ecological Conditions

It is the desire of the Resource Agencies, along with other interested parties, to continue a level of coordination and adjustment for the Project. By having specific coordination meetings, results of surveys and other information will be reviewed. Data from ongoing monitoring will assist in making any needed changes in management of the area and in future planning. Also, because Licensees must provide an operations and maintenance plan for the upcoming year at least 2 weeks prior to the meeting, any necessary surveys or analyses for sensitive wildlife and plant and/or management indicator species can be completed.

PENSTOCK AND OTHER DRAINAGE STRUCTURE EMERGENCY AND MAINTENANCE RELEASE POINTS (DRUM-SPAULDING

HYDROELECTRIC PROJECT AND YUBA-BEAR HYDROELECTRIC PROJECT)

Objectives Addressed by Penstock and Other Drainage Structure Emergency and Maintenance Release Points

- Macroinvertebrates
- Flow Fluctuations
- Geomorphology
- Riparian Habitat
- Threatened, Endangered, and Sensitive Species and Management Indicator Species
- Hydropower Operations
- Water Quality

Information Used to Establish Penstock and Other Drainage Structure Emergency and Maintenance Release Points

Rationale for Penstock and Other Drainage Structure Emergency and Maintenance Release Points

Several canals and other Project features are located on hillslopes, sensitive drainages, or other unstable areas that may experience undesirable results in drainages and hillslopes below should there be a failure or release from the canals or other features. It is anticipated that developing a plan that designates preferred canal drainage structures and release points to be used for drainage during maintenance will minimize adverse impacts to water quality and aquatic biota.

RATIONALE FOR PRELIMINARY CONDITIONS AND RECOMMENDATIONS – RECREATION AND AESTHETIC RESOURCES

Existing Conditions

- The Drum-Spaulding and Yuba-Bear (DSYB) Projects are conveniently located to several urban centers and consequently attracts a large number of recreationists to the area. Interstate 80 runs through the Project area, providing easy access (1-3 hours) for local (Grass Valley, Nevada City, Auburn) and major regional population centers (Sacramento, Reno, San Francisco). The majority of users visit on weekends, consistent with national recreation trends (FERC 1996, page 4).
- Visitors are drawn to the multiple scenic high sierra mountain lakes created by the DSYB Projects (Projects). These users bring with them a large demand for various water and land based recreational opportunities associated with the lakes and streams within the Projects.

- Inadequate management of project-induced recreation leads to impacts to the natural resources on the National Forest. These impacts include: degradation of habitats for Threatened and Endangered species, Forest Service sensitive species, and other species of concern; impact to cultural resources; soil compaction; erosion; degradation of water quality; vegetation trampling and impacts to riparian areas.
- Additional management actions are needed to mitigate the recreation impacts in the Bowman area while keeping this area rustic. Uncontrolled recreation in this area is resulting in a variety of resource impacts and social conflicts. Due to the prevalence of high clearance and sport utility vehicles which have no problem accessing the Bowman area, previous strategies to limit use have not been effective.
- Unmanaged project induced recreation increases the risk of wildfires and wildfires' associated resource impacts.
- Inadequate toilet facilities in concentrated-use areas create a health risk to recreationists being exposed to human waste.
- At some lakes there are insufficient camp hosts sites in the campgrounds, resulting in insufficient management presence.
- In addition to these resource impacts, lack of recreational facilities at some of the Project lakes limits the optimal recreational potential of the Projects. Notable among the facility supported recreational demands largely unmet within the Project areas are hiking and camping, including developed boat-in camping opportunities.
- Some of the Project facilities are at or near capacity during the key summer weekends.
- Many of the facilities including those at Meadow Lake, Kidd Lake, Peak Lake, Bowman Lake, Sawmill Lake Faucherie Lake and Jackson Meadows Reservoir are moderately high-elevation lakes with associated recreation developments. Public visitation is primarily during the summer and fall seasons when road access is available.
- Some of the current Project recreation facilities do not meet FS design and accessibility standards.
- Some of the recreational services provided within the Project do not meet current standards.
- Many Project facilities have constructed features that are in fair or poor condition.
- Some actions specified in the current license, Exhibit Rs have not been completed.
- Some Project facilities may not meet visual quality standards as assigned in agency plans.
- Boat ramps serving the project reservoirs are in need of some improvements to adequately meet current standards and visitor expectations. There is inadequate streamflow information and other information available about Project-related facilities and recreation opportunities.
- Licensees do not currently provide sufficient financial assistance to address the level of Project-related recreation and its resulting impacts and demands. The FS does not have the ability to manage all the project-related recreation in a manner that meets FS requirements.
- FS patrols Licensee land and NFS lands for fire protection. The recreation facilities are operated by the FS, FS concessionaire and PG&E's concessionaire.
- Lake levels and Project regulated streamflows have not always been maintained in a predictable manner, resulting in a variety of recreation and natural resource impacts.
- Use of the Fordyce Jeep Trail by 4x4 enthusiasts is limited in the summer due to water releases that prevent vehicles from crossing Fordyce Creek.
- The South Yuba River is a designated California Wild and Scenic River between Lang's Crossing and the confluence with Kentucky Creek below Bridgeport (river stretches of

Scenic and Recreation designations). The South Yuba River is also recommended for federal Wild and Scenic River designation.

- Project operations have altered the river and its associated biota both upstream and downstream of Project facilities in several significant ways. Among other things, fish movement is limited, downstream flow regimes are altered, habitat is inundated, and concentrated recreational areas were created that would not exist if the Project did not exist (project-related recreation).

Desired Conditions

- Ensure that resources and conditions are meeting or moving toward direction in the Tahoe National Forest Land and Resource Management Plan, BLM Sierra Resource Management Plan, and agency policy. Ensure that project induced recreation is not impairing the attainment of natural resource goals in the Forest.
- Monitor recreational facilities and visitors to ensure Forest plan and policy objectives are met.
- Construct, improve and maintain sufficient recreational facilities at and adjacent to Project reservoirs to properly manage project induced recreation and provide for the full recreational potential consistent with Forest plan and policy objectives during the term of the license.
- Provide and maintain trails and trailheads at, between, and adjacent to Project reservoirs to manage project induced hiking.
- Ensure project-related facilities meet FS design and outdoor accessibility standards.
- Ensure Licensee provides the appropriate level of service, maintenance, and operations for Project-related recreation.
- Ensure Licensees are responsible for recreation related costs including facility maintenance, enforcement patrols, fire protection, and preventing resource damage within and adjacent to project facilities.
- Consider recreation needs when determining desired lake levels and streamflows.
- Provide streamflow and other Project recreation opportunity information in a variety of formats desired by the public, including new electronic based technologies.
- Protect the outstandingly remarkable values of the California-designation South Yuba Wild and Scenic River.
- Bring Project facilities into compliance with the visual quality objectives (VQOs) in TNF's LRMP and the Visual Resource Management (VRM) objectives in BLM's SRMP to the extent possible.
- On selected Licensee lands, mitigate negative visual effects and work to achieve high levels of visual quality as seen from NFS and Licensee land viewpoints.
- CDFG gages reservoir fishing success by examining the catch-per-unit-effort (CPUE). This is typically expressed in number of fish caught per hour fished. CDFG seeks to attain CPUEs of 1.0 fish per hour or greater. A reservoir fishery is classified as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour.

Objectives Addressed by Recreation Measures

- Recreation Management Objective
- Resource Protection Objective
- Visual Resources Objective
- Recreation Design Objective
- Recreational Access Objective
- Resource Protection Objective
- To improve scenic quality within the project area.
- Bring Project facilities and features into compliance with the visual quality objectives (VQOs) in TNF's LRMP and the Visual Resource Management (VRM) objectives in BLM's SRMP to the extent possible.

Information Used to Establish Recreation Measures

- 2007 Recreation Use Impact and Inventory/ Condition Field Assessment Forms, Yuba-Bear Hydroelectric Project and Drum Spaulding Feb. (2010)
- 2008 California Outdoor Recreation Plan (CORP). (2009).
- Collection Agreement between Nevada Irrigation District and USDA Forest Service Tahoe National Forest (2008).
- Electric Consumers Protection Act (ECPA). 1986.
- Federal Power Commission Order No. 313, Section 2.7 (FPC 1965), as amended Order No. 508 (April, 1974)
- Forest Service Trail Accessibility Guidelines (FSTAG) (USDA 2006a)
- Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) (USDA 2006b)
- Architectural Barriers Act Accessibility Standards (ABAAS)
- ABA Accessibility Standards for Federal Facilities
- Forest Service's universal design policy (FSM 2330.5).
- Memorandum of Understanding Between Pacific Gas and Electric Company and USDA Forest Service Tahoe National Forest (2005)
- Principles of Recreation Resource Planning (Haas 2007)
- Recreation Development at Licensed Hydropower Projects (FERC 1996)
- Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (USDA 2004)
- Tahoe National Forest Land and Resource Management Plans (USDA 1990)
- BLM Sierra Resource Management Plan (2008)
- South Yuba River Comprehensive Management Plan (2006)NID, Final License Application. Recreation Facilities Plan (NID 2011a)
- PG&E, Final License Application. Recreation Facilities Plan (PG&E 2011b)
- NID, Final License Application. Recreation Facilities Plan (NID 2011)
- Technical Memorandum 8-1 Recreation Flow, Yuba-Bear and Drum-Spaulding Project (NID, PG&E 2011)
- Technical Memorandum 8-2a Recreation Use and Visitor Survey, Drum Spaulding Project (PG&E 2011)

- Technical Memorandum 8-2b Recreation Use and Visitor Survey, Yuba Bear Project (NID 2010 and NID 2011)
- Forest Service Manual 2300, Chapter 2330—Publicly Managed Recreation Opportunities.
- National Forest Landscape Management Volume 1 (USDA 1973)
- National Forest Landscape Management Volume 2, Chapter 1, The Visual Management System (USDA 1974)
- Visual Quality Assessment Technical Study Report (Technical Memorandum 10.1, Visual Quality, March 2010)
- Consultation with TNF Forest Landscape Architect William Davis and BLM Associate Field Manager Jim Eicher.
- FERC approved Study 2.8.2 (Recreation Use and Visitor Surveys, July 11, 2008)
- Study 2.3.12 (Reservoir Fish Populations, December 2, 2008)
- Technical Memorandum 3-5 (Fish Entrainment)
- Yuba-Bear and Drum-Spaulding Pre-Application Documents (Aquatic Resources Section)
- California Department of Fish and Game Stocking Allotments
- California Department of Fish and Game Creel Survey Data

Rationale for Recreation Measures

RATIONALE FOR RECREATION MEASURES – SURVEY, MONITORING, AND FUTURE DEVELOPMENT TRIGGERS

- Licensee shall conduct Recreation Monitoring once every 6 years which will include evaluation of resource impacts from developed and dispersed use, including evidence of garbage and human waste left on site. The FS shall be involved in the evaluation of resource impacts.
- Licensee shall conduct occupancy surveys of all project facilities on a 6 year cycle as described in the Tahoe National Forest DSYB Recreation Trigger Plan (Attachment B)
- Licensee shall conduct a Recreational User Survey (questionnaire) once every 12 years starting from license issuance. Survey methods and questions shall be reviewed and approved by the Resource Agencies in advance. The Recreation Survey shall be focused to address the key issues at the time. Survey information shall be reviewed by all interested parties.
- At 6 and 12 years, Licensee shall prepare the Recreation Monitoring and Survey Report and shall be provided to FS for review, comment and approval prior to being filed with the Commission. The Recreation Monitoring and Survey Report shall incorporate data from the information listed above, traffic counters, other resource monitoring results, law enforcement input, emergency services (including fire) input, accident reports, Project Patrol reports, occupancy rates and other applicable information. The Recreation Resources Report shall comply with regulations at 18 CFR section 4.51(f) (1996), or as amended.

  The report shall address, at a minimum, the following factors:

  6-Year Monitoring Report:

- Occupancy and capacity information.
- Summarize monitoring results in relation to established triggers and address any changes in trends (including changes in peak season) since previous reports (or initially from relicensing studies).
- User and resource conflicts.
- Outstanding health and safety issues.
- Known bear encounters at sites without food lockers.
- Kinds and sizes of recreational vehicles (i.e. trailer, RV).
- A 6-year schedule for maintenance, rehabilitation, reconstruction and new construction.
- Proposed facility changes based on any mandated updated guidelines, such as ADA and FSORAG.
- New or modified management actions (increased patrols, additional sanitation facilities, closure orders, etc.) proposed to address concerns identified in report.
- Summary of the amount of garbage and evidence of human waste noticeable within 100’ of clusters of dispersed campsites and concentrated use areas.

12-Year Monitoring Report (Plus all the items in the 6-Year Monitoring Report)

- Results of visitor surveys.
- Changes in use type, volume, group size, duration of stay, other use pattern and trends.
- Results of resource survey for riparian and lakeshore trampling, barren core area at popular dispersed sites.
- User perceptions of crowding both at facilities and along lakeshore/lake surface.
- User perceptions on the need for garbage collection at developed sites.
- Percent of users seeing evidence of human waste (including toilet paper) and user perceptions on the need for toilet facilities at dispersed sites and concentrated use areas.
- Kinds, quality, quantity, and range of recreational opportunities visitors are engaging in.
- Preferences in recreation activities and amenities.
- Summarize the most current regional and statewide trends in recreation based on available surveys and reports.

- Within 1 year of submission of the Report on Recreation Resources Licensee shall consult with the Resource Agencies and interested parties to review this report and propose appropriate management actions. FS reserves the authority to require changes in the Project and its operation to accomplish protection and utilization of NFS resources identified as a result of these surveys.

As part of managing the recreation resources within or affected by the DSYB projects, understanding the dynamic changes in recreation over the life of the license is critical. It is widely recognized that substantial changes in recreation use, activities, motivations, and other related items can happen in a short span of time. These trends are important to recognize and track so that adjustments in management strategies can be made in order to prevent the degradation of either resource conditions or recreation experiences. As an example, the Outdoor Recreation Resources Review Commission, which was largely responsible for developing use, activity, and motivation data starting in 1960, recommended completing recreation surveys on a 5-year interval (Haas 2007). The change over time of visitor attitudes, preferences, use patterns, experience, and capacity may require modifications to the management of recreation within the Project area. This form of information gathering is aimed at fully using recreation sites while mitigating Project-related impacts within and adjacent to Project-affected areas and the downstream footprint area of the project. The timing of the recreation user surveys (12 years) was developed as a compromise to minimize the expense of monitoring to Licensee but to ensure changes in recreation could be identified with sufficient time for management programs to react and to correspond with reporting requirements for recreation that THE COMMISSION requires. This measure will provide Licensee and FS the ability to react to changes and provide the quality recreation opportunities in the Project area required to meet the Forest Plan, and other applicable management standards. Public perception of crowding will inform managers if a social carrying capacity is being approached either at the facility or on the Project lake. The Recreation Monitoring and Survey Reports must include and address both NFS and Licensee lands simultaneously to be meaningful. The recreational uses and facilities are so intertwined that the recreation use patterns do not differentiate between land ownership.

During relicensing discussions, Licensees and FS met and conferenced on several occasions and considered a variety of Recreation Trigger alternatives, and were approaching agreement on a Recreation Trigger Plan (A Recreation Trigger Plan would set forth certain actions to address the issue of recreation facilities consistently approaching full weekend capacity). However, FS and Licensees were not able to reach concurrence by the time of filing the Preliminary Protection, Mitigation and Enhancement conditions. At the end of the Recreation Trigger discussions the main points of difference were:

- <u>1 verses 2 Trigger System</u> – Licensees preferred a 2 trigger system: Trigger 1 (TR1) launches feasibility/suitability analysis, and; Trigger 2 (TR2) launches NEPA/design/construction phases. FS preferred a 1 trigger system that launches feasibility/suitability/NEPA/design/construction. FS contends that the 2 trigger system is unnecessarily complex and would create an unacceptable delay in implementing needed recreation facility development or management actions due to the “3 out of 6 year” trigger threshold requirement for both TR1 and TR2.
- <u>Occupancy Trigger Threshold Percentages</u> – Licensees preferred trigger thresholds of 85 percent for TR1 and 95 percent for TR2. FS contends that a 95 percent TR2 threshold would result in ensuring that recreation overflow conditions existed before new facilities were developed to meet the growing demand, and proposes a single 90 percent threshold.
- <u>Groupings</u> – Licensees and FS had differences in opinions on which recreation sites should be grouped together for purposes of trigger calculations (recreation facilities would be grouped based on geographic factors and by type of facility). The grouping concept makes the assumption that recreationists would substitute another facility within the group if their first choice was not available. FS perceived stronger site affiliations for user groups than Licensees, i.e. users at Sawmill Lake would not necessarily go to Jackson Meadows if there were no sites available at Sawmill Lake. These differences resulted in FS and licenses having different groupings. The FS based it groupings on years of experience managing and observing recreationists at the Project lakes and facilities.
- The FS believes that certain facilities are close enough to capacity during peak summer weekends that additional facilities need to be constructed shortly after license issuance rather than triggering in construction.

RATIONALE FOR RECREATION MEASURES - FOREST SERVICE AND BUREAU OF LAND MANAGEMENT LIAISONS

To ensure projects on, adjacent to, or affecting NFS lands comply with the Forest Plan, Region 5 design standards, and projects on, adjacent to, or affecting BLM lands comply with the Sierra Resource Management Plan, and the Americans With Disabilities Act, it is critical that Licensee identify a single liaison to meet these objectives. Cooperation during all phases of the Projects will ensure early and upfront clarity to achieve this goal of compliance with applicable standards. This measure is not intended to require specific staffing on the part of Licensees, but rather is intended to provide efficient and effective planning and communication among the FS, BLM, and Licensees.

RATIONALE FOR RECREATION MEASURES –REVIEW OF RECREATION DEVELOPMENTS AND ANNUAL COORDINATION MEETING (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

It is the desire of the FS, CDFG, BLM, and SWRCB, along with other interested parties, to continue a level of coordination and adjustment for the Project. Annual meetings and other meetings every 6 years to review results of surveys and other data will assist in determining necessary maintenance, rehabilitation, construction, and reconstruction work needed, based on facility condition and other factors at the time. Data from ongoing monitoring will assist in making any needed changes in the schedule of work, and for future planning.

Each year during the term of the licenses, Licensee will arrange to meet with interested Resource Agencies (FS and BLM at a minimum) for an Annual Coordination Meeting to discuss the measures needed to ensure public safety, and protection and utilization of the recreation facilities listed in of this Plan. The date of the meeting will be mutually agreed to by Licensee and the Resource Agencies but in general will be held within the first 90 days of each calendar year. A detailed agenda will be provided to the Resource Agencies when the meeting date is proposed to assure that the appropriate parties are present.

The need for garbage collection will be addressed based on the results of visitor surveys, evidence that wildlife is becoming habituated and the status of garbage and litter left on site by users. The need for toilet facilities where dispersed camping is occurring will be discussed at least every 6 years (following submittal of Monitoring Report), and more frequently if warranted.

During the annual meeting with Resource Agencies, Licensee will review the status of recreation projects from the previous year. This will include rehabilitation of existing recreation facilities, the establishment of new recreation facilities, and any other recreation measures or programs that were implemented. The Resource Agencies will provide Licensee with any available recreational use data from the previous year for the facilities listed in this Plan.

At the coordination meetings, Licensee will provide the Resource Agencies with a summary list of the recreation facilities scheduled for rehabilitation and any other Plan measures or programs to be implemented. Work on recreation facilities scheduled for the forthcoming years will be presented to the Resource Agencies for review and will include logistical and coordination planning, and an implementation schedule. Licensee and the Resource Agencies will identify any coordination needs in regards to other resource agency projects being implemented in the area. Permitting requirements and other key resources that will need to be protected from potential impacts associated with the implementation of the scheduled recreation projects will be addressed. Any Licensee proposal for new or increases in recreation fees on NFS lands must be discussed and approved by FS.

Licensee and the Resource Agencies may consider potential adjustments in specific actions or schedules, if appropriate. The Resource Agencies will be asked to approve any revisions to the schedule, and the revised schedule will be submitted to the Commission. Within 60 days following such consultation, Licensee shall file with the the Commission evidence of the meeting, which summarizes any comments made by the Resource Agencies, and any agreements or Plan revisions that were reached by Licensee and the Resource Agencies.

The Annual Coordination Meeting is a minimum requirement; it is anticipated that meetings will occur throughout each year as needed to implement the Recreation Plans.

It is the desire of the FS, along with other interested parties, to continue coordination and adjustment for the Project. By having specific coordination meetings, public interests including the results of surveys, resource protection measures, and other input from prior years can be reviewed. These reviews will allow for the determination of necessary maintenance, rehabilitation, construction, and reconstruction work needed, based on facility condition and other factors at the time. Data from ongoing monitoring will assist in making any needed changes in the schedule of work, and for future planning.

The agency and Licensee have agreed to address garbage collection at many of the project recreation sites at the annual coordination meeting. During the 2009 user surveys, the public indicated a preference for garbage collection in various locations -- 59 percent of the overnight users at Lindsey, 50 percent at Bowman, 47 percent at Sawmill, and 53 percent at Meadow indicated a preference for garbage collection. Garbage left at campsites is both unsightly and can habituate wildlife. The amount of garbage left at campsites and the public perception for the need for garbage collection will weigh into those annual discussions, especially if consistently more than 50 percent of the recreationists indicate this is desired.

RATIONALE FOR RECREATION MEASURES - RECREATION PLAN

The purpose of the Recreation Plan is to identify Licensee’s responsibilities related to the management of recreation facilities associated with the Project over the term of the new license. This plan also identifies measures that Licensee will implement to protect resources and mitigate impacts from project induced recreation, and to enhance recreation opportunities at, and in the vicinity of, the Project. The Recreation Plan consists of a number of elements, including:

- Heavy Maintenance of Recreation Facilities
- General reconstruction
- Specific Modifications and Enhancements of Existing Project Recreation Facilities and Construction of New Project Recreation Facilities
- Costs of Managing Project-Related Recreation
- Recreation Facility Plan Revision
- Fish Stocking Program
- Recreation Reservoir Minimum Pool Elevation and Scheduling Objectives
- Recreational Streamflows
- Visual Resource Management Plan

The following narratives describe the objectives and rationale for each of the principle sections of the Recreation Plan:

RATIONALE FOR RECREATION MEASURES – RECREATION PLAN HEAVY MAINTENANCE

Heavy maintenance is necessary to keep existing FS facilities in serviceable condition to meet health and safety requirements, protect resources, and meet public needs, including accessibility. Heavy maintenance and rehabilitation include components of recreation facilities such as water systems, traffic control barriers, roads, spurs, and associated drainage structures, grills and fire rings, picnic tables, toilets, and signboards. Long-term and heavy maintenance includes, but is not limited to: repairing and re-surfacing paved or graveled areas; replacing culverts and other heavy maintenance along access roads; re-roofing and painting buildings; replacing picnic tables and other accessory structures, and; replacing toilets and septic systems. As a part of the annual consultation and coordination meetings, necessary maintenance, rehabilitation, and reconstruction will be determined through a periodic review of the facilities by the resource agencies and Licensees. These reviews will determine the necessary work, based on facility condition and other factors at the time. Data from ongoing monitoring will assist in making needed changes in the work schedule and in future planning.

RATIONALE FOR RECREATION MEASURES – RECREATION PLAN GENERAL RECONSTRUCTION

Current Design Standards

Since many of the existing facilities were constructed in the 1960’s and 1970’s, they are expected to reach their useful life at least once during the term of the license and need reconstruction. Because of the age of the facilities, many are not meeting current design standards (including accessibility standards) and were not designed to accommodate the current use and vehicle configurations.

Prior to reconstruction or rehabilitation of a recreation facility, the design of the facility will be reviewed in light of changes in use and design standards since the facility was constructed. Modifications will be made to the facility design to address the functionality of the facility and compliance of the facility with current design standards. This will include, but not necessarily limited to: road widths and geometry and spur width and length (in light of the current vehicle use of the facility); providing additional campsites when warranted by demand; and compliance with current federal and agency accessibility standards: NFS lands - Forest Service Outdoor Recreation Accessibility Guide (FSORAG), Architectural Barrier Act (ABA) Accessibility Standards (ABAAS) and agency facility design standards, or other applicable standards at the time of design, and; Licensee lands - Americans with Disabilities Act (ADA 1990). Modification of the design may involve land beyond the existing footprint. Existing constructed features will be incorporated into the new design whenever it is efficient to do so, provided the features meet current standards and are in good condition. The intent of redesign is to assure the facility meets current standards, and users needs while maintaining the character of the surrounding forest setting; the intent is not to "start from scratch".

It should be noted that Region 5's goal is that all facilities and programs will be universally accessible (USFS 1998). Consequently, the opportunity to provide for accessibility shall be addressed at each individual site (e.g. each campsite, picnic site, etc.), not just the minimum required by FSORAG.

When new construction or expansion is specified, the site capacities are general estimates only and will be refined during site design, based on current resource agency plans, Recreation Opportunity Spectrum (ROS) class, laws, standards and policy for resource protection, topographic feasibility and recreation facility design.

Additional features (such as gates) may be added as part of the design modification.

Other Facility Features

To assure the reconstructed facilities meet current standards and enhance site management, reconstruction or rehabilitation will address all constructed features as well as site grading and other site modifications including, but not limited to:

- Reconstruction, replacement or rehabilitation of constructed features, including - toilets, gates, table, fire rings, septic systems, water system features, barriers, retaining walls, unit markers, bulletin boards, signs, entrance and fee stations, animal resistant food lockers etc.
- Accessibility - Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities. At Development Scale 3 or higher recreation facilities provide ORARs between constructed features, campsites, toilets and spurs.
- Regrading and graveling non-paved roads and spurs, resurfacing paved roads & including providing asphalt treatment and sufficient subgrade and (where appropriate) providing turn outs at entrance stations, toilets, trash bid pads etc. Providing asphalt treatment of spurs when the circulation road is paved.
- Address opportunities to lengthen and widen spurs as needed. Current FSORAG campground spur dimension standards are: 16’ wide by 20’ long for single vehicles, 45’ long for RVs, and 60’ long for vehicles with large trailers. A percentage of the spurs will be 20’ wide. (USDA Forest Service 2006b).

- Replacement of wood barriers with rock barriers and of sufficient quantity to prevent off road travel. Install additional barriers as needed.
- Remove protrusions and provide a graded living space including tent pad & clear floor space around tables, food storage lockers and grills.
- Installation of gates.
- Upgrade of host sites. Providing campground host sites with a minimum of septic and water will improve public service and campground management by allowing the manager to attract high quality hosts.
- Providing enhancements such as longer spurs and extra parking when there is a demand.
- Installing signing that meet FS standards and address recreation area opportunities (including trails), maps of facilities, resource protection information (appropriate for the area), emergency contacts, safety, and regulations (including water surface regulations). Every developed recreation facility is required to have a Site Identification sign that meets FS sign standards (Forest Service Handbook 7109.11a). Sufficient bulletin board space should be provided to avoid overcrowding of bulletin boards which results in visitors bypassing information.

Reconstruction of All Recreation Facilities

In addition to the actions listed below (unless otherwise agreed to) all existing Project and Project-related recreation facilities, constructed features and infrastructure will be replaced within 20 years of license issuance.

Drinking Water Standards for Recreation Sites that Provide Potable Water

Some of the Project recreation facilities on both NFS and Licensee lands provide drinking water and new drinking water systems are proposed. FS policy specifies that all water systems shall be managed as public drinking water systems (i.e. serve at least 15 service connections or 25 persons) under the federal Safe Drinking Water Act (SDWA) that was signed into law in 1974, and reauthorized in 1996 to protect public health. In some states such as California, primacy has been delegated to the states and to the Counties which enforce all statutes, regulations and policies for drinking water systems within their jurisdictional boundaries. In Sierra County the California Department of Public Health regulates and enforces the drinking water quality laws and regulations. Nevada and Placer counties regulate and enforce the drinking water laws and regulations through their own health departments.

Vegetation Management in Recreation Sites

Vegetation is a key component of quality recreation sites in the area. Recreation site without shade in this area are under-utilized and unpopular, therefore it is critical to maintain a healthy, mature stand of vegetation. The vegetation management requirements are aimed at enhancing the recreation experience through active and professional vegetation management.

RATIONALE FOR RECREATION MEASURES – RECREATION PLAN SPECIFIC FACILITIES

FERC regulations require the full and accessible development of the recreational potential of all Major License Projects. Starting in 1958 the federal government took a strong interest and active role in promoting outdoor recreation opportunities for the nation. On April 23, 1963 the Federal Power Commission (FPC) issued Order 260-A, which amended Section 4.41 of the Commission's regulations (18 CFR Part 4, Subpart E, §4.41 – Contents of application) requiring the filing of a recreation resource plan for all major license applications filed after June 1, 1963. In 1965 the FPC issued Order No. 313, which added Section 2.7 of the General Policy and Interpretations section of the regulations to ensure: that the development of the recreation resources on all projects are consistent with the recreational needs; public access; development of suitable public recreational facilities, and; the incorporation of sufficient lands within the Project boundaries in order to optimize the development of the recreational resources offered by the Project. On April 30, 1974 Section 2.7 was amended by Order No. 508 to include "consideration of the needs of physically handicapped" in the design and access development to project recreation facilities (FERC 1996).

The TNF LRMP specifies a recreation opportunity spectrum (ROS) designation for each area of the Forest. ROS designations are made in the recognition that people choose a specific setting for the outdoor activities that they participate in. ROS offers a framework for understanding the relationships and interactions between the factors influencing the setting. Such factors include ease of access, remoteness, naturalness, types of facilities, social interactions, visitor impacts and visitor management. Lands within the Project area range from a ROS designation of Rural (more developed), to Roaded Natural, Semi-Primitive Motorized and Semi-Primitive Non-Motorized (less developed and more remote). A description of the ROS classes can be found in the LRMP (USDA 1990).

The current TNF Land and Resource Management Plan (USDA 1990) provides the following direction for recreation management that applies to NFS lands with the Project areas.

> Current Management Direction
>
> The program includes all practices necessary to protect, administer, and develop outdoor recreation opportunities in a manner compatible with other resource values and with minimal environmental impact. In addition, the recreation program protects, manages, and develops trails and roads to scenic and cultural resources on the Forest. (USDA 1990, Summary of the AMS – Page-2)
>
> Experience throughout the Pacific Southwest Region indicates that optimum campground use is about 35 to 40 percent of theoretical capacity. Averages however do not show that often the sites are filled to capacity, while at other times there is no use. (USDA 1990, Summary of the AMS – Page-4)

Provide a broad spectrum of dispersed and developed recreation opportunities in accordance with identified needs and demands. (USDA 1990, Management Direction - Page V-5)

Desired Future Condition

New campgrounds will be constructed and existing facilities will be reconstructed to provide additional capacity. Expected demand for sites will be met. New trail construction and trailhead construction/reconstruction will increase dispersed recreation opportunities. Facilities at all developed sites will be maintained at a standard that ensures public health, safety and user enjoyment. (USDA 1990, Management Direction - Page V-5)

Administer, operate and maintain developed recreation and interpretive sites to meet the standards and management objectives for public service and use. Standards for public health, safety and comfort are established in FSM 2330 and various handbooks on design, maintenance, etc. Management objectives are based on a site capacity, site protection needs, seasonal demand for public use, and desired levels of service to enhance visitor's experience and convenience. (USDA 1990, Management Direction - Page V-52)

The Sierra Nevada Forest Plan Amendment confirmed the continuing demand for recreational facilities across the national forests of the Sierra Nevada: "Projected population growth in the United States and increasing tourism in this region, along with other factors, clearly contribute to increasing demand for recreation facilities and services throughout the Sierra Nevada national forests" (USDA Forest Service 2004). This underscores the need for increased maintenance of recreational facilities, patrols, the need for improving existing recreational facilities, and the need for new recreational facilities in order to effectively manage the increasing recreational demands across the Sierra Nevada national forests, including the Project areas. Managing the recreational resources and implementing the Recreation Management Plans on NFS lands within the Project Areas must also comply with the 2004 Sierra Nevada Framework Plan Amendment (USDA Forest Service 2004). The two Riparian Standards and Guides listed below are of particular note in relation to recreation resources management and development:

103. Prevent disturbance to streambanks and natural lake and pond shorelines caused by resource activities (for example, livestock, off-highway vehicles, and dispersed recreation) from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites, sites authorized under Special Use Permits and designated off-highway vehicle routes.

116. Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic and riparian-dependent species. At the project level, evaluate

and consider actions to ensure consistency with standards and guidelines or desired conditions.

Licensees have been, and continue to be, the substantial force in recreation development within the DSYB project area. Licensees' roles in facility and infrastructure development have been pervasive over the last 50 years. Most of the current recreation facilities were planned and developed by Licensees in the 1960's, during an era with different design standards and when there was much less demand for recreational facilities as compared to today. Though some of these facilities have been replaced over the years and portions of sites meet current accessibility standards, many of the recreational facilities are still of the original 1960's construction, do not meet current recreation design and accessibility standards and have generally reached the end of their useful life. Licensees estimate that recreation use Project-wide will increase by 71 percent during the new license period (NID 2011, PG&E 2011, Page E6.6-38 and Page E6.6-49). There is a clear need to repair, rehabilitate, redesign and/or replace outdated recreation facilities, and to construct additional facilities to meet current and projected future recreational demands throughout the Project, including the accommodation of the heavy mid summer weekend use patterns prevalent in the Project area.

User surveys conducted by Licensee indicate how important Project reservoir related activities are to the visitors themselves. The three most popular activities for visitors to the DS Project are camping at developed sites, fishing and hiking/walking. The three most popular activities for visitors to the YB Project are camping at developed sites, fishing and motorboating. The following table displays the percentages of visitors' top three ranked recreational activities and projected future demand by Project (NID 2011, PG&E 2011).

Projects' Top Three Recreation Activity Preferences and Projected Future Demand

Recreational Activity	% of Visitors Ranked as Top Priority	Projected Increase in Demand by 2050
NID		
1. Camping (Dev. & Disp)	44%	
Developed		45%
Dispersed		27%
2. Fishing	17%	27%
3. Motorboating*	7%*	54%*
PG&E		
1. Camping (Dev. & Disp)	33%	
Developed		45%
Dispersed		23%
2. Fishing	21%	23%
3. Hiking	15%	50%

* These statistics are largely influenced by Rollings Lake, which is outside the TNF boundary, and do not directly relate to the Yuba-Bear Project reservoir use patterns and projections within the TNF.

Developed camping is recognized as the predominate current recreational activity for both Projects, and is projected to remain the predominate activity in the future: "Clearly, camping, and especially developed camping, will likely continue to be the predominant recreation activity based on the high percentage of visitors participating and the expected growth rate." (NID 2011). Fishing is another notable popular recreational activity within both Projects. Hiking also ranks high among the spectrum of recreationists across California and within the Projects. The 2008 California Outdoor Recreation Plan (CORP) identified "walking for fitness or pleasure" as the #1 outdoor recreational activity that Californians participated in:

> "Generally, Californians tend to participate in activities that are less expensive, require less equipment, and need fewer technical skills. The Public Opinions and Attitudes Survey 2007 discovered that Californians' top 15 activities (by participation) were: 1. Walking for fitness or pleasure 74.2 percent..." (CORP, 2009)

In PG&E's Technical Memorandum 8-2a, Recreational Use and Visitor Surveys section 3.7.4.3 it states the following concerning hiking/walking at the Project reservoirs, "Activity Projections through 2050. Hiking/walking was the third top-ranking activity at the Project reservoirs, with nearly 15 percent of all visitors stating it was their top-ranked activity. The growth rate for hiking/walking is 50 percent by 2050" (PG&E 2011).

Thus, it is reasonable to anticipate the need for improved and additional recreational facilities to accommodate camping, fishing, hiking and boating in the new DSYB license period.

Through the development of the DSYB reservoirs, the accompanying infrastructure, access roads, and the recreation facility development, Licensee has been and is the greatest influence within the DSYB Project area. In order for visitors of all abilities to experience quality recreation opportunities and be able to fully utilize recreation sites within the Project area, it is necessary to ensure that the appropriate infrastructure is in place, in good condition, and that accessibility is provided through universal design standards. The goal of universal design is to ensure integration of all people, without separate or segregated access for people with disabilities. Under FS's universal design policy (FSM 2330.5), new or altered facilities and associated constructed features in recreation areas are required to be accessible, rather than only a certain percentage of those facilities, with few exceptions. Ongoing maintenance and improvement efforts coordinated between the FS and Licensees have provided for accessibility at some of the recreation facilities; however other accessibility needs have been identified in Licensees' Technical Memorandum 8-2a and 8-2b, Recreational Use and Visitor Surveys (NID 2011, PG&E 2011). FERC regulations at 18 CFR 2.8 require Licensee to "develop suitable public recreational facilities upon project lands and waters and to make provisions for adequate public access to such project facilities and waters and to include therein consideration of the needs of physically handicapped individuals in the design and construction of such project facilities and access." FS policy (USDA 1998) is to provide 100 percent barrier-free access where possible, consistent with the intent of the Region 5 (R5) "Universal Access Strategy."

Information, Guidance, Direction, Requirements and Rationale That Apply to All Recreation Facilities

Accessibility

To meet the intent of FERC and FS accessibility direction, all new or rehabilitated/reconstructed Project recreational areas and facilities on NFS lands will meet FS Outdoor Recreation Accessibility Guidelines (FSORAG 2006) and Forest Service Trail Accessibility Guidelines (FSTAG 2006), or their replacement, current at the time of design.

The current accessibility guidelines were finalized on May 22, 2006, through Federal Register publication. The applicable standard for new or altered Forest Service facilities (i.e. buildings, boating and fishing facilities) is the Architectural Barriers Act Accessibility Standards (ABAAS). The ABAAS have replaced the Uniform Federal Accessibility Standards (UFAS) and any use of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) by Federal agencies. See http://www.access-board.gov/ada-aba/aba-standards-gsa.cfm.

> Accessibility and FS Site Development Scale (see Attachment A for Forest Service Recreation Site Development Scale definitions) - Constructed features in FS Development Scale[17] 1and 2 recreation sites are primarily for resource protection. Sites where features are provided to facilitate use, comfort and convenience by recreationists are rated from Development Scale 3 – 5. Regardless of the FS Recreation Site Development Scale, under FS's universal design policy, with few exceptions, all new or altered facilities and associated constructed features at recreation sites must comply with the technical provisions of the FSORAG.
>
> Outdoor Recreation Access Routes (ORARs) are required at recreation sites with a FS Recreation Site Development Scale of 3 or higher. Constructed features in FS Development Scale 1 and 2 recreation sites are primarily for resource protection rather than visitor comfort and convenience and ORARs are not required in these areas. In Development Scale 1 or 2 recreation areas, paths connecting associated constructed features, as well as paths connecting them to a trail, must comply with section 7.0 of FS Trail Accessibility Guidelines (FSTAG). These paths are not ORARs and are not required to meet the technical provisions for an ORAR in the FSORAG.
>
> As noted in the FSORAG, scoping and technical provisions, the accessibility requirements differ by recreation site development scale. Generally, the percentage of constructed features within recreation sites and the connections to an ORAR is the variable dependent on development scale.

Deviations are permitted from certain technical provisions of the FSORAG where one or more of four conditions for departure exist and an exception applies. Allowing some deviation is essential, as the outdoor environment is very different from a constructed indoor environment. Factors that influence the ability to provide fully accessible facilities, such as soil, surrounding vegetation, hydrology, terrain, and surface characteristics, are fundamental to outdoor areas. Without deviations from the technical provisions, compliance could significantly and unacceptably alter the nature of the outdoor experience.

In general terms, the conditions are:

[17] See Attachment A for Development Scale definitions.

> Condition for Departure 1. Where compliance would cause substantial harm to cultural, historic, religious, or natural features or characteristics.
>
> Condition for Departure 2. Where compliance would substantially change the nature of the setting or the purpose or a portion of a facility or would not be consistent with the applicable land management plan.
>
> Condition for Departure 3. Where compliance would require construction methods or materials that are prohibited by federal, state, or local law, other than state or local law whose sole purpose is to prohibit use by persons with disabilities.
>
> Condition for Departure 4. Where compliance would be impractical due to terrain or prevailing construction practices.

Newly constructed or rehabilitated/reconstructed recreational facilities on Licensee lands are required to adhere to the Americans with Disabilities Act Accessibility Guidelines (ADAAG).

Forest Service Trail Accessibility Guidelines (FSTAG 2006) also apply to new or reconstructed trails. Conditions for departure from FSTAG requirements exist under certain circumstances: to protect cultural, historic, religious or significant natural resources; where FSTAG would substantially change the recreational setting or trail class, designed or managed uses; to meet existing laws, and; if construction is impractical.

Deferred Maintenance and Amenity Upgrades

Through collection agreements, NID has funded FS a portion of the costs to operate, maintain and patrol many of the recreation facilities within the YB Project on both NID and NFS lands. Since 2005, at the request of FS, PG&E took over the operation and maintenance of the Drum-Spaulding Project recreation facilities on NFS lands from the TNF. PG&E selected to utilize a concessionaire to meet that responsibility. Numerous other funding sources, including Appropriated, Recreation Enhancement Funds, grants obtained from the California Department of Boating and Waterways (DBOW), Granger-Thye Act fee offset[18], and others have been used to supplement Licensee funds and direct operations and maintenance. Even with these funds and direct operations and maintenance, there is still a substantial amount (over $900,000) of deferred maintenance at the recreation facilities on NFS lands within the DSYB Projects (USDA 2012d). This deferred maintenance figure is very conservative as it is not comprehensive, and does not include facility roads and spurs.

There are a number of amenity upgrades and improvements in the specific recreation plan conditions. These have largely been developed through the analysis of Licensee's visitor survey results (NID 2011, PG&E 2011), the recreation site condition survey results (NID, PG&E 2010),

[18] Under the authority of the Granger-Thye Act, campground concessionaires operating government facilities (campgrounds) renovate, recondition, improve and maintain the facilities in lieu of feed due to the government. This heavy maintenance work is referred to as "fee offset".

the stream-based recreation studies (NID, PG&E 2011), concessionaire's observations and input, and FS knowledge of uses, trends and needs within and adjacent to the project area. These information sources highlighted needs identified by visitors for new facilities and upgrades to existing amenities at Licensee-constructed facilities.

Certain amenities are needed at all recreation facilities and concentrated use areas for resource protection. These facilities include toilets, and (at overnight facilities) animal resistant food lockers and fire rings. In some cases, animal resistant garbage containers are also needed. The following rationale applies to all sites where these facilities are called for and will not be repeated at each site.

Toilets

Wherever Project features and amenities attract concentrations of people it is essential to address human waste disposal needs to prevent the creation of health hazards, to protect bodies of water from contamination and protect the area aesthetics. As the number of people and duration of time spent at a particular area increases, the need for toilets as an effective means to safely address human waste increases. Surveys document that within the Project area visitors consistently observed human waste at popular dispersed campsites (NID 2011, PG&E 2011). This indicates that there is a high probability of visitors at these popular dispersed camps coming into contact with human waste, which is a health hazard. Pathogens can be transferred to later campers by direct contact, insect and water, although most studies show little impact to overall water quality (Temple 1982).

Most visitors to areas without toilets are not self contained in relation to disposal of human waste. As the surveys above indicate, many users make no attempt to bury or pack out their human waste. Conscientious users will dig a cathole but most users make them improperly, despite educational efforts. When catholes are improperly made, wastes do not break down quickly (ATC 2001). Human pathogens remain viable for up to two years in catholes (Temple 1982).

For the cathole method to be effective, users must break up wastes with a stick, mixing them thoroughly with duff within the cathole before covering with a mound of leaves and duff. This creates a mini-composting pile in the top layer of forest soil. This will only work well if the soil that the cathole is dug in is biologically active and diverse with decomposer organisms. At higher elevations, many of these organisms may be absent (ATC 2001).

There remain toilets at Project recreation facilities that were constructed in the 1960s or 1970s that do not meet current accessibility standards and have generally reached the end of their useful life.

Animal Resistant Food Lockers and Garbage Containers

FS and CDFG have accumulated hundreds of reports of human-bear encounters on private and public lands within Nevada, Sierra, and Placer Counties, including land within these projects. Bear home ranges can encompass 20 square miles (Ahlborn 2008), and dispersal distances ranging up to 80 km. (50 mi.) have been documented (Lee and Vaughan 2003). Therefore, project-associated campground facilities that do not contain animal resistant trash and food storage facilities can habituate individual animals for long distances.

Once an animal is habituated to human food attractants, that animal's behavior has been modified. Human food and garbage does the following:

- Habituates animals to an unnatural food supply.
- Causes animals to congregate in unnatural numbers and increases the spread of disease (both as human disease vectors in the case of rodents, and animal diseases between individual animals).
- Wildlife frequenting recreation areas increases their occurrence crossing roads, often resulting in roadkill (e.g. most road-killed bears occur near towns and campgrounds).
- Garbage is dangerous to animals--it is unhealthy, with low nutrients and contains foreign objects such as glass, metal and plastic.
- Animals fail to forage naturally and disperse throughout their habitat. Habituated animals become public nuisances, cause loss of property to visitors, and threatens human safety and welfare.

Rodents that can access trash cans and dumpsters present risks to human health, because they are vectors of human diseases. Plague is known for the higher elevations of this project, and surveillance programs identify when facilities need to be closed to protect human health.

During relicensing meetings between Licensees and FS, after the filing of the FLAs, an agreement was made that Licensees and FS would monitor Licensees' use of a pack-in/pack-out trash management strategy at certain Project recreation facilities to determine whether the strategy adequately addresses litter, or if trash receptacles and trash service are needed. The need for garbage collection will be discussed at the annual meeting. Continued public demand or substantial amounts of garbage and litter left on site (including garbage left in food storage lockers) will trigger the need for garbage collection services at individual facilities. Some facilities currently have trash receptacles and trash service, which would continue to be provided, i.e. Faucherie Group Campground, Spaulding Campground, Picnic Site and Boat launch, Discovery Interpretive Trailhead/Picnic Site, Bear Valley Group Campground, and all the recreation facilities at Jackson Meadows (except the boat-in campground). All trash receptacles at recreation sites shall be animal resistant.

<u>Fire Rings</u>

Over half of all the recorded fires started on the TNF within the Project area from 2000 to 2009 originated from abandoned campfires (NID 2011b, page 9).

<u>Facility Plans (Drawings)</u>

Accurate drawings are useful in facility redesign and maintenance, especially in regards to underground utilities.

Public Education and Information

The prevention of the spread of amphibian chytrid fungus and aquatic invasive muscles are of particular concern for the lakes and reservoirs Project-wide. Amphibian chytrid fungus and other aquatic invasive species and diseases are documented to have highly negative effects on native aquatic species, especially amphibians. Specifically, amphibian chytrid fungus has caused declines and local extirpations of several species of amphibians. In California, a combination of exotic predatory fish and amphibian chytrid fungus effects have resulted in the extirpation of over 90 percent of the mountain/Sierra Nevada yellow-legged frog (*Rana muscosa/sierrae*) populations (Vredenburg et al. 2005, 2007, 2010).

Recreationists need relevant and readily available information (including electronic based) in order to: plan their visits to the Project areas and facilities, enhancing their experience; determine if Project affected stream flows and reservoir levels will meet their needs; understand how to be compliant with agency and Licensee regulations; understand the reasons for, and need to, comply with invasive species prevention procedures; learn about the natural resources and role of water within the Project areas, and; improve visitors' overall experience while at the Project areas.

Drum-Spaulding Project Area

Additional specific rationale sections accompany each of the following reservoirs or areas. Due to the integrated nature of the recreation facilities and uses at many of the Project reservoirs on Licensees and NFS lands, the following section integrates and addresses recreation facilities on NFS and Licensee lands.

Implementation time frames for the specified actions are provided in each of the Project recreation facility descriptions below. Attachment C, Implementation Schedule, provides a summary of the implementation time schedule of the significant actions in table format. All work should be completed within the year specified in the discussions below.

Within the TNF proclaimed boundary the Drum-Spaulding Project contains 20 reservoirs/impoundments. These bodies of water encompass a variety of environmental settings, differing levels of public access, and numerous and varied recreational opportunities. The recreational opportunities include primarily camping, fishing, boating, swimming, hiking, picnicking, sightseeing, wildlife viewing, four-wheel driving and hunting, among others. Hiking/walking was identified as a primary activity at every lake (except Upper Peak) in the Project (PG&E 2011). The vast majority of the recreation use occurs from May 15 through September 15. The following information for the Drum-Spaulding Project within the TNF proclaimed boundary is broken down into seven Recreation Areas composed of Project reservoirs grouped by geographical proximity. The Drum-Spaulding Project also includes the following facilities that are entirely on PG&E and private land, have only minor recreational use and have little effect on the TNF (these facilities will not be addressed beyond this point):

- Deer Creek Forebay
- Drum Forebay

- Drum Afterbay
- Alta Forebay
- Halsey Afterbay
- Wise Forebay
- Halsey Forebay
- Rock Creek Reservoir

The TNF supports PG&E's FLA proposal to implement a "camping in designated sites only" policy within the Drum-Spaulding Project, in part. Rather than a project-wide policy, the TNF supports a "camping in designated sites only" management for Fordyce, Rucker, Blue, Lower Lindsey, Carr, Meadow, Kelly, Kidd, Peak and Lake Valley lakes. Fuller will remain a "No Camping" lake.

> "PG&E, in Section 3 of the Recreation Facilities Plan, adopted this proposal to limit camping to designated campsites within the FERC Project boundary as a policy. The section further states that PG&E will work with FS to develop a consistent policy on NFS lands and to implement a Forest Order prohibiting camping outside of designated areas within the FERC Project boundary on NFS lands. PG&E will also pursue county ordinances (Nevada and Placer counties) to limit camping to designated sites on PG&E land within the FERC Project Boundary." (NID, PG&E 2011a, page E6.6-159)

A restricted camping area designation on NFS lands will need to be addressed the Commission's NEPA process and a subsequent forest order. Additional coordination will be needed with the county sheriff to implement the closures on private and Licensee owned land.

If monitoring indicates a need to broaden the camping restrictions to other Project lake areas due to impacts to riparian or other sensitive resources, then the TNF will work with PG&E to coordinate a consistent camping policy between NFS and PG&E lands in those areas.

In order to increase the effectiveness of this camping closure it will be necessary to annually, throughout the recreation season, dismantle user created campsites within the closure area.

Spaulding Recreation Area

Due to its proximity to the I-80 and Highway 20 interchange, the Lake Spaulding Recreation Area is easily accessible to the large metropolitan centers of Reno, Sacramento and the San Francisco Bay Area, and to local communities, like Grass Valley, Nevada City, Truckee and Auburn. The Lake Spaulding Recreation Area is comprised of four Project reservoirs, including Lake Spaulding, Fuller Lake, Rucker Lake, Blue Lake, and the non-reservoir Bear Valley facilities of Bear Valley Group Camp and the Discovery Trail (Bear Valley facilities are entirely on PG&E lands). Many landowners, including Forest Service, PG&E, timber companies, and other private landowners are located in the area. Landownerships of the Project reservoirs are predominately PG&E and Tahoe National Forest lands. Some small private parcels are adjacent to Rucker and Fuller lakes. FS has designated NFS land into three ROS classes – "Semi-Primitive Motorized," "Roaded Natural" and "Rural." The NFS land surrounding Rucker and

Fuller Lakes are designated "Rural" class; Blue Lake and the west shoreline of Lake Spaulding, located on PG&E lands, are "Roaded Natural." The east shoreline of Lake Spaulding is in the "Semi-Primitive Motorized" class.

Lake Spaulding

Lake Spaulding is 682 water surface acres and 8.6 miles of shoreline when full. Approximately 40 percent of the shoreline is accessible by foot. Most of the Lake Spaulding shoreline is steep, exposed granite, with a few beaches. Dispersed boat-in camping occurs along the shorelines of the reservoir, particularly along the north and northeast shoreline near the mouth of South Yuba River and Fordyce Creek. The Lake Spaulding Recreation Area facilities provide opportunities for land-based activities, such as developed camping, picnicking, sightseeing, and water-based activities including boating, swimming, fishing, and water skiing. Lake Spaulding has three developed facilities – a campground, a picnic area, and a boat launch facility, which are all located on PG&E land (PG&E 2011b). RVs use the parking lot by the boat launch.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are:

Within 5 years of license issuance:

- Construct a 12-unit Development Scale 2 boat-in campground on NFS land on northeast end of the lake by the Fordyce Creek inlet. The minimum facilities to be included at this campground include toilet, fire rings, picnic tables, site markers, animal resistant food storage lockers, tent pads, site identification sign and information board.
- Install a boat mooring system for the use and benefit of the boat-in campers. Appropriate lake elevations for this mooring system to be determined.
- Dismantle all other user-created shoreline fire rings in the vicinity of the developed boat-in campground.

Rationale

Recreational use in the Project as a whole is expected to increase significantly over the license period. Technical Memorandum 8-2a projected a 71 percent increase in use during the term of the license (PG&E 2011, page 488). Developed camping is recognized as the predominate current recreational activity for both Projects, and is projected to remain the predominate activity in the future, "Clearly, camping, and especially developed camping, will likely continue to be the predominant recreation activity based on the high percentage of visitors participating and the expected growth rate." (NID 2011, page 419). Also see discussion of the broad need for recreation facilities at Projects, the TNF and Sierra Mountain range at the beginning of the Rationale for Recreation Measures—Recreation Plan Specific Facilities section. Thus, it is prudent for PG&E to provide additional and desirable camping facilities now to meet current needs, and in the future to meet future demands at its Project lakes, and in particular Lake Spaulding due to the available water surface capacity for recreational use and the current modest level of recreational facility development.

On the west side of the Sierra Mountain crest within the Projects, there are no designated developed boat-in camping facilities. Over half (55.8 percent) of the recreationists surveyed at Spaulding Lake Boat Launch indicated a preference for boat-in campsites to be provided (PG&E 2011). There are relatively few locations on Spaulding Lake that people repeatedly use for shoreline camping. The FLA states, "Most of the Lake Spaulding shoreline is steep, exposed granite, with a few beaches. Some dispersed boat-in camping occurs along the shorelines of the reservoir, particularly along the north and northeast shoreline near the mouth of South Yuba River and Fordyce Creek" (NID, PG&E 2011a, page E6.6-22). The limited suitable and desirable shoreline camping opportunities creates the situation where shoreline camping is concentrated in just a few locations with no sanitary or fire safe facilities. A site review by FS staff of the heavily used dispersed camping location on NFS land near the Fordyce Creek inlet demonstrated the need to manage the use and address sanitation, as evidenced by 12 user created sites, user constructed features (benches, rock fire rings, a table), trash, and tissue paper near the shoreline. The FS feels strongly that the three primitive boat-in dispersed campsites proposed by Licensee in their FLA does not meet the current demand for boat-in camping opportunities and does not address sanitation needs at a concentrated use area. Based on surveys of dispersed camping on Spaulding Lake and a map of these sites (PG&E 2011d), the NFS land at the northeast portion of Spaulding Lake near the Fordyce Creek inlet is the most heavily used area by dispersed campers. Therefore, this location would be well suited for the development of a formal boat-in campground.

Recommendations on Licensee lands (many are included in FLA):

- Retro-fit the existing accessible campsite, or relocate the site, to meet current Americans with Disabilities Act Guidelines for Buildings and Facilities (ADAAG), including:
  - Install an accessible access route to the restroom and water spigot, and
  - Pave the accessible spur.
- Re-pave the campground circulation road(s).
- Re-pave the existing paved vehicle spurs and pave the existing native surface vehicle spurs.
- Replace picnic tables, fire rings, site markers and vehicle barriers as necessary at each campsite.
- Install an animal-resistant food locker at each campsite.
- Remove the 2 existing double-vault restrooms at the boat launch (one is located by the walk-in campground, and the other by the parking area), and install one 4-unit accessible vault restroom building, or two double-vault restrooms, as appropriate.
- Provide 3 accessible parking spaces and access routes to the new restroom(s) at boat launch.
- Retrofit or create 1 picnic unit to meet accessible guidelines (ADAAG), if the site terrain allows. The retrofit shall include leveling the picnic site, installing an accessible picnic table, and providing an access route to and from the parking area and the toilet.
- Improve the paved access road to the boat launch parking area, where possible.
- On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, recreation and water surface regulations, boat-in camping information, and recreation area and site layout maps.
- Provide showers at Spaulding Lake Campground, or at other campground facility within a one-half-hour drive from the Spaulding Lake Campground and provide information to recreationists in the Spaulding Recreation Area as to their location and availability.

- Widen road to boat launch.
- Widen Spaulding Lake campground circulation roads.

Rationale

Despite the easy access from a major Interstate (I-80) and State Highway (20), the Spaulding Lake Campground's relatively low occupancy rate of 29 percent during the 2009 peak season (PG&E 2011) indicates that the current recreational facilities at Spaulding Lake are not adequately meeting the public's preferences or needs.

Licensee rated the campground and picnic facilities at Spaulding Lake as being in "fair" condition and the boat lunch/parking lot in "fair to good" condition (PG&E 2011b). Some features of the existing recreation facilities are accessible, but as whole the facilities do not meet current accessibility standards.

Recreationists surveyed at Spaulding Lake in 2009 indicated a high degree of preference (above or near 50 percent of persons surveyed) for the following new facilities: showers (highly preferred 44.4 percent, slightly preferred 20 percent); food storage lockers (highly preferred 47.8 percent, slightly preferred 13 percent); potable water at the walk-in campsites (highly preferred 38.5 percent, slightly preferred 23.1 percent); campsites (highly preferred 20.5 percent, slightly preferred 22.7 percent) (PG&E 2011, Table 3.4-257).

Of the visitors that indicated that the roads to the Spaulding Lake recreation facilities were unacceptable, 11 out of 12 noted narrowness as the reason (PG&E 2011, Table 3.4-211).

Fuller Lake

Fuller Lake is located roughly four miles from Highway 20 on Bowman Lake Road (FS Road 18). At its maximum water surface elevation of 5,341 feet, Fuller Lake has 70 water surface acres, and 1.3 miles of shoreline. Though more than 80 percent of the shoreline is accessible by foot, private ownership restricts public access on much of the northern shoreline. Fuller Lake offers day-use and water-based recreation opportunities, a picnic area, and an angler access facility. Several private homes and the Grass Valley Rod and Gun Club (club's use is predominately fishing) are located on the reservoir's western shore. Fuller Lake is one of the least remote and most popular reservoirs in the Lake Spaulding Recreation Area (NID, PG&E 2011a, page E6.6-25). The TNF's LRMP includes just Fuller and Rucker Lakes within the Fuller Management Area (052) (USDA Forest Service 1990). Due to the high visitation, recreational organizations and private homes at the lakes, Fuller and Rucker lakes have a ROS setting of Rural. Every year, CDFG stocks the reservoir with rainbow or brown trout every other week, from May through July (CDFG 2007). Popular activities at Fuller Lake include picnicking, fishing, and small motorized and non-motorized boating. Most of the recreational activity at this lake is fishing-related. In the winter (typically November through April) Fuller is accessible by snowmobile, via Bowman Road that is track packed by NID's snowcat that is used to maintain over-snow access to Bowman Reservoir through the winter. Nevada County maintains a 10 MPH speed limit on Fuller Lake.

Currently two recreational facilities are located at the Fuller Lake: 1) Fuller Lake Day Use Area and Boat Launch on NFS land, and; 2) Fuller Lake Angler Access on PG&E land. The Fuller Lake Day Use Area and Boat Launch includes a picnic area with one accessible site, paved parking lot, accessible toilet, and boat launch for small boats. The Fuller Lake Angler Access includes an accessible toilet with one accessible parking spot, and a small gravel parking area with boulders that restrict trailer boat launching, but allows for car-top boat launching.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility (some of which are identified in the FLA) are:

Fuller Day Use/Boat Launch Site (Development Scale 3 facilities) (NFS lands)

Within 5 years of license issuance reconstruct the Day Use/Boat Launch, including:

- Replace/rehabilitate the existing facilities/amenities, i.e. picnic sites and paths.
- Install at least 2 animal resistant trash receptacles and trash service.
- Relocate the fee station to make it more visible.
- Install a minimum 20 foot long courtesy dock on the south side of the ramp.
- Improve/expand info board signage with resource protection info.
- Expand and improve the turnaround at the top of the boat launch ramp to accommodate boats/trailers up to 16 feet long.
- Expand the existing trailer parking spaces to 40 feet and add new trailer spaces to create a total of 15 40-foot trailer parking spaces.
- Provide 15-20 single vehicle parking spaces at the Fuller Lake Day Use Area and Boat Launch facility, and enough parking opportunities near the Angler Access site to accommodate 40 single vehicles combined between the two sites. Work with FS if it is necessary to define safe parking in the Bowman Road Right-of-Way to accommodate the needed parking.
- Install the following accessible features south of the boat launch: fishing pier; restroom, minimum of 1 van accessible parking space, and paths meeting ORAR standards linking all the accessible features. Improve the fish habitat in the location of the fishing pier to attract fish. In design, consider installing one accessible picnic site next to the pier.
- Install trail and lake directional signs at the trail entry points and intersections.
- Provide trail system information on a bulletin board at trail system entry access points: angler access; penstock access road intersection with Bowman Road; Rucker Lake Trailhead, and Blue Lake Trailhead.

If monitoring determines that additional parking is needed at the Spaulding Lake Trail access point off Bowman Road (shared with Fuller lake Angler Access parking), then construct trailhead with single-unit toilet and parking for a minimum of 10 vehicles.

Fuller Angler Access (Licensee Lands)

Within 5 years of license issuance:

- Re-grade and place gravel on the existing dirt parking area.

- Improve/expand information board signage (incl. land/water resource protection information).

Rationale

Fuller Lake and Lake Valley Reservoir had the highest recreation use of any of the reservoirs in the Project in 2009. In Licensee use projections for the Project, Fuller Lake use is projected to grow between 20,000 and 34,000 RDs by 2050 (PG&E 2011, 3.7.4.1.3 Peak Season Projections). Additional facilities and management at Fuller Lake will be necessary to meet the increasing demand and to protect the natural resources.

Most visitors participated in trout fishing and they rated their fishing experience as "good" to "very good" overall. The reservoir water level remains relatively full during the fishing season and did not inhibit visitors' recreation activities, or the scenic quality of the shoreline (NID, PG&E 2011a, page E6.6-55). The most common watercrafts were fishing float tubes (3.3 avg./9 max.), followed by fishing boats (2.6 avg./10 max.), and canoes/kayaks (1.8 avg./8 max.) (PG&E 2011, Table 3.3-34). Fishing (73.8 percent primary activity and 13.3 percent secondary activity) and picnicking (8.2 percent primary activity and 30 percent secondary activity) were by far the most popular activities recreationists engaged in at Fuller Lake (PG&E 2011, Table 3.4-324.)

Surveys conducted in 2009 at the Fuller Picnic/Boat Launch parking lot indicate that though the average overall occupancy was 37 percent, the maximum overall occupancy was 136 percent of the current capacity. The weekend maximum occupancy was 136 percent, the weekday maximum occupancy was 129 percent, and the holiday maximum occupancy was 107 percent (PG&E 2011, Table 3.3-32). Of the visitors at Fuller Lake that were asked what they preferred for new facilities, 24.6 percent preferred new boat trailer parking and another 25 percent indicated a preference for new "other trailer parking" (for boats, OHVs, etc.) (PG&E 2011, Table 3.4-352). Since boats are the only craft trailered to the Fuller lake Boat Launch, and there is no OHV use, it is reasonable to conclude that a substantial number of visitors preferred new boat trailer parking. The same survey indicated that 45.6 percent preferred additional vehicle parking opportunities.

Recreationists surveyed at Fuller Lake in 2009 also indicated the following preferences for new facilities: 50.7 percent would like new toilets; 39.4 percent want trash receptacles; 38.8 percent desire new picnic facilities; 38.5 percent want shoreline trails, and 29.4 percent would like to see an accessible fishing pier (PG&E 2011, Table 3.4-352)**.** An accessible fishing pier at Fuller Lake was one of the recommended items in the Pacific Forest and Watershed Lands Stewardship Council's Land Conservation Plan (Stewardship Council 2007, Table YB-2).

At the Fuller Reservoir developed sites, the DS recreational survey indicated additional efforts to manage trash are already needed. In that survey, (lack of) trash receptacles were rated the least (at Fuller Angler Access), or second least (at Fuller Day Use/Boat Ramp) acceptable condition at the lake (PGE Tech Memo 8-2a, Table 3.4-328, Table 3.4-329).

Hiking is an activity that a notably high percentage of the recreationists in the Spaulding Recreation Area participate in. Seventy-seven percent of the users of Rucker Lake; 64 percent of the users of Spaulding Lake; 75 percent of day visitors and 64 percent of overnight visitors of Blue Lake reported hiking as an activity they participated in (PG&E 2011, Table 3.4-374. Table 3.4-225, Table 3.4-411, Table 3.4-413) therefore it is advantageous that visitors to project lakes have information on trail system in the area.

Visitor Capacity – TNF has completed some basic capacity analyses during the Drum Spaulding hydro-relicensing for this popular fishing lake. Fuller Reservoir is approximately 70 acres in surface area. With the FS proposed parking facilities, and accounting for the private land boat use, the TNF expects a maximum of about 40 vessels (including non-trailed water craft, i.e. float tubes) on the 70-acre reservoir, or approximately 1.75 acres per boat. This boat/acre metric is easily within the range identified in various studies and other planning processes. The Bureau of Outdoor Recreation recommends a density coefficient for fishing at.5ac./boat (BOR 1977), and Warren & Rea (1989) recommends a density coefficient for fishing at 1.3 ac./boat.

Rucker Lake

Rucker Lake is located 5.5 miles from Highway 20 on Bowman Lake Road (FS Road 18) and Rucker Lake Road (FS Road 18-6). When full, Rucker's maximum water surface elevation is 5,464 feet, it has 79 water surface acres and 1.5 miles of shoreline. Approximately 50 percent of the shoreline is accessible to the public by foot. Private landowners (private homes) restricts public foot access to the west and southwest portions of the lake, but ¼ mile of the NFS land shoreline that is landlocked by private land is open to the public via boat access. Rucker Organization Camp is located on a portion of Rucker's north shore and limits public access in that area. Marshy areas also restrict access elsewhere along the shoreline. Rucker Lake provides opportunities for camping, small non-motorized boating, and swimming. Nevada County has designated Rucker Lake as a special fishing lake (Bass), and has an ordinance that prohibits internal combustion engines. The TNF's LRMP created the Fuller Management Area (052) to include just Fuller and Rucker Lakes and surrounding area (USDA Forest Service 1990). Because of the organization camp and private homes, Rucker Lake has a ROS setting of Rural. Popular activities at Rucker Lake include camping, swimming, hiking and fishing. Though hiking was identified by Rucker Lake visitors as a common activity, there are no formal trail opportunities available at or near Rucker Lake; therefore, most recreationists must be utilizing the primitive roads in the area for hiking.

Rucker Lake currently has a small seven-unit walk-in campground, with an accessible 2-unit toilet, picnic tables, fire rings, site markers and relatively small food lockers. Campers park in the designated parking lot and walk approximately 300 feet down an approximately 25 percent slope to the campground. Boaters typically travel through one of the campsites to launch their watercraft.

Licensee and FS engaged in many discussions concerning the recreation management needs for Rucker Lake and the redevelopment of the campground after the filing of the draft and final license application, and have generally come to agreement on a plan for redeveloping the Rucker campground.

Specific measures (a few of which are included in the FLA) for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are:

Rucker Lake Campground Reconstruction and Expansion (Development Scale 3 facility) (NFS lands)

Within 3 years of license issuance:

- Install and maintain a heavy-duty directional sign for Rucker Lake, Blue Lake and Rucker Campground at Bowman Road.
- Rehabilitate existing campground features, including:
    - Refurbish or replace tables.
    - Replace metal fire rings if not in good condition.
    - Replace or refurbish site identification markers if not in good condition.
- Replace existing smaller food lockers with 30-cubic foot food lockers.
- Provide six additional campsites.
- Define and further develop the trail between the parking area and the camping area.

Within 10 years of license issuance:

- Convert Rucker Campground to a 20-unit, plus 1 host site, drive-in (non-trailer single car) universally accessible campground with paved or gravel maintenance level 3road, picnic tables, fire rings, site markers, parking spurs, 2 double-unit vault toilets and 30-cubic foot food lockers.
- Develop and provide potable water with distribution system.
- At host site provide water, septic, and power (solar panels, or quiet generator).
- Expand the campground to the east developing the campsites sites at least 100 feet from the shoreline. Cross a short (15 foot) wet spot with an appropriate engineering method to access the flat to the east of the existing campground. Work with the FS Landscape Architect to thin the dense stand of trees between the campsites and the shoreline to enhance the lake views from the campground.
- Convert the two sites near the informal boat launch to picnic sites.
- Develop the informal boat launch as an accessible formal car-top boat launch, pave (or gravel) and sign as a boat launch.
- Rehabilitate the 3 or 4 campsites east of the new picnic sites and designate them as walk-in sites, create the designated parking spaces for these sites a minimum of 100 feet away from the shoreline.
- Install a new campground information board with campground and resource protection information.
- Convert the existing campground parking area into a trailhead (parking for 20 vehicles), install a minimum two-panel information board (provide recreation opportunities and natural resources information).

<u>Rationale</u>

The Rucker Campground directional sign has been a target for theft for years. To address this issue, subject to Forest Service approval, Licensee will construct a large, heavy, durable, or other vandal resistant concept, sign at the Rucker/Blue Lake turnoff on the Bowman Lake Road. (FS recommends using a large sand-blasted boulder or similar heavy weight design.) Without a sign along Bowman Road and adequate signing along the access road, Rucker Lake is a facility that most visitors will only find through word of mouth. Long term residents, who frequently recreate in this area, are unaware of the existence of this campground. Several of the individual comments at Rucker Lake reflected the "hidden" nature of this facility. Apparently the entrance sign on Bowman Road was frequently stolen in the past. Some managers postulate that the sign was an attractive target for theft. Others managers postulate that the sign was a target from neighboring land owners who wanted to reduce traffic at the lake. In either case, by providing a vandal & theft resistant sign, this problem should be resolve. If the sign continues to be stolen, Licensee should work with law enforcement authorities in an attempt to locate the perpetrator(s).

The Fuller/Rucker area has long been popular with recreationists. The 1962 PG&E Recreation Study, South Fork Yuba-Bear River Watersheds, noted that Fuller Lake campground (which has since been closed) was full on weekends (PG&E 1962). This plan proposed development of campgrounds on Licensee land along Fall Creek and Rucker Creek over the following 10 year period. None of these proposed campgrounds are in existence today. The 1990 TNF LRMP identified the opportunity to work with Licensee to develop adequate recreation facilities on PG&E land to meet the recreation demand. The 1994 PG&E Exhibit R specified converting Fuller Lake campground to a day use area and converting Rucker Lake dispersed camping area to hike in, tent 13-15-unit campground. Both of these actions were successfully completed by Licensee, although the capacity of Rucker (currently listed as 7 units) is currently smaller than envisioned. No additional campgrounds were built in the vicinity to accommodate the use that was displaced from the closure of Fuller Lake campground, although clearly the demand for camping has increased since 1962.

In PG&E's revision to Revised Exhibit R submitted to the Commission on October 30, 1992, PGE proposed a 30-unit campground southeast of Rucker on PG&E land (just northwest of Fuller) (PG&E 1992, page 56). Although the final 1994 Exhibit R did not include the 30-unit PGE campground, FS still believes that additional overnight camping opportunities are needed now and will increasingly be needed in the future. The Technical Memorandum 8-2a projected a 70 percent increase in use during the term of the license (PG&E 2011). Surveys conducted in 2009 at Rucker Lake and use projections predict that Rucker Campground would exceed its current capacity during the license period (NID, PG&E 2011a, Table 6.6.1-23).

FS policy (USDA 1998) is to provide 100 percent barrier-free access where possible, consistent with the intent of the Region 5 (R5) "Universal Access Strategy." The terrain at the Rucker Campground is relatively flat and amenable to developing the entire campground as accessible.

When Rucker visitors were asked about potential future improvements, a majority (58 percent) reported potable water was highly or slightly preferred (PG&E 2011, Table 3.4-392). Visitors at Blue Reservoir (only 1 mile away) also indicated strong support for potable water in the general area as 50 percent of them preferred potable water at Blue Lake (PG&E 2011, Table 3.4-431). One of the spigots shall be provided for the camp host.

Despite having food lockers at each Rucker campsite, surveys indicated that 41.7 percent of the Rucker Campground users highly preferred new food lockers (PG&E 2011, Table 3.4-392). This is due to the fact that the current food lockers are too small to hold the common food coolers used by recreationists. Through experience, the TNF has determined that food lockers need to have 30-cubic feet of volume to meet the needs of today's campers.

Given the campground expansion, the existing double unit vault toilet building will not support the future predicted use. To accommodate the need for additional bathroom capacity, and be consistent with Forest Service vault toilet building capacity guidelines, a second double-unit vault toilet building is needed.

At the Rucker Reservoir campground, the DS recreational survey indicated additional efforts to manage trash is already needed. In that survey trash receptacles were rated the most unacceptable facility condition at the site (PG&E 2011, Table 3.4-378), and ranked the most preferred potential future improvement (68 percent reported trash receptacles were highly or slightly preferred (PG&E 2011, Table 3.4-392)). Trash collection is consistent with the Rural ROS of this area.

Blue Lake

Blue Lake is located 6.3 miles from Highway 20 on Bowman Lake Road (Forest Service Road 18) and Rucker Lake Road (Forest Service Road 18-6). The access road to Blue Lake is a rough road; four-wheel drive is needed as you near Blue Lake on PG&E land. Low clearance vehicles and trailers are not recommended even though the road on NFS is designated as a maintenance level 3 road. At the request of FS, PG&E closed vehicular access to the campsites on the northeast side of the lake in 1998, to prevent motor vehicle trespass into the Grouse non-motorized area at the west end of Blue Lake. At its maximum water surface elevation of 5,931 feet, Blue Lake has 60 water surface acres and 1.3 miles of shoreline. At the locked gate there is an informal parking for 15 VAOT. The entire shoreline is accessible to the public by foot, although this access can be difficult when the reservoir is full due to the thick brush on the north shoreline. Two primitive camping areas are located along the west and northeast shoreline of Blue Lake and consist of nine sites, each with a steel fire ring. One campsite near the parking area locked gate has a wood picnic table, and steel and rock fire rings. No sanitation facilities exist at or near the lake. PG&E owns, manages and built the facility on PG&E land. However, FS owns the land underlying the reservoir.

A Nevada County ordinance sets a speed limit of 10 MPH on Blue Lake. With no vehicle access to the lake motorized boat use is impractical. Blue Lake is within the South Yuba Management Area (042) of the TNF LRMP (USDA Forest Service 1990), which applies the ROS setting of Roaded Natural. The most popular activities at Blue Lake include camping, swimming, hiking and fishing (PG&E 2011, Table 3.4-413).

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility that Forest Service recommends are:

Recommendations on Licensee Lands:

Within 5 years of license issuance: bring the Blue Lake Dam access road (which parallels the creek after leaving FS Road 18-6) up to Maintenance Level 3 standard for passenger vehicles.

Rationale

The 2-mile long Blue Lake Road (18-6 Road), the sole motorized access to the Blue Reservoir, from the Bowman Road is designated as a Maintenance Level 3 road (USDA Forest Service 2010). However, the current condition of the route more approximates a Maintenance Level 2 road, resulting in a road surface filled with potholes and washboards, making travel by visitors (especially in sedans) rougher, slower, and more dangerous than optimal. The Blue Lake visitor survey supported the need to improve the maintenance level on this route, as only 2 of 9 respondents who voiced an opinion about the Blue Lake Road rated the road as totally acceptable; the rest rated the route as slightly acceptable, or slightly unacceptable (PG&E 2011, Table 3.4-401, Table 3.4-402). One of the surveyed visitors made the following statement regarding the Blue Lake Road, "Last section of road before parking area definitely needs to be graded and maintained" (PG&E 2011, Table 3.4-403).

<u>Bear Valley Group Camp and the Discovery Trail (Licensee Land)</u>

The Bear Valley area consists of two facilities – Sierra Discovery Trail and Bear Valley Group Campground. Forest Service supports the PG&E proposed measures on PG&E lands identified in their FLA (NID, PG&E 2011a, page E6.6-99):

Recommendations on Licensee Lands (all of which are included in the FLA):

Sierra Discovery Trail

Repair or replace the existing trail boardwalk, as needed.

Bear Valley Group Campground

- Grade and level the group area around the large group fire ring.
- Provide 2 accessible campsites adjacent to the central group area.
- Grade and level two tent pad areas and an access route from the central group area.
- Create a space within the existing food preparation and cooking area that meets accessibility guidelines (ADAAG). This area will include a hardened surface (e.g., concrete) with accessible food preparation tables. The area shall also have an accessible path from the central paved access area.
- Install 5 new animal-resistant food lockers adjacent to the central food preparation and cooking area.

Grouse Recreation Area

The Grouse Recreation Area contains eight Project reservoirs on PG&E and NFS lands (Feeley, Carr, Lower Lindsey, Middle Lindsey, Upper Lindsey, Culbertson (also has other private land near the lake) Lower Rock, and Upper Rock lakes). The Grouse Recreation Area is located north of the Interstate 80/Highway 20 interchange. These Project reservoirs are either on the periphery or within the FS Grouse Lakes non-motorized area. The FS has designated the NFS lands within the Grouse Recreation Area into two ROS classes, Roaded Natural and Semi-Primitive Non-Motorized. NFS land around Lower Lindsey and Carr lakes, which are accessible by road, are designated as Roaded Natural. Gates located at the east end of the drive-in Lindsey Campground and at the north end of Carr Lake prevent vehicles from entering into the Grouse non-motorized area. Carr Lake Campground is behind the gate and is managed for a walk-in camping experience. NFS lands around Feeley, Middle and Upper Lindsey, Culbertson, and Upper and Lower Rock lakes are designated as Semi-Primitive Non-Motorized. Elevations in this area range from 5,000 to 7,000 feet.

PG&E charges a user fee for recreation use of the developed camping facilities at Lower Lindsey and Carr Lakes while the other reservoirs have no recreation fee for use of the dispersed sites. Access to the Project reservoirs is provided by TNF & PG&E roads and TNF trails. Primary access to the Grouse Recreation Area occurs via Bowman Lake Road (Forest Service Road 18), which is paved beyond the Carr-Lindsey Road (Forest Service Road 17) junction. The Carr-Lindsey Road (FS Road 17) is designated as a Maintenance Level 3 road, and provides access to two reservoirs Lower Lindsey and Carr (FS Road 17-4) lakes.

Access in the Grouse Lakes Area, with over 20 lakes, is via a 14 mile network of TNF trails used by hikers, backpackers, mountain bikers, and horseback riders. Approximately 2 ½ miles of the trail network is actually a road used by PG&E to maintain their Project facilities from Lower Lindsey up to Lower Rock Lake. A private landowner also uses the road to access his cabin and buildings near Culbertson Lake. Most of the recreational opportunities in the Grouse Lakes Area are undeveloped.

Carr-Feeley Reservoirs

Vehicle access to the Carr and Feeley Reservoirs is via the Bowman Lake Road, to FS Road 17 for 2 miles, and then the final ½ miles on FS Road 17-4. Most of Carr Lake and all of Feeley Lake are located on NFS lands. A small portion of Carr Lake's western side is on PG&E land. There is a 30 vehicle parking lot near Carr Lake that serves the campground, day users visiting the Project lakes and hikers, backpackers, equestrians and mountain bikers venturing further into the Grouse Lakes Basin. A gate just prior to Carr Lake prevents vehicles from driving to the shorelines of Carr and Feeley reservoirs and into the FS Grouse Non-Motorized Area. From the parking lot recreationists walk a short distance to reach the two Project lakes.

At its maximum water surface elevation of 6,664 feet, Carr Lake has 16 water surface acres and 0.6 miles of shoreline. Approximately 60 percent of the lakeshore is accessible by foot. Foot access to the remaining shore is limited by steep terrain and thick brush.

Carr Lake has a walk-in campground and trailhead facility primarily located on NFS land, with a portion on PG&E land. Common recreational activities include fishing, small motorized and non-motorized boating, and camping (NID, PG&E 2011a, Page E6.6-28).

When full, Feeley Lake has a surface elevation of 6,724 feet, has 51 water surface acres, and 1.6 miles of shoreline. Feeley Lake is within walking distance (0.2 miles) from Carr Lake and is accessed via a trail (old road bed up to the dam) from the Carr Lake Trailhead. However, there are ample shoreline recreation opportunities, as approximately 90 percent of Feeley Lake is accessible by foot. An informal, unimproved boat launch is located near Feeley Lake Dam. Feeley Lake provides opportunities for day hiking, backpacking and fishing, but due to the terrain, does not provide appealing shoreline camping opportunities (PG&E 2011a, Page E6.6-28).

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are:

Carr Lake Campground (Development Scale 2) (NFS land)

Within 5 years of license issuance reconstruct the Carr Lake Campground, including:

- Replace the existing 2 single-unit toilets with a single-unit accessible toilet (serves 5 campsites).
- Install a double-unit accessible toilet at the southern end of the parking area, with a directional sign for the toilet opportunity at the entrance of the parking area.
- Construct a trail at a 5 percent grade or less from the double-unit toilet to the existing campsites on the northwestern portion of the lake (sites 1-5).
- Construct a trail at a 5 percent grade or less from the double-unit toilet to the new campsites to be constructed on PG&E land on the west side of Carr Lake.
- Convert the campsite on the northern tip of the lake (site 6) that is used as an informal boat launch into an actual informal boat launch. Sign the boat launch opportunity.
- Rehabilitate the existing campsite facilities and information board.
- Provide tables, fire rings, tent pads, site markers, and animal resistant food lockers (30 cubic foot) at each site.
- Designate parking spaces for Carr Lake Campers.

Carr Lake Trailhead/Day Use (Development Scale 2) (NFS lands)

Within 10 years of license issuance:

- Install three picnic sites (picnic table, cement BBQ grill with self-contained ash box , paths) on the western edge of the parking area that overlook the expansive views looking west. Construct and designate one of these site as fully accessible, including designating an accessible parking space.
- Staying approximately within the current parking area perimeter and working with the FS Landscape Architect increase the trailhead/campground parking capacity by 15 vehicles by moving boulders, clearing a few trees and grading the parking surface.

- Provide a three panel information kiosk with information about recreational opportunities, Project highlights, area natural resources highlights, leave no trace camping, proper food storage, proper human waste disposal and preventing the spread of aquatic invasive species and disease causing fungus such as *chytrid*.

Carr Lake Campground Expansion (Development Scale 2) (Licensee Lands)

Recommendations on Licensee lands (most of which are include in the FLA):

Within 5 years of license issuance, on the west side of Carr Lake create 5 to 6 new campsites on a broad ridge that overlook Carr Lake. At each campsite provide firering, picnic table, site marker, animal resistant food lockers (30 cubic foot), clear floor space around site features, tent pad, and paths connecting site with parking area and toilet.

Rationale

The DS survey supports the replacement of the existing toilets as the condition of the toilets were rated the most unacceptable facility condition at Carr and Feeley reservoirs (PG&E 2011, Table 3.4-463). Furthermore, when visitors to Carr and Feeley Reservoirs were asked about potential new facility improvements, restrooms ranked as the most preferred with 48 percent of the users indicating a desire for toilets (PG&E 2011, Table 3.4-483).

The double-unit toilet at the parking area is needed because currently there are no restrooms facilities at the west end of Carr Lake, where they are needed to serve overnight visitors in campsites 1-5, and day users utilizing the Carr/Feeley Trailhead.
When Carr Lake visitors were asked why facilities were unacceptable, common responses included “no restroom”, “no restroom near parking area”, or “restroom was far away”. Currently, the campsites on the northwest side of the lake are approximately 1,500 feet away from the toilet located on the eastern part of the lake. FS design standards specify that users should have to travel no more than 500’ (0.1 miles) to a toilet (FSM 2333.51). The additional double-unit toilet would bring the campground much closer to meeting this FS design standard. A large percentage (52.9 percent) of the overnight visitors reported seeing evidence of human waste at Carr Lake Campground, and one-third of the trailhead users also reported seeing evidence of human waste (PG&E 2011a, Table 10). This indicates that the majority of users that come to this Project lake potentially come into contact with human waste.

The DS survey supports improving the parking situation at Carr/Feeley lakes as the condition of the vehicle parking areas was rated the second most unacceptable facility condition at Carr and Feeley reservoirs (PG&E 2011, Table 3.4-463). Furthermore, when visitors to Carr and Feeley Reservoirs were asked about potential new facility improvements, 44 percent preferred additional vehicle parking (PG&E 2011, Table 3.4-483).

In 2009, the overall peak season occupancy for the Carr-Feeley Trailhead (30 VAOT) was 61 percent, and by 2050, it is projected to reach 99 percent (Table 3.7-31). Holiday capacity was already at full capacity in 2009; and weekend capacity is projected to reach full capacity by 2020 (PG&E 2011, Page 452 of 514). There is also the opportunity to redistribute some of the trail use, thereby reducing the demand for this facility. Providing a more attractive hiking experience along the Project lakes in the Lindsey Lake area prior to expanding the Carr-Feeley trailhead, may attract some of these current users to the much less used Lindsey Lake trailhead. Charging a fee for Carr-Feeley trailhead use (while not charging a fee at other trailheads) offers another potential opportunity to redistribute use, (but this fee collection could create a management challenge unless there is a host onsite).

The current lack of campsite amenities, poor condition of the existing toilet facility and crowded weekend parking at Carr Lake Campground all combine to lessen the attraction and use of the campground. Restrooms and parking were some of the top items listed as most unacceptable facilities in a survey of the Carr/Feeley visitors (PG&E 2011, Table 3.4-483). None of the facilities at Carr Lake are accessible. Lack of food lockers was specifically listed by several respondents as to why they were not satisfied with the facilities. The occupancy rate of Carr Lake Campground in 2009 was documented at 31 percent for weekends (PG&E 2011, Table 3.7-30). The lack of campsite amenities, poor toilet facilities and insufficient parking most likely contributed to the low occupancy rate. In contrast to the low campground occupancy rate listed, a survey of the visitors of Carr and Feeley Reservoirs documented that 37 percent preferred additional campsites in the area (PG&E 2011, Table 3.4-483). This discrepancy between the low documented occupancy and the demand for additional campsites is indicative of the desire for better campsites and campground amenities. Recreational use in the Project as a whole is expected to increase significantly over the license period. Technical Memorandum 8-2a projected a 70 percent increase in use during the term of the license (PG&E 2011). Developed camping is recognized as the predominate current recreational activity for *both Projects, and is projected to remain the predominate activity in the future, “Clearly, camping, and especially developed camping, will likely continue to be the predominant recreation activity based on the high percentage of visitors participating and the expected growth rate.” (NID 2011). Thus, it is prudent to for PG&E provide additional and desirable camping facilities at its Project lakes.

Lower Lindsey Lake

Lower Lindsey Lake is located approximately 13 miles from Highway 20 via Bowman Lake Road (Forest Service Road 18) and Carr-Lindsey Road (Forest Service Road 17). The road is accessible by passenger vehicle until approximately 0.3 miles prior to reaching Lindsey Lake and the campground, where high-clearance vehicles are highly recommended. At its maximum water surface elevation of 6,236 feet, Lower Lindsey Lake has 29 water surface acres and 0.9 mile of shoreline. Approximately 80 percent of the shoreline is accessible by foot. Vehicle access is possible along the north shoreline of the lake through the 12-unit Lindsey Lake developed campground. The only accessible feature at the Lindsey lake Campground is a double-unit toilet; however there is no accessible path to the toilet. PG&E operates and maintains the campground and charges a camping fee. Steep terrain and thick brush limit access to portions of the south and east shoreline. Overall, Lower Lindsey Lake provides recreational opportunities for developed camping, fishing, boating, and access to trails for hiking, mountain biking, and horseback riding within the Grouse Non-Motorized Area.

The majority of Lindsey Lake day use visitors participated in swimming, hiking/walking, fishing, picnicking, and wildlife viewing (PG&E 2011, Table 3.4-514). Fishing and hiking/walking were also the most common primary activity of Lindsey Lake day use visitors (PG&E 2011, Table 3.4-515). The majority of overnight visitors to Lower Lindsey Lake participated in camping, hiking/walking, and swimming (PG&E 2011, Table 3.4-516). Camping and hiking/walking represented the most common primary activity participation of overnight visitors (PG&E 2011, Table 3.4-517). All day and overnight users surveyed at the Lindsey Trailhead participated in hiking/walking (PG&E 2011, Table 3.4-518 and 520).

Specific measures (some of which are included in the FLA) for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are:

Lindsey Lake Campground (Development Scale 2) (NFS land majority, one campsite on Licensee Land)

Within 2 years of license issuance:

- Replace the single panel entrance station information board with a three panel kiosk that provides appropriate educational information on land and water related resource protection measures, emergency contacts, recreation area and campsite layout maps, safety, recreation and water surface regulations, wildfire prevention, sanitation, and preventing the spread of aquatic invasive species and disease causing fungus such as chytrid.
- Improve/re-define campsite vehicle spurs with rock barriers.
- Grade, gravel and remove protrusions in the access road, campground road and vehicle spurs.
- Convert the campsite immediately east of the informal boat launch) to a picnic site.
- Install and/or replace existing vehicle barriers along the access road, the campground road and spurs as needed to effectively manage vehicles.
- Gravel the boat launch, sign as a car-top boat launch and designate and sign a single space for vehicle loading/unloading (but not parking).
- Install directional signage for the Lindsey campground and trailhead facilities at the intersection of Bowman (FS 18 Rd) and the Carr-Lindsey (FS 17 Rd) roads to direct Lindsey Lake visitors to the FS 18-9 Rd route (shorter). Install directional signs at the intersection of Bowman Road and FS 18-9 Rd, intersection of FS 18-9 Rd and FS 17-8 Rd, and intersection of FS 17-8 Rd and FS 17 Rd.

Within 15 years of license issuance, redesign/reconstruct campground. Prior to this time, and after the construction of the Lindsey Creek Campground (see new campground facility proposal), coordinate with FS to consider converting all or a portion of the campground to day use, or a combination of day use and hike-in campsites. Reconstruction would include the following:

- Replace toilet if needed. If toilet is not in need of replacement, retrofit toilet to provide lighting (solar tube/skylight), assisted venting (with solar panel powered fans) and an accessible path to entrance.
- Replace tables and fire rings (if the site remains a campsite). If sites are converted to day-use, replace tables and replace fire rings with barbeque grills with self-contained ash box.

- Provide appropriate signing that meets Forest Service standards and specify that Lindsey Campground is for campers only and not for use as trailhead parking.
- Replace unit markers.
- Re-gravel road and spurs and barrier as needed.
- Install an animal resistant food locker at each campsite (30 cubic-foot minimum).

Lindsey Trailhead (Development Scale 3) (NFS land)

Within 5 years of license issuance:

- Expand existing parking capacity by a minimum of 10 vehicle spaces (minimum total 30 spaces trailhead parking).
- Install an accessible vault toilet (minimum single-unit).
- Install three picnic sites with tables and BBQ grills with self-contained ash box. .
- Install Site Identification sign to Forest Service standard specification.
- Provide information panels that provide appropriate educational information on land and water related resource protection measures, emergency contacts, recreation area and trail maps, safety, recreation and water surface regulations, wildfire prevention, environmentally friendly backcountry sanitation techniques, and preventing the spread of aquatic invasive species and disease causing fungus such as chytrid.
- Provide trail system information on a bulletin board at Lindsey Trailhead.

Lindsey Creek Campground (Development Scale 3) (NFS Land)

Within 10 years of license issuance or when triggers dictate that the new facility's camping capacity is needed (whichever comes first):

- Construct a 20 to 25 unit drive-in family campground on the south side of Lindsey Creek across from the Lindsey Trailhead.
- Provide a camp host site with water spigot, septic (or holding) tank and power (solar panels or a quiet generator).
- Provide potable water and distribute water to Lindsey Trailhead and Lindsey Lake Campground (or Day Use site if converted). The number of spigots will be appropriate to the Development Scales.
- Access road and campground road will be a gravel Maintenance Level 3 road. Gravel spurs. Cross (by bridge or bottomless culvert) over Lindsey Creek west of Lindsey Trailhead.
- Install rock barriers to prevent vehicles from leaving the campground road and spurs.
- Install 2 double-unit accessible vault toilets.
- Install a 30-cubic foot food locker, picnic table, site marker, tent pads and fire ring at each site.
- Install site identification sign to Forest Service sign standards.
- Install pay station and information panel (include information on regulations, map of campground, resource protection and recreation opportunities).

Rationale

Lindsey Lake Campground

Visitors surveyed at Lindsey Lake indicated a notable preference for new camping facilities and amenities. When Lindsey Lake campers were asked what new facilities they preferred, 42.8 percent indicated that they preferred new campsites, 45.1 percent indicated that they desired food lockers, 47.9 percent preferred new restrooms, 57.7 percent wanted potable water, and 58.9 percent would like to see trash receptacles (PG&E 2011, Table 3.4-549). Lack of potable water, trash receptacles and food lockers were the top three items listed as most unacceptable (do not exist) facilities in a survey of the Lindsey Campground visitors (PG&E 2011, Table 3.4-528). There were two write-in comments indicating the lack of picnic tables as reasons why visitors rated facilities as unacceptable at Lower Lindsey Lake (PG&E 2011, Table 3.4-529). The restroom is the only accessible feature at Lindsey Campground, but there is no accessible path leading to it.

At the Lindsey Lake Campground, the DS recreational survey indicated additional efforts to manage trash is likely already needed. In that survey trash receptacles were rated the most unacceptable facility condition at the site (PG&E 2011, Table 3.4-529), and ranked the most preferred potential future improvement (58.9 percent reported trash receptacles were highly or slightly preferred (PG&E 2011, Table 3.4-549)). Although the TNF has chosen not to include any quantitative triggers or actions related to trash pickup and removal, the Forest still believes that refuse management is a critical element to managing recreation in the DS project area. It is Licensee's responsibility under the FERC license to maintain the Project facilities in a condition that provides for public health and safety. During PG&E/TNF annual coordination meetings, Licensee and TNF will work to develop actions to address any trash issues that may develop over time. Possible trash solutions may include but are not limited to: additional trash patrols, additional trash hauling, installation and maintenance of trash cans and/or dumpsters, and additional visitor education and signing.

PG&E proposed in their FLA to supply the following information on only one campground information board:

> "provides appropriate educational information on land and water related resource protection measures, emergency contacts, recreation area and campsite layout maps, safety, and recreation and water surface regulations. This information board will specifically contain information about fire, sanitation, and safety" (NID, PG&E 2011a, page E6.6-105)

It will take three panels to appropriately display the information above without overcrowding the board. Overcrowding, or cluttering, a board with information will cause visitors to bypass the information being displayed, thus one overcrowded information panel would not meet the intent to educate the visitors.

Currently the road and spurs at the eastern (far) end of Lower Lindsey Campground are suited for high clearance vehicles only. Though a section of the access road near Lindsey Campground is currently rough, the road is designated as Maintenance Level 3 (maintained for passenger vehicles). Once both the campground spurs and road are maintained to the intended design level, then vehicle access would be consistent and available to passenger vehicles, and use of the campground is expected to increase. The following is a comment given by a visitor as a reason why Lindsey Campground facilities are unacceptable, “Parking spur small and narrow, vegetation screening does not exist, vehicle parking inadequate many needed for hikers.” Another visitor wrote, “There really wasn't much of a spot to park because the fire pit and table were so close together where you parked was practically on top of it.” (PG&E 2011, Table 3.4-529).

About 19 percent of the visitors surveyed at Lower Lindsey Lake rated the signage to the facility as unacceptable (PG&E 2011, Table 3.4-530), while 35.5 percent of the visitors preferred new directional signage be provided (PG&E 2011, Table 3.4-549).

Lindsey Trailhead

In PG&E’s current Exhibit R, PG&E, TNF and FERC all recognized the need for a trailhead near Lindsey Campground, calling for developing parking for up to 30 VAOT, installing an information panel, and barriers (PG&E 1994). Currently parking for 20 VAOT has been developed and barriers installed. PG&E has expressed their plans to install an information panel to meet the provisions of the current Exhibit R measure.

It is clearly evident that the preponderance of the Lindsey Trailhead users are drawn to this location because of the six PG&E Project lakes that are within a 1/8 to 3 mile hike from the trailhead, via the FS Lindsey Trail, which is a road for 2 ½ miles. Recreation surveys conducted at Lower Lindsey Trailhead reveal that a large percentage of the day users not only hiked from this trailhead, but fished (42.9 percent), swam (28.6 percent) or picnicked (28.6 percent) (PG&E 2011, Table 3.4-518).

Expansion of the trailhead parking capacity is needed. One-third of the people surveyed at the trailhead preferred that there be more vehicle parking (PG&E 2011, Table 3.4-550).
In 2009 28.5 percent of Lindsey Trailhead visitors expressed that they felt slightly to extremely crowded (PG&E 2011, Table 3.4-543). PG&E’s 2009 low occupancy figures for weekend and holiday use at Lindsey Trailhead of 11 percent (or two vehicles) on average (PG&E 2011, Table 3.7-34) do not correspond with the visitors’ sentiments described above, nor with FS personnel observations of trailhead occupancy.

All recreationists using the Lindsey Trailhead before and after venturing to, or by, the Project lakes would benefit from the availability of the picnic sites and restroom. Over ¼ of the people surveyed (26.7 percent) in 2009 at Lindsey Trailhead reported seeing evidence of human waste (PG&E 2011a, Table 12). With more visitors coming to use the trailhead from general population growth and due to the proposed trail system connecting six Project lakes, human waste issues will only increase over time if no toilet facility is provided.

With the addition of a toilet and picnic sites, the Lindsey Trailhead/Day Use site would become a formal Developed Site. By Forest Service policy (Forest Service Manual 2330), every developed recreation facility is required to have a Site Identification sign that meets FS sign standards (Forest Service Handbook 7109.11a).

Lindsey Creek Campground

Recreational use in the Project as a whole is expected to increase significantly over the license period. Technical Memorandum 8-2a projected a 70 percent increase in use during the term of the license (PG&E 2011). Developed camping is recognized as the predominate current recreational activity for both Projects, and is projected to remain the predominate activity in the future, “Clearly, camping, and especially developed camping, will likely continue to be the predominant recreation activity based on the high percentage of visitors participating and the expected growth rate.” (NID 2011). Also see discussion of the broad need for recreation facilities at Projects, the TNF and Sierra Mountain range at the beginning of the Rationale for Specific Modifications and Enhancements at Existing Project Recreation Facilities and Water Supply Facilities, and New Project Recreation Facilities section. Thus, it is prudent for PG&E to provide additional and desirable camping facilities at its Project lakes.

PG&E reported the 2009 average weekend occupancy at Lindsey Lake Campground to be 60 percent and projects that by 2050 the average weekend occupancy would be 92 percent (PG&E 2011, Table 4.2-1). Forest Service observations of weekend use at Lindsey Lake Campground lead FS managers to believe these figures do not reflect the actual weekend use during mid-summer weekends. In 2009 the campground was at 100 percent occupancy during all July weekends, near full on four weekend days in June, and 62 percent on August weekends, indicating during the “high season” there will be a demand for additional campsites to accommodate summer weekend demand (PG&E 2010, 3.3.12.2 Developed Campground Facility Occupancy). The same report stated the following; “The campground was at full capacity nine times during the 2009 survey season, and all of these were weekend days in June, July, and August. The campground was near full capacity on four weekends in June (92 percent).” Use figures of average weekend use from 2006 to 2009 showed an increase in use of 79 percent in just four years (PG&E 2011, Table 3.7-33). In addition, 2 of the 12 campsites at Lindsey Lake Campground are to be converted to picnic sites (near the boat launch), thus lowering the availability of developed camping opportunities. With these factors combined with the attraction of the enhanced trail opportunity to six high Sierra Project lakes, it is FS’s professional judgment that the additional camping capacity will be needed within a decade.

Lindsey Creek Campground would be a short hike from six Project lakes with the Lindsey Lake Trail Development Project in place. This campground would serve as an overnight base facility from which to launch day use activities at the Project lakes. Providing hardened sites and toilet facilities will help protect the more sensitive lakeside environments from the impacts of heavy camping use.

Middle Lindsey, Upper Lindsey, Culbertson, Lower Rock, Upper Rock Reservoirs (the majority on Licensee Lands, portion of Culbertson Lake on NFS land)

These series of Project lakes are located within the TNF Grouse Non-Motorized Area. All the Project lakes except Upper Rock Lake are accessed by administrative use only gravel roads;

public vehicular access is restricted by a gate at the east end of Lindsey Lake Campground. This road is also the public hiking/walking access to the Project lakes.

Middle Lindsey Lake is located in the Grouse Lakes Recreation Area (less than a mile hike from Lower Lindsey Lake). At its maximum water surface elevation of 6,436 feet, has 21 water surface acres and 1.2 mile of shoreline. Approximately 75 percent of the shoreline is accessible by foot, with some areas inaccessible due to steep rock outcrops. Three designated primitive campsites with fire rings are on the north shoreline. The property around Middle Lindsey Lake is owned by PG&E (PG&E 2011, Page E6.6-29).

Upper Lindsey Lake is a small and secluded lake, surrounded by a steep high ridge. The reservoir is a 1.3-mile walk, on PG&E administrative roads, from the Lower Lindsey Lake Trailhead. At its maximum water surface elevation of 6,483 feet, has 4 water surface acres and 0.5 miles of shoreline. Approximately 40 percent of the shoreline is accessible by foot. Recreation opportunities are limited because much of the shoreline is steep, rocky, and covered with thick willows and manzanita, making foot travel and hiking difficult. Due to topography, camping opportunities are limited at Upper Lindsey Lake. Day-use activities are most common, and include hiking, swimming, and fishing. Upper Lindsey Lake does not have any developed site amenities (i.e., no steel fire rings). The property around Upper Lindsey Lake is owned by PG&E (PG&E 2011, Page E6.6-29).

Culbertson Lake is a 1.5-mile hike from the Lower Lindsey Lake trailhead. At its maximum water surface elevation of 6,436 feet, has 70 water surface acres and 2 miles of shoreline. The majority of the shoreline is accessible by foot, while a steep talus slope prevents access along the east shoreline. There are two cabins on a small parcel of private land located near the west shoreline near the dam, and public access is only allowed on the road through the private land. The remaining property is on NFS land and PG&E land. There are three designated primitive campsites on NFS land with steel fire rings on the west shore (PG&E 2011, Page E6.6-29, 30).

Lower Rock Lake is a 2.3-mile hike from the Lower Lindsey Lake trailhead, in a remote setting that offers overnight and day-use recreation opportunities. At its maximum water surface elevation of 6,626 feet, has 7.6 water surface acres, and 0.2 miles of shoreline. Approximately 70 percent of the shoreline is accessible by foot, although the southeast shoreline is difficult to access due to extremely steep terrain. Land around Lower Rock Lake is owned by PG&E. Camping is available at three hike-in designated primitive campsites along the northwest shore. Each site has a steel fire ring and site marker (PG&E 2011, Page E6.6-30).

Upper Rock Lake is the most remote Project reservoir in the Grouse Lakes Area. Upper Rock Lake is a 2.8-mile hike from the Lower Lindsey Lake trailhead. At its maximum water surface elevation of 6,715 feet, has 20 water surface acres and 1 mile of shoreline. Approximately 70 percent of the shoreline is accessible by foot, while steep topography limits access along the south shoreline. Land around Upper Rock Lake is owned by PG&E. Camping is available at three hike-in designated primitive campsites on the north and west sides of the lake. Each site has a steel fire ring and site marker (PG&E 2011, Page E6.6-30).

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are: (recommended for Licensee Lands; required on NFS lands)

Within 5 years of license issuance:

- At existing designated walk-in campsites at Middle Lindsey (3), Culbertson (3), Lower Rock (3), Upper Rock (3) – define campsite with site marker, install/replace fire ring and maintain fire clearing, maintain in trash-free condition.
- Monitor use to determine when additional dispersed campsites would be needed.
- Provide signage to lead backpackers to the dispersed campsites.

<u>Rationale</u>

Designating dispersed campsites in non-sensitive areas and located in fire safe locations, will help protect the natural environment around the Project lakes. One recreationist provided the following specific comment regarding signage, “We hiked to Culbertson Lake to fish but no signs indicated a trail to lakeshore that was not on private property, so had to bushwhack to shore then we found some campsites but had no idea how to get there from road. Signs for trail would be very helpful!” (PG&E 2011, Table 3.4-531).

Fordyce Recreation Area

The Fordyce Lake Recreation Area is located in the central portion of the TNF north of Interstate 80 (I-80) with elevations ranging from 6,200 to 7,000 feet. The area contains two Project reservoirs Lake Sterling, and Fordyce Lake. Forest Service has designated ROS classes for NFS land surrounding Lake Sterling and Fordyce Lake as Semi-Primitive Motorized. Primary access to Fordyce Lake and Lake Sterling is via Forest Service roads, Rattlesnake Road (FS Road 85) from I-80 (Cisco Grove exit) and then Forest Service Roads 85-2 and 85-2-1. The road to Fordyce Lake is improved dirt with gravel except for the last two miles, which is very steep and rocky and is only passable by four-wheel drive vehicles. The primary road (FS Road 85-2) to the west shoreline of Lake Sterling (where the campground is located) is steep for the last 0.8 miles. The road to Lake Sterling is not recommended for travel with trailers and four-wheel drive is recommended. There is a secondary Sierra Pacific Industries road to the east shoreline of Lake Sterling on PG&E property. This access is located off FS Road 85-2-2 past Magonigal Summit and includes rough sections of roads requiring high clearance vehicles.

Because of the recreational attraction of the Project lakes and rough nature of the roads to access them, these Project lakes have become very popular with OHV recreationists. A private campground at Cisco Grove markets and caters to this user group, which is a source of many of the day users at Fordyce and Sterling lakes.

<u>**Lake Sterling**</u>

Lake Sterling is located 6.1 miles north of I-80 at the Cisco Grove exit. At its maximum water surface elevation of 6,988 feet, Lake Sterling has 105 water surface acres and 1.8 miles of shoreline. The entire shoreline is accessible by foot, and 20 percent of the shoreline is accessible by vehicle. A Boy Scout summer camp is located adjacent to the public campground on TNF and PG&E land. The shoreline landscape is mostly dense forest with some small areas of steep rock outcrops. Lake Sterling provides recreational opportunities for camping, hiking, hunting, swimming, fishing, and small motorized and non-motorized boating. A walk-in six-unit rustic campground is located at Lake Sterling on the south shoreline (NFS lands). A double-unit toilet serves the campers and day users. A dirt and gravel parking area bounded by large boulders, with a capacity of 10 vehicles, is located approximately 100 yards uphill of the campsites. There are no accessible features at the campground.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility are (NFS lands):

Sterling Lake Campground Conversion to Day Use (Development Scale 3)

Within 10 years of license issuance:

- Remove all the campground facilities.
- Install four to five picnic sites set back 100’ from the water’s edge with tables, BBQ grills with self-contained ash box and site markers.
- Construct a five foot wide path of no more than 5 percent grade from the parking area to the picnic sites.
- Install a (minimum) single-unit toilet.
- Install directional signs to and from reservoir.
- Expand the parking area by 10-15 vehicle spaces.
- Pending DSOD approval install safety rail across dam for hiker safety.
- Provide Forest Service with access on PG&E lands.
- Install trail sign at parking area.
- Install adequate rock barriers at parking area to prevent off-road vehicle use.

Sterling Lake Dispersed Campsites (Development Scale 2) (Licensee Lands)

Recommendations on Licensee lands (most of which are included in the FLA):

Within 5 years of license issuance:

- Install at least three primitive campsites on the east end of Sterling Lake, include a fire ring and site marker at each site.
- Install an information board with site appropriate resource protection, camping and regulation information.
- Monitor use and human waste. If human waste exposure causes health risk concerns or over 25 percent of the users notice human waste, and/or monitoring surveys show that a majority of overnight visitors prefer more camping amenities on the lake, then pursue road right of way from Sierra Pacific Industries (SPI) for the access road to the east end of the lake. Construct 10-unit developed campground (Development Scale 2) with a minimum of fire rings and site markers at each site, information bulletin board and a single-unit toilet.

Rationale

Sterling Lake Campground Conversion to Day Use

Sterling Lake Campground (six campsites) receives very low use. In 2009 the overall average occupancy was 10 percent, the average weekend occupancy was only 32 percent, and the projected overall average occupancy by the year 2050 is only 16 percent (PG&E 2011, Table 3.7-12). This means that in 2009 only 2 campsites were used on average during the weekends throughout the peak recreation use season. These low occupancy figures match the FS's staff observations of the campground usage. What the TNF staff observations have revealed is that there is a substantial amount of day use at this location. A high percentage of these users are OHV enthusiasts exploring the different lakes in the area; Fordyce and Sterling (Project lakes), and; Upper Lola Montez Lake. This creates an undesirable situation for both day users and campers when many of the day users want to use the same shoreline area where people have their campsite set up. A survey of the visitors at Sterling Lake showed that about ¼ of them had conflicts with other users (PG&E 2011, Table 3.4-151). It is the FS's professional judgment that a small day use facility would better meet the needs and preferences of the recreationists at Sterling Lake than the existing campground. A survey of the day users at Sterling Lake indicated that 60 percent of them preferred to have new picnic facilities (PG&E 2011, Table 3.4-159).

The existing restroom facility is from the 1960's or 1970's era, is considered to be in "fair" condition but needs a new roof (NID, PG&E 2010, Sterling Lake); it is not accessible, has served out its useful life and needs to be replaced to better serve the recreating public at Sterling Lake.

An accessible path from the parking area, new accessible toilet, and picnic sites is feasible and would serve users of all abilities.

The lack of signage to and at Sterling Lake was specifically noted by some visitors during interviews; "No signs at all to this area", and "Several signs missing at intersections to lake access" (PG&E 2011, Table 3.4-145).

Currently there are only ten formal vehicle parking spaces at the west end of Sterling Lake. In a 2009 survey of Sterling Lake overnight visitors 80 percent responded that they preferred additional parking at the site (PG&E 2011, Table 3.4-161). Projections of parking occupancy made by PG&E (PG&E 2011, Table 3.7-14) indicate that the average capacity would be near full (93 percent) by 2030 and exceeded by 2040. Through Forest Service staff experience of conducting OHV patrols at this site, the FS has observed frequent overflowing of this parking area mid-day on summer weekends. Additional parking is needed to meet the increasing use of Sterling Lake.

Sterling Lake Dispersed Campsites

PG&E proposed in their FLA to provide three dispersed campsites at Sterling Lake to meet the camping needs. Considering the elimination of the developed campground on the west end of Sterling Lake (on NFS land), the TNF can support PG&E's proposal if monitoring of the camping use and human waste is also included. Monitoring needs to focus on: 1) determining if there is more demand for camping facilities than what is provided, and; 2) determining if human waste is becoming a health concern despite the efforts to provide appropriate resource protection information to the campers.

If the monitoring makes it apparent that a developed camping facility is needed, then PG&E should secure a right of way from SPI for use of the access road to the east end of Sterling Lake and construct a 10-unit Development Scale 2 campground with sanitation facilities.

Fordyce Lake

Fordyce Lake is located 6.5 miles off I-80 via FS Road 85 and Fordyce Lake Road (FS Road 85-2-1), which turns into a rocky four-wheel drive road approximately 2-miles before the lake. The lakeshore includes PG&E and NFS lands. At its maximum water surface elevation of 6,405 feet, Fordyce Lake has 716 water surface acres and 10 miles of shoreline. During high water, 60 percent of the shoreline is accessible by foot, and 30 percent by vehicle. As water recedes, vehicle access to the shoreline and lakebed increases. Steep granite bluffs and thick brush around the reservoir limits access around part of the lake. Fordyce Lake provides opportunities for a wide variety of recreational activities, including undeveloped camping, OHV use, hiking, hunting, swimming, fishing, and small motorized and non-motorized boating. Most of the undeveloped camping occurs along the west shore of the southern arm of the lake. Six dispersed campsites are located along the reservoir side of Fordyce Lake Road up to the peninsula, and just south of the dam. Four of the dispersed campsites have one rock fire ring, and two sites have two rock fire rings. Most of the sites are accessible by vehicle, using short dirt and gravel spur roads off Fordyce Lake Road. This popular dispersed camping area is located at the top of a four-wheel drive trail that connects to the Fordyce Jeep Trail, a renowned difficult rock-crawler four-wheel drive trail.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility, and mitigation are: (NFS lands)

OHV Barriers and Signage (NFS Lands)

Within 1 year of license issuance:

- Maintain OHV barriers and signage installed as part of PG&E’s 1994 Exhibit R (not yet completed by time of filing Preliminary PM&Es) to prevent OHVs from traveling under the high water mark on NFS lands.
- Pursue Nevada County Ordinance to restrict OHV use under the high water mark of Fordyce Lake.

Fordyce Campground Development (Licensee Lands)

Recommendations on Licensee lands (some of which are included in the FLA):

Within 3 years of license issuance:

- Install 10 primitive campsites along Fordyce Lake Road. Each campsite will include a fire ring, an animal-resistant food locker, and a site marker.
- Install a single-unit toilet.
- Install a facility identification sign.

On Licensee and NFS lands:

Within 3 years of license issuance:

- Improve/expand information board signage.
- Provide management presence through a person who will patrol Fordyce Lake and Sterling Lake during the prime recreation season (generally, snowmelt in June through September 15).
- Install regulatory signage at logical vehicle access points, to discourage vehicle use below the high water line. In the event that the Nevada Co. ordinance is obtained, the signage shall reference it.
- Install and maintain barriers and signing on the southern arm of the lake to close off uncontrolled OHV use that occurs when the lake level drops.
- Dismantle and remove dispersed rock fire rings and makeshift toilets. This needs to be an ongoing action item.
- Limit camping to designated sites only.

Rationale

Fluctuating water levels of Fordyce Lake creates meadow habitat for a variety of wildlife species including potential habitat for willow flycatcher (a FS sensitive and State listed species). Uncontrolled vehicle use below the high water line impacts this habitat, since the typical visitor to this lake has the capability to drive below the high water line. The OHV opportunities are a primary attraction of this project lake with 80 percent of day users and 41 percent of the overnight users indicating that OHV use is their primary activity (PG&E 2011, Table 3.4-181). Installing barriers and signage to prevent use below the high water mark will reinforce the effectiveness of any county ordinance (PG&E land) and FS regulations (NFS land) that prohibits motorized vehicle use below the high water. The TNF's Motorized Travel Management Record of Decision (USDA Forest Service 2010) documents the decision to restrict motorized vehicles from operating below the high water mark on the southern tip of Fordyce Lake on NFS lands. The consistent management of motorized use will protect the lake's natural resources and reduce confusion for Fordyce visitors.

The 1962 PG&E Recreation Study, South Fork Yuba-Bear River Watersheds, noted that there was a pit privy and some trash cans at Fordyce Lake at that time (PG&E 1962). This study proposed a 10-unit campground along the west shore of the south arm of the lake within 10 years of the study, but this campground was not constructed. Sixty-five percent of the users at Fordyce Lake identified toilets as a desirable facility (PG&E 2011, Table 3.4-199). Forest Service staff has identified at least six homemade wooden toilets on NFS land at the south end of the lake. A survey conducted in 2009 indicated that 15 percent of the Fordyce visitors saw signs of human waste (PG&E 2011a, Table 4).

The maximum number of occupied sites observed during the 2009 surveys was 18. Once the campsites below the high water mark are closed, the demand is expected to be greater than the supply of campsites during peak times; however the topography for site development is limited. Highly visible management presence will be important to manage use, especially on weekends.

South Yuba River

Currently lands along the South Yuba River are heavily impacted from recreational uses for hiking, swimming, and day-use activity. At the river crossings especially at Edwards and Purdon Crossing parking is limited and vehicles block the roadway once parking spaces become full. Heavy use requires toilet facilities at both sites. Currently the Purdon Crossing site does not have a permanent restroom facility and is in need of one. BLM built a restroom facility at Edwards and it will need replacement in10-15 years. Signage is needed at both sites as well as building boating takeout sites that include: 8-foot-wide paths with steps that lead from the river to the trail head or parking area for both Edwards and Purdon. Over 50,000 users visit these sites on any given year. The South Yuba River diversions has caused the river to be lower in the spring and summer months thus allowing the high number of recreational users to utilize these areas sooner than they would have in an unimpaired condition. BLM has absorbed all of the costs of patrolling, maintenance, building facilities, and rehabbing eroded areas caused from heavy recreational uses. BLM is working with PG&E to develop an outside FERC Recreation Agreement to assist BLM in meeting future and current demand and needs at these sites.

White Rock and Meadow Lake Areas

White Rock Lake

White Rock Lake is a remote lake within the Castle Peak Roadless Area, located 34.4 miles from Truckee, California, approximately 15 miles of which is on a rough dirt road. Approximately 60 percent of the shoreline is accessible by foot. White Rock Lake provides recreational opportunities for camping, hiking, fishing, hunting, and small motorized and non-motorized boating and is located on NFS and PG&E lands. Recreation amenities at White Rock Lake include two primitive camping areas (non-fee) that are located along the western shoreline near the dam (NFS land) and the north shoreline (PG&E land). In total, the two camping areas provide six designated campsites, each with steel fire rings and site markers. The primitive camping facility is a pack-it-in/pack-it-out facility (PG&E 2011a) and there are no toilets. The ROS is semi-primitive motorized.

Bear Management

Annually monitor camping area for bear encounters. At the annual meeting, review the need for animal resistant food storage lockers. If the need arises (such as reports of bear encounters or rodent issues, including plague) install food storage locker, within one year.

White Rock Camping Area (Licensee and NFS Lands)

Within 3 years of the license:

- Define and armor each campsite. Install barriers as needed to prevent vehicle encroachment on the shoreline.
- Grade road along north shoreline and provide for appropriate drainage, as needed. Maintain road in a graded, properly drained condition.
- Install information board with information about leave no trace camping, proper food storage, proper human waste disposal and preventing the spread of aquatic invasive species and disease causing fungus such as *chytrid*.
- Install directional signs at all intersection from Meadow Lake Road (Nevada County Road 843) along the dirt and gravel roads leading directly to the reservoir and back from the reservoir.
- Install vehicle barriers/barricade at the end of the road at upstream end of lake to prevent vehicle use where the meadow restoration is ongoing.

Rationale

The TNF LRMP states that the resource management emphasis is to enhance dispersed recreation opportunities and maintain the remote qualities of the area. LRMP further states that summer motorized use has resulted in watershed resource damage in the White Rock Lake area and directs confining OHV use to designated routes and monitoring recreation impacts. This direction was reaffirmed in the Tahoe National Forest Motorized Travel Management Record of Decision (USDA 2010). Currently, there are portions of the road accessing the campsites along the north side of the lake (PG&E land) that are difficult to negotiate resulting in widening of the routes and creation of multiple routes as users try to access the campsites. By grading the road through this area, providing for drainage, defining and armoring campsites, and installing barriers near the meadow, there will be less incentive for users to create additional routes, thus less resource damage and less potential sedimentation of the lake.

There was a medium amount of garbage noted by Licensee and a small amount of evidence of human waste. Since there are no facilities for food storage or toilets, educational signing may further reduce the potential for resource impacts. PG&E is willing to install food storage lockers (which visitors identified as a desirable improvement) however, to protect the rustic aspect of this lake, this improvement does not need to be constructed until there is a demonstrated need.

<u>Meadow Lake</u>

Meadow Lake is located approximately 32 miles from Truckee. Much of the route is rough and unpaved. Meadow Lake provides recreation opportunities for rustic group, and family camping, as well as fishing, swimming, boating and operating off highway vehicles (OHV). When possible, the California Department of Fish and Game stocks the reservoir annually with rainbow trout. PG&E manages the Meadow Lake facilities on NFS and PG&E land and collects a recreation use fee. The entire shoreline of Meadow Lake is accessible by foot, and approximately 60 percent of the shoreline is accessible by vehicle (PG&E, 2011a). There are two family campgrounds and a group campground as well as two informal boat launches, most of which are located on NFS land. The area is classified as Roaded Natural.

General Meadow Lake Measures

Within 5 years of license reissuance:

- Prohibit camping along the shore of Meadow Lake except within developed sites or dispersed areas accessed only by boat. Additional coordination will be needed with the county sheriff to implement the closures on private and Licensee owned land.
- Barricade parking areas. Install information sign indicating the area is for day use parking only.
- Install signage on boat launches and at the campgrounds prohibiting OHV use below high water level and other resource protection messages.
- Install new directional signs at all intersections along the roads leading to and from Meadow Lake (starting at the Fiberboard road).
- Place aggregate on the two boat launches and delineate launch areas with boulders.

Meadow Lake Day Use Area

Develop a small day use area/interpretive site near the boat launch that includes 3 picnic tables and gravel parking (up to 8 VAOT), interpretive display on cultural resource protection, information kiosk, and boat launch. On the information board, provide appropriate educational information on land and water related resource protection measures, emergency contacts, and recreation and water surface regulations. Signing and interpretation will be developed in consultation with the FS.

Meadow Shoreline Campground

The Shoreline campsites include 10 rustic campsites with picnic tables, fire rings, animal resistant food lockers, site markers, and generally unconstrained parking. There are no toilets or potable water. These sites are located along the north and northwest shoreline of the reservoir on the lake-side of the Nevada County Road and are spread out over approximately a mile. The campground is a pack-it-in/pack-it-out facility and does not have accessible features. Most campsites are located on NFS land, and a few are on PG&E land.

Within 8 years of license reissuance:

Reconstruct the campground as a Development Scale 2 campground including:

- Install 2 single unit vault toilets. The new toilets are to be placed so as to optimize travel to toilets. Provide signing to the nearest toilet near the campsite entrances.
- Relocate and reinforce vehicle barriers to improve vehicle management at each campsite providing parking adjacent to the county road and away from the lakeshore. Re-orient table/fire ring at sites farther from shoreline within approximately the existing footprint.
- Define and armor campsites.

- Provide appropriate signing that meets FS and other applicable agency standards. Replace entrance information board & include signage about resource protection.
- Place spot aggregate at the entrance to and in the parking area of the camp sites.
- Construct a pedestrian trail (native surface) from Meadow Knolls CG to the lake in the vicinity of the first 2 campsites at the shoreline campground and provide signing indicating the location of the toilet in Meadow Knolls CG.

Meadow Campground (NFS Lands)

This campground is located on NFS land along the southwest shoreline of the reservoir, and includes 15 campsites. Each campsite contains a wood picnic table, steel fire ring, gravel spur, animal-resistant food lockers, parking and site marker. There are two accessible vault restrooms (a single and a double-unit). There is no potable water. The campground is a pack-it-in/pack-it-out facility and has a host on-site. The road system is poorly defined and there is a rather confusing maze of roads through this campground.

Within 5 years of license issuance:

- Install information boards. Post signing on resource protection, emergency contacts, and recreation and water surface regulations.
- Post signs at Meadow Knolls and Shoreline Campgrounds indicating the location of potable water.

Within 15 years of license issuance reconstruct as a Development Scale 3 campground including: Redesign/relocate spurs and campground roads, as needed, establishing the desirable, logical road and campsite location within approximately the existing footprint. Close non-essential routes. Delineate roads and spurs with barriers. Develop a potable water source (single hand pump acceptable).

Meadow Knolls Group Campground (NFS Lands)

The Meadow Knoll Group Campground is a rustic group campground, located at the north end of the reservoir, with two group sites for 25 people each (50 people total), and two accessible double-unit vault restrooms. The group campground is located on NFS land. Except during large OHV events, this campground receives little use.

Within 20 years of license issuance, reconstruct the group campground to meet current standards as needed, gravel and barrier road and spurs. Clean up down logs and slash, and continue to treat vegetation throughout the campground.

Rationale

There are significant cultural resources in this area. The 1990 LRMP directs restricting camping to developed sites and designated camping areas only, protect cultural resources by managing recreation use, and educating and informing the public of the need for protection. Due to sediment production concerns, it is anticipated that the maintenance of the Nevada County

Meadow Lake road will be improved during the term of the license. As maintenance of the road improves, the use of these campgrounds is expected to increase.

As with other areas of concentrated camping, toilet facilities are needed at Shoreline Campground. Sixty two percent of those surveyed at Shoreline campground indicated a desire for toilets while 32 percent noticed human waste at the facility. Licensee also noted 30+ incidences of evidence human waste at this site (NID, PG&E 2010). Since this 10 unit campground is spread out over approximately one mile, three toilets would be needed to meet the FS design standard which specifies the maximum distance users should have to travel to a toilet is 500'. However, signing can direct users of sites # 1 & 2 to the trail leading to Meadow Knolls Campground, thus allowing for the construction of only two toilets.

At many of the Shoreline campsites, vehicles can be driven directly to the water's edge. Limiting vehicle access to spurs adjacent to the county road and reorienting facilities away from the lakeshore will protect the lakeshore and riparian areas.

There is a desire for additional services at this lake. Sixty percent of the overnight users of Shoreline Campground and 73 percent of those at Meadow Campground preferred potable water. The majority (54 percent of the overnight users of Shoreline and 53 percent of those at Meadow Campground) preferred trash service and Licensee noted excessive amounts of trash at Shoreline Campground (NID, PG&E 2010). The need for garbage collection will be discussed at the annual meeting. Continued public demand or increases in garbage and litter left on site (including left in fire pits and food lockers) will trigger the need for garbage collection services.

This area is popular with OHV users and driving below the high water mark occurs. Consequently, controlling vehicle use to protect lakeshore & riparian resources and water quality is an emphasis in this area to meet NFS Standards and Guidelines.

One user noted that the lake is hard to find.

Peak and Kidd Lakes

Kidd Lake is located 3.8 miles, and Upper and Lower Peak Lakes are located 5.5 miles, from the I-80 via Kidd Lake Road (a county road). The land around Kidd Lake is primarily owned by PG&E, however, there is a private landowner on the northwest side of the lake. This private landowners has offered this land for sale to the FS and Truckee Donner Land Trust and the FS have been in discussions with the landowner on this matter. Kidd Lake has a relatively flat, wooded shoreline, and provides recreational opportunities for developed camping, hiking, small motorized and non-motorized boating, and fishing, although opportunities to launch boats for visitors, who are not using the group campground or the Girl Scout camp, are lacking.

There is PG&E, NFS and private land around Upper and Lower Peak lakes which provide opportunities for hiking, undeveloped camping, fishing, and small motorized and non-motorized boating. A non-Project trailhead for Palisades Creek Trail is located near the Upper Peak Lake Dam on NFS land and provides access to the Wild and Scenic North Fork of the American River, Long Lake (non-project) and Upper and Lower Peak Lakes. At high water, non-motorized boaters portage their boats the short distance between Peak Lake and Long Lake. Approximately 25 percent of the shoreline of Lower Peak is accessible by vehicle, and 70 percent by foot. The NFS land has an ROS of Roaded Natural.

Within 5 years of license issuance (NFS lands):

- Construct and maintain a pedestrian, non-motorized trail from the trailhead near the Upper Peak Lake Dam to the lake at an acceptable grade.
- Gate the road from the trailhead to the lake.
- Replace trailhead bulletin boards and provide signage that meets FS standards including information on leave no trace camping, map showing campsites and proper food storage.

(Both NFS and PG&E lands)

- Construct and maintain a non-motorized trail connecting with the dispersed campsites that Licensee proposes to construct with the existing trailhead and existing trail (Palisades Trail) on south side of Lower Peak Lake.

Rationale

Information at the trailhead will enhance visitor experiences and help to protect resource values.

PG&E is proposing dispersed campsites along the shoreline of Lower Peak Lake. The trail will serve the users of these campsites. The proposed trail will limit shoreline impact by providing access to these campsites. Without a constructed trail, these campsites would be accessed by visitor created trails. Visitor created trails cause more resource damage than properly constructed and maintained trails. Visitor created trails are often located too close to lakeshores, run at unsustainable grades, have no consideration for proper drainage, and are braided as users pick different routes. The FS recommends that the trail and campsites be constructed concurrently.

TNF LRMP direction for this area includes considering future development to support dispersed recreation as use increases. Hiking/walking and swimming were identified as activities users at Kidd, Upper and Lower Peak Lakes participate in. Hiking/walking was the most popular activity at Peak Lakes with 78 percent participating and almost half the users (48 percent) listing it as the primary activity. Eighty eight percent of the users of Kidd Lake reported participating in hiking/walking. Participation in this activity is projected to increase by 50 percent by 2050 (NID 2011). The only trail opportunity in the area is the Palisades Creek Trail (a 7 mile long trail that drops approximately 2000' feet in elevation into the North Fork of the American River.) The trail accessing Peak Lakes is overly steep and runs along PG&E's road accessing the dam. In addition to reducing the potential for resource damage, the proposed trails will enhance the recreation opportunities for project users—both in terms of walking/hiking and providing focused access to the lakeshore for swimming and other day use activities along the shoreline.

Lake Valley Area

Though the Lake Valley Recreation Area reservoirs do not include any NFS lands, the existing and potential future recreation facilities provide recreational opportunities that are complimentary to those provided on NFS lands in the area and within the Drum-Spaulding Project. The Lake Valley Reservoir Recreation Area is located south of I-80 at the Yuba Gap exit, and ranges in elevation from 5,500 to 6,000 feet. The area contains two Project reservoirs (Lake Valley Reservoir and Kelly Lake), and are readily accessible by vehicle via I-80. PG&E owns all of the land surrounding these two reservoirs, with the exception of a private parcel on the northeast corner of Kelly Lake. Primary access to the area is by Lake Valley and Crystal Lake roads from I-80. Access to Lake Valley Reservoir is by the gravel and paved roads maintained by FS, PG&E, and PG&E's lessee. Recreational facilities currently provided in this Recreation Area include: a 5-unit picnic site and unimproved boat launch at Kelly Lake, and; a 35-unit campground (Lodgepole Campground), 10-unit picnic site (Silvertip Picnic Site) and a one-lane concrete boat launch (Silvertip Boat launch) (NID, PG&E 2011a). Lake Valley Reservoir currently receives a large portion of the recreational use in the Drum-Spaulding Project Area, "Lake Valley Reservoir and Fuller Lake are again expected to have the highest use levels by 2050, with between 30,000 and 40,000 RDs annual peak season use" (NID, PG&E 2011a).

FS supports the following improvements at Kelly Lake as proposed by PG&E (PG&E lands):

Kelly Lake Picnic Area

Recommendations on Licensee lands (most of which are included in the FLA):

Within 3 years of license issuance:

- Replace three picnic tables and remove 2 picnic tables due to low use.
- Replace, as appropriate, vehicle barriers around the parking area.
- Add 2 directional signs leading to the private Snowflower Resort gate entrance and 2 directional signs from the gate entrance to Kelly Lake.
- Approach Sunflower Resort about providing directional signage to Kelly Lake at their gate.
- Secure/Formalize public road access to reservoir.
- Improve road access.

Forest Service supports the following improvements at Lake Valley as proposed by PG&E in the FLA (PG&E lands):

Lodgepole Campground

Within 2 years of license issuance:

- Retrofit the water spigots to accessible standards (ADAAG) nearest to the 2 existing accessible campsites.
- Install 35 new animal-resistant food lockers (one at each campsite).

Silvertip Picnic Area and Boat Launch

Within 5 years of license issuance:

- Widen (to 20 feet) and pave the site's access road, from Forest Service Road 19 to the parking area.
- Re-configure the existing parking area to provide spaces for up to 15 single parking spaces and 10 double parking spaces that will accommodate vehicles with trailers.
- Provide one single-accessible parking space and one double-accessible parking space.
- Pave and stripe the parking area.
- If necessary, replace or relocate the existing double-vault restroom with a double-vault accessible restroom to accommodate an expanded parking area.
- Install up to 5 pedestal grills in a central location.
- Install up to 5 additional picnic sites.
- Retrofit one picnic unit to meet accessibility guidelines (ADAAG). The accessible picnic site will need to be near the parking area, because much of the terrain towards the shoreline is significantly sloped.
- Extend the boat ramp to provide launching capabilities through Labor Day for all water year types, except Critically Dry.

Lake Valley Group Campground

Within 5 years of license issuance, develop a new group campground (Lake Valley Group Campground) for 50 to 100 people adjacent to the Silvertip Picnic Area and Boat Launch facility. During design of the facility, PG&E will determine if a suitable location is available within the FERC Project Boundary. If not, then PG&E will propose to expand the boundary to include the facility where it is ultimately located.

Lake Valley Campground

A new campground is proposed if the campground facility occupancy-monitoring trigger is met as outlined in the Recreation Facilities Plan.

Rationale

FS supports the improvements to the Kelly Lake picnic sites and signage proposed by PG&E. It is FS's observation that the low use is largely due to the public not knowing about the lake and the rough road. Of the people who knew about Kelly Lake, and were present, 44.4 percent of those surveyed rated the access as unacceptable (PG&E 2011, table 3.4-620). It is reasonable to expect that with the additional signage, use at the site will increase. This is why FS also recommends that PG&E secure/formalize and publicize the public's ability to access the lake and improve the condition of the road.

The FS supports the rationale for improvements and additional facilities at Lake Valley for the reasons provided in PG&E's FLA (NID, PG&E 2011a, pages E6.6-109 & 110). Additionally, the improvements at these PG&E facilities will help meet the need for, and help distribute the use of, lake associated recreation, which will reduce the recreation demand and associated impacts on the TNF within the Project area.

Bear River Corridor

Bear River Trail Project

The Bear River Trail Project is a 33-mile riverine recreation trail proposal along the Bear River in Placer and Nevada Counties starting at the headwaters of the Bear River in Bear Valley and ending at NID's Combie Reservoir. Approximately 15.5 miles of the trail would be on PG&E property, 6 miles on NID, 4.9 miles on NFS lands, 4.4 miles on BLM lands, 2.7 miles on Placer County lands (Bear River Campground) and 3 miles on private lands.

FS recommends that Licensee provide the following to support the development of the Bear River Trail:

- Cooperate with trail planners to determine the alignment of the trail across Licensees' lands along Bear River, including Project canals, and for trailheads on Licensees' lands (see Large scale map of alignment concept below).
- Provide for the perpetual public access and use of the trail and roads to reach the trail across PG&E lands. Easements could be held by Placer and Nevada counties in their respective jurisdictions, or by a Land Trust entity (i.e. Bear Yuba Land Trust).
- Provide support for trailhead development, sanitation and signage needs related to the trail on PG&E lands.

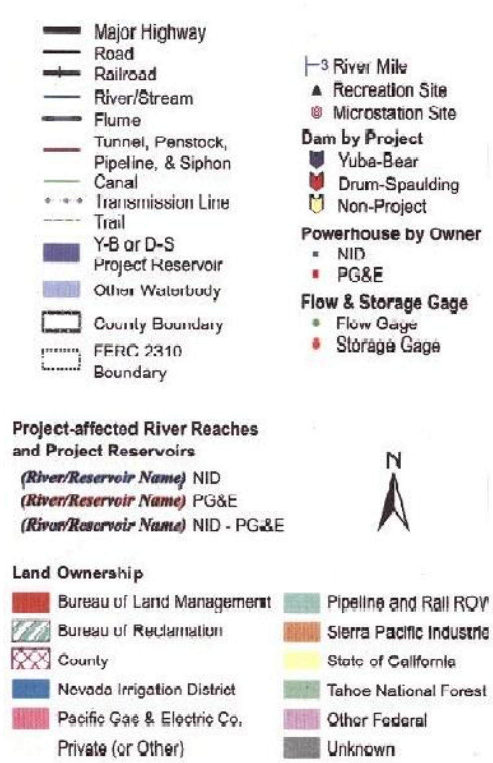
Rationale

Under current conditions, the Bear River offers little public access and recreation facilities despite its proximity to the I-80 corridor and high population and recreation centers such as Auburn, Grass Valley, Nevada City, Colfax, and Lake of the Pines. The Bear River Watershed is the most densely populated of major Sierra rivers, but has surprisingly little developed recreation. The only developed recreation is Placer County's popular Bear River Campground, which has a network of trails, full campground facilities, and two group camps. A measure of the demand for recreation is the fact that when reservations for the two group camps open on the first day of each calendar year, the two group camps are fully reserved for the season within six hours of non-stop phone calls to County Parks.

The Bear River corridor itself provides numerous and substantial open space and potential recreation opportunities due to the land ownership pattern in the river corridor, which is dominated by PG&E, NID, BLM, and the State of California. The existing access points already receive a lot of informal public use; however, the lack of recreation infrastructure, unsafe parking on public roads, inadequate sanitation facilities and unsafe and unmarked trails greatly curtails the public's ability to experience the resource.

Together the DSYB Projects extend along the entire length of the 33 miles of river. The Bear Valley to Drum Powerhouse stretch is mostly PG&E lands with some FS land, and is directly affected by pulse flows in the river from the Project and periodic releases and damage from Drum Canal spills along side streams. PG&E management of the Drum Powerhouse access road along over 7 miles of river has closed and gated historic roads that in the past provided river access. Drum Powerhouse is fully gated and fenced, and blocks access to the Bear River above the powerhouse; the access below Drum Afterbay is gated and closed. With the exception of the immediate area of the Bear River Campgrounds, there are no provisions for public recreation – no maintained trails, no sanitary stations, and no available parking. Although most of the present and potential public recreation uses of the Bear River corridor occur within the boundaries of the current DSYB licenses, Licensees do not provide riverine recreation opportunities for the large demand for public recreation along the Bear River.

The proposed Bear River Trail project will mitigate these project impacts, and provide the public with safe access to swimming, fishing, hiking, whitewater boating, inner-tubing, historic sites, biking, recreational gold panning, and overall riverine recreational opportunities. Much of the trail would be built on historic mining canal grades, historic railroad beds and stagecoach roads, and does not require large amounts of newly constructed trail. The trail concept has widespread local support among citizen groups, federal and local governments, including the Tahoe National Forest, unanimous endorsement from Placer County Fish & Game Commission, Foothill Water Network, Placer County Parks Commission, Weimar-Applegate-Colfax Municipal Advisory Council, and Placer County District 5 Supervisor Jennifer Montgomery (Placer County 2012.



Large scale map of Bar River Trail alignment concept – Bear Vallley to Rollins Lake (predominately PG&E lands)

Yuba-Bear Project Area

Additional specific rationale sections accompany each of the following reservoirs or areas. Due to the integrated nature of the recreation facilities and uses at many of the Project reservoirs on Licensees and NFS lands, the following section integrates and addresses recreation facilities on NFS and Licensee lands.

Implementation time frames for the specified actions are provided in each of the Project recreation facility descriptions below. Attachment C, Implementation Schedule, provides a summary of the implementation time schedule of the significant actions in table format. All work should be completed within the year specified in the discussions below.

The Yuba-Bear project includes seven impoundments within the Tahoe National Forest, and two impoundments within the Mother Lode Field Office District of the Bureau of Land Management. Within the TNF, the Yuba Bear project consists of two major recreation areas (Jackson Meadows Recreation Area and Bowman Recreation Area), and other minor recreation areas. These bodies of water encompass a variety of environmental settings, differing levels of public access, and numerous and varied recreational opportunities. The recreational opportunities include primarily camping, fishing, boating, swimming, hiking, picnicking, sightseeing, wildlife viewing, four-wheel driving, hunting and winter activities, among others. The vast majority of the recreation use occurs from June 15 through September 15 during the prime recreation season. Additionally, heavy recreation occurs at Rollins Lake, but since it is located approximately five miles outside the National Forest it will not be discussed further in this document. Although these two major areas (Jackson Meadows and Bowman) are geographically near one another, they are “a world apart” in terms of the recreation opportunities they provide. The Jackson Meadows Recreation Area is accessed by paved, high speed roads and offers predominately Development Scale 4 recreational facilities (designed for user comfort) versus the Bowman Recreation Area, which is accessed by very rocky and low speed roads and generally offers Development Scale 2 recreational facilities (designed for resource protection, not user comfort).

Jackson Lake (not to be confused with Jackson Meadows Reservoir) is located approximately 2.5 miles upstream of Bowman Lake. Although roughly a third of the lakeshore is NFS land, there is no roaded public access to this lake. Therefore, the recreation opportunities at this lake were not addressed during this planning effort.

Jackson Meadows Recreation Area

Jackson Meadows Recreation Area centers around the Jackson Meadows Reservoir. From the nearest state highway (Highway 89), visitors travel 15 miles at 45 MPH on a straight, paved, double-lane road and arrive at the first campground about 20 minutes after leaving the state highway. Most of the camp sites are accessed using only paved roads. The facilities have a high degree of amenities (i.e. flush toilets, RV dump station, and routine garbage collection). Generally the facilities are Development Scale 4 except the boat-in campground which does not have potable water and is a lower Development Scale. A fee is currently charged for all camping facilities except the boat-in campground. Users bring RVs and trailers up to 40 feet long, although the campgrounds were not built to accommodate such large vehicles.

The Jackson Meadows Recreation Area also includes some minor Project recreation reservoirs, Milton Diversion Impoundment and French Lake.

Jackson Meadows Reservoir lies at an elevation of 6,036 feet. Access to the reservoir occurs by three routes. The majority of user access Jackson Meadow via the only paved route which involves taking Forest Service Road 07 approximately 18 miles east from Highway 89. Access from the west (dirt/gravel roads) is via Sierra County Road 401 and Henness Pass Road (Sierra County Road 301) approximately 25 miles from Highway 49. Access from the south is via the partially paved Bowman Lake Road (Forest Road 18) and dirt/gravel Nevada County Road 843 and 956 approximately 23 miles from Highway 20.

At maximum water surface elevation, Jackson Meadows Reservoir is 1,008 acres with 9.9 miles of shoreline. Maximum speed on the reservoir is 35 mph from official sunrise to sunset and 10 mph from sunset to sunrise. A "flat wake" zone of 5 mph occurs within 200 feet of the Woodcamp Boat launch (Nevada County 2004). California Department of Fish and Game (CDFG) stocks rainbow trout in the reservoir monthly from May through August, and the reservoir supports year round fishing (NID 2011a).

The majority of the land around Jackson Meadows is owned by the NID, Sierra Pacific Industries (SPI) and the TNF. There are also a few small private land owners. There is a conservation easement on the SPI land which is held by the Truckee Donner Land Trust (TDLT). This conservation easement allows for public recreation of the SPI land and specifically allows for trail construction across the land.

Jackson Meadows Reservoir Recreation Area consists of eight campgrounds, two picnic areas and two boat launches – all located on either NFS or NID lands. As a whole, the recreation area provides overnight camping at 122 developed family campsites, seven RV/overflow sites, five group camping sites (150 Persons-at-one-time [PAOT]), and 8 boat-in campsites. In addition, the recreation area provides 17 total picnic sites. Currently, all facilities are managed by FS through a concessionaire. In 2009, the peak recreation use estimate was 20,185 Recreation Days (RDs) comprised mostly of overnight use (16,770 RDs).

Developed facilities on NID land include RV dump station, Aspen Group Campground and Silvertip Group Campground. Developed facilities on NFS land include Aspen Picnic Area, Pass Creek Campground, Pass Creek Overflow, Pass Creek Boat Launch, East Meadow Campground, Findley Campground, Fir Top Campground, Woodcamp Campground, Woodcamp Picnic Area, Woodcamp Boat Launch, Woodcamp Interpretive Trail, Jackson Meadows Administrative site, Jackson Meadows Vista, and Jackson Point Boat-In Campground. Camping around Jackson Meadows is restricted to developed campgrounds and little (un-authorized) use occurs outside of the campgrounds. The NFS are classified as Roaded Natural in FS ROS classification system (USDA 2004).

Visitors to this area are clearly drawn to the area by the reservoir. Camping, fishing and swimming (all reservoir-related activities) and hiking/walking have some of the highest participation among visitors. Boating and water skiing are also popular activities.

Development Plan (Both NFS and Licensee Lands)

The current Yuba-Bear Exhibit R (2000) requires Licensee to develop campground expansion proposals for new facilities. Since this requirement was part of the existing license, the agency anticipates these proposals should be submitted prior to issuance of the new license.

If this plan is not completed during the current license, within 1 year of issuance of the license:

- In consultation with FS, prepare a development plan for facility expansion. Since there is a limited amount of developable land in the area, part of the intent of developing this plan is to assure the optimum use of this land to meet future project induced recreation. This plan should aim to provide the following capacity (based on suitable topography):
  - Additional 100 PAOT group sites (preferably accessible along paved road) in 25 PAOT units
  - Additional 57 Development Scale 4, family campsites (preferably accessible along a paved road).
  - Shower facilities--one on each side of the lake.
  - An RV dump station, with a leach field, on the east side of the lake.
  - Replacement of at least six RV overflow sites, with potable water, which are accessible by paved road only to replace the sites at Pass Creek Overflow.
  - Plans (throughout the term of the license) to acquire access to sufficient lands to meet the projected demand. This should includes acquiring, by any means necessary, but not including by condemnation, fee title land or an easement to provide public access to the Jackson Point peninsula in order to allow additional recreational development of that land, if Licensee and public lands with legal access are insufficient to meet the development needs. Acquire other private land or rights to use private land, if needed, to meet the development needs outline above.
- This Recreation Development Plan is to be approved by the applicable Resource Agencies, including the FS at a minimum. Licensee shall be responsible for the environmental documentation, development of sites and/or implementation of measures identified in this plan after approval of the plan.
- Continue to monitor visitor feedback on crowding of lakeshore and water surface throughout the new license and make appropriate adjustments to proposals for construction of new facilities based on the results of this monitoring.

Rationale

According to the July 1964 NID Feasibility report, a total of 160 family campsites were envisioned during the current license period. Including the existing seven Pass Creek overflow units and the eight Jackson Point boat-in campground, the total number of family campsites is currently 137 sites. (Although there are technically nine units at Pass Creek Overflow, this site was designed as six units and is currently managed for seven units. The middle site in the cluster of three parallel spaces does not have living space associated with the RV parking, making these spaces undesirable.)

The need for additional facilities at Jackson Meadows, during the peak season, has long been recognized. In a July 21, 1987 letter to NID, the Commission acknowledged that people were turned away from Jackson Meadows on heavy summer weekends. The TNF LRMP (USDA 1990) states that the management emphasis of this area is to enhance developed and dispersed recreation opportunities. This document also states that the area is reaching existing recreation facility capacity and options to resolve this issue may include development of additional recreation facilities.

The TNF LRMP further states that experience throughout the Pacific Southwest Region indicates that optimum campground capacity is 35-40 percent of theoretical capacity and that the desired future condition is that new campgrounds will be constructed and the existing facilities will be reconstructed to provide additional capacity. According to Licensee (NID 2010), the average occupancy at Jackson Meadow is 42.6 percent from Memorial Day to the end of September. Licensee projected an increase in use of approximately 57 percent at Jackson Meadows over the next 40 years. Licensee projected that the campgrounds at Jackson Meadows may be at 100 percent capacity on weekends by 2020 if use projections hold true (NID 2010). Technical Memorandum 8-2b Recreation Use and Visitor Survey (NID 2010) states that "Clearly, growth of developed camping is an important recreation component to monitor on the Project…[camping] is expected to grow considerably over the course of the new license..."

Recognizing the need for additional capacity, the 2000 Revised Exhibit R, stated: "Licensee will consult with the Tahoe National Forest and develop a recreation use/demand study and based on that study, develop campground expansion proposals for new facilities on the basis of demonstrated need, consistent with the carrying capacity of the area and within feasible expansion areas" (NID 2000). However, this plan has not been developed and no campground expansion proposals have been made at this time.

Based on current occupancy and projected increases in use, there is clearly a demand for additional camping facilities. However, the TNF LRMP states that there is a concern that this area is reaching recreation use capacity, causing impacts to other resources, but LRMP offers no specifics of these impacts. In order to determine if there is potential resource capacity for additional facilities, the agency conducted a variety of tasks including:

- Canvassing resource specialists for concerns about additional development;
- Reviewing Licensee's inventory data regarding resource impacts associated with recreation use.

Resource impacts are generally concentrated at the developed sites (as is expected) and no overarching resource concerns were revealed, although site specific NEPA would be needed for any specific proposal.

There was also a concern that the lake not be over developed from a social standpoint. In order to determine if there is potential social capacity for additional facilities, the agency conducted a variety of tasks including:

- Reviewing Licensee's information to determine visitor's perception of crowding, including Technical Memorandum 8-2b and as presented in the revised Exhibit R (2000).
- Reviewing literature on lake surface boating densities (BOR 1977; Warren & Rea 1989; Bosley 2005; Dearlove 2010) as well as recommended boat densities on other California lakes (e.g. Lake Britton, Bullards Bar). Reviewing Licensee's visitor use data on boat use.
- Reviewing historic documents associated with the development of the recreation sites at this reservoir.

The user surveys did not reveal a crowding issue along the lakeshore and lake surface (although some level of crowding was perceived in certain developed sites) (NID 2011). The Jackson Meadows Recreation Composite Plan from the 1970's (USDA, undated) recommended a maximum boating density of 7 acres per boat. Based on literature reviews and the type of use occurring on the lake, the agency recommended a maximum boating density of 12 acres/trailered boat. To determine maximum appropriate level of development, calculations were done reducing the lake surface acreage to account for draw down and a 100'shoreline buffer (Bosley, 2005), thereby, effectively reducing the lake surface capacity.

It is expected, however, that suitable topography will be the most limiting factor of carrying capacity of this lake. The construction of additional facilities will likely require acquisition of private land (either through fee title acquisition or a lease agreement) and/or access across private land. 18 CFR Ch. 1 2.7 a states that the Commission expects Licensee to acquire in fee and include within the project boundary enough land to assure optimum development of the recreational resource afforded by the project.

The Recreation Use and Visitor's Survey Study Plan included a requirement that (if it is determined that particular project-related recreation developments are needed) Licensee would conduct suitability studies to identify potentially suitable land for development given the type of facility or facilities needed. Technical Memorandum 8-2b (NID 2010) states that "At present, the visitor use and occupancy data shows that the existing Project recreation developments are adequate to meet the current recreation demand." However, as previously noted, this same document acknowledges that facilities at Jackson Meadows are approaching capacity on weekends and that camping use is expected to grow considerable over the course of the license (NID 2010).

Therefore, the FS conducted a cursory review of some of the land suitable for recreational development during 2010. There is limited developable land on NID, NFS & private lands around the reservoir. Several potential locations were identified in the agency response to the DLA. Additional in depth work is needed in this regard; however the Jackson Point peninsula offers some of the more developable land around Jackson Meadows. The demand for drive-in camping is much higher than the demand for boat-in camping; therefore, at this time it does not make sense to construct additional boat-in campsites at this location. Without roaded access, use of this peninsula for recreation also presents logistical issues (such as waste disposal of the existing toilets at Jackson Point Campground) and resource concerns (such as administrative access in the event of an escaped campfire.) It is anticipated that it will be necessary to acquire access across a parcel of private land at the base of this peninsula to gain access to the NFS land on this peninsula in order to meet the increasing demand for camping. Every effort should be made to obtain this roaded access onto this peninsula.

This private parcel of land changed owners within the last decade. Although the current landowner is not agreeable to granting a road easement, Licensee must continue to attempt to acquire this access throughout the term of the license. This will include remaining informed if the land is for sale and purchasing this land, if a road easement cannot be acquired. This will be an ongoing need throughout the term of the license until access to the peninsula is obtained. Until *public* access can be obtained, Licensee should make every effort to acquire access to Jackson Point for *administrative* purposes (such as construction, toilet pumping and fire suppression.)

Whenever additional recreation facilities are provided, the water and septic systems shall be re-engineered, reconstructed, and resized to accommodate the additional demand. Generally, in family campgrounds, the majority of the toilets should be flush toilets unless it is infeasible to provide sufficient septic or water to accommodate this. However, a limited number of vault toilets should be provided to allow for continued operation when the water system fails.

The majority of the overnight users of the Jackson Meadow recreation sites expressed a desire for showers, with a high percentage of the visitors indicating that showers are highly preferred. The 1964 Feasibility Report, prepared for NID under the provisions of the Davis-Grunsky Act of July 1964, proposed hot showers at most of the campgrounds around Jackson Meadow. These shower facilities were never constructed. Although the agency is *not* requesting that Licensee construct showers at this time (due to more pressing needs to meet the projected demand for camping and boat launching), these facilities should be included in the development plan since there is a clear and demonstrated public demand for such facilities. Including these facilities in the development plan will assure a “placeholder” for these facilities in the future, if at a future date it is determined that these facilities should be constructed.

Revisions to Technical Memorandum

It should be noted that NID made substantial changes between the April 2010 version and the September 2011 version of Technical Memorandum 8-2b, in terms of projected occupancy rates at Jackson Meadows over the term of the license. In the April 2010 version, Licensee projected “at Jackson Meadows Reservoir, overall capacity is expected to reach **74 percent** by 2050, however, weekend capacities may reach full capacity by 2020 if projections hold true.” In contrast, in the September 2011 version of this document, Licensee projected “At all of the Jackson Meadows family campgrounds combined (excludes group campgrounds) the overall peak season occupancy is projected to reach **46 percent** by 2050…”

Licensee further stated in the September 2011 version that “occupancy data was collected on a weekly basis at Jackson Meadows Reservoir in 2009 by the concessionaire; and as a result, seasonal occupancy is the only type of occupancy to project.” In fact, Licensee collected occupancy data by weekends and weekdays during the visitor use study, which should allow for weekend projections. Additionally, the concessionaire provided weekend occupancy data for July-September 2009.

The April 2010 version of the Technical Memorandum is more reflective of the current occupancy rates at Jackson Meadows. The 2009 occupancy rates presented in September 2011 version of the Technical Memorandum, Table 3.7-10 Projected Peak Season Occupancy by Day Type for Jackson Meadows Reservoir Campgrounds are significantly lower than those provided by the concessionaire.

Traditionally, the peak recreation season is considered Memorial Day weekend through Labor Day weekend, however, the highest use is between mid-June and mid-August. At Jackson Meadows, the sites are often under snow well past Memorial Day. The following table displays the concessionaire's report of the occupancy rates at Jackson Meadows family campgrounds (excluding Jackson Point boat-in campground) from Memorial Day weekend or campground opening (whichever came first) through Labor Day weekend (CLM 2009, 2010). This table also displays the data Licensee included in the September 2011 version of Technical Memorandum 8-2b Table 3.7-10 although Licensee did not specify what the dates of the peak season are for this chart.

Peak Season Occupancy (weekends and weekdays)

	# of sites w/o camp host site	Licensee's 2009 Peak Season Occupancy from Table 3.7-10 (NID 2011)	Concessionaire's 2009 report of occupancy .(Site opening through Labor Day) (CLM 2009)	Concessionaire's 2010 report of occupancy (Site opening through Labor Day) (CLM 2010)
East Meadows CG	45	33%	50%	51%
Pass Creek CG (including overflow)	36	28%	39%	33%
Findley CG	14	20%	30%	34%
Firtop CG	12	29%	40%	47%
Woodcamp CG	19	33%	45%	46%
Average site occupancy		**30%**	**42.7%**	**44.4%**

As displayed above, there are substantial differences in what Licensee is reporting in the September 2011 version of Technical Memorandum 8-2b and what the concessionaire's occupancy reports are showing. Based on this information provided by the concessionaire, it is clear that, contrary to the information in the September 2011 version of Technical Memorandum 8-2b, which stated that at Jackson Meadows"…most of the campgrounds projected to be from 40 to 50 percent occupancy by 2050" the occupancy at many of the campgrounds are already at that level during the peak season.

Of greater concern, weekend occupancy during the high use season (mid-June to mid-August) is currently approaching capacity. By the middle of August, many schools are back in session and use of family campgrounds drops off. In 2009, the average weekend occupancy (Friday & Saturday nights) at the five Jackson Meadows family campgrounds listed above (excluding Pass Creek Overflow and the camp host campsites) was 91 percent in July and 74 percent in August (CLM 2009) and in 2010 the average weekend occupancy was 87 percent in July and 78 percent in August (CLM 2010).

Since future occupancy projections are based on current occupancy rates, the April 2010 version of the Technical Memorandum 8-2 is expected to be more reflective of future occupancy. Therefore, the agency based the new construction proposals on the use projections made in the April 2010 Technical Memorandum 8-2b. Much of the new construction will be triggered based on future occupancy rates.

Group Campgrounds Construction (Either on NFS or Licensee Lands)

Within 4 years of license issuance: Construct the group campground facilities with potable water to accommodate at least 50 PAOT.

If agreement cannot be reached on occupancy triggers, construct the remaining group campground 50 PAOT called for in the Jackson Meadow development plan within 20 years of license issuance. If agreement is reached on occupancy triggers, construct additional sites when triggers are reached.

Rationale

Group campgrounds are some of the more constrained recreation resources in the combined DSYB project area, with most of these facilities near or at capacity on weekends. The Revised Exhibit R (2000) stated that both Aspen and Silvertip Group Campgrounds had an average of 100 percent occupancy on weekends (at that time). This same document stated that the need for [additional] Group Campgrounds would be demonstrated when these campgrounds were reserved by groups 75 percent of the capacity for 14 weekends days between Memorial Day and Labor Day for two consecutive years (excluding holiday weekends). Between 2000 and 2008, weekend occupancy data is not available. Partial occupancy information is available from 2009-2011.

In 2009, June occupancy data is not available, however the group campgrounds at Jackson Meadows were at least 75 percent occupied for 13 days between July 9 and the end of August. There is also two additional weekend days at the end of September (opening weekend of hunting season) when the campground reached this trigger.

In 2010, Aspen Campground (3 units, 100 PAOT) occupancy is not available until July 31. However, during the month of July, Silvertip Campground (2 units, 50 PAOT) was 100 percent occupied and in August both campgrounds exceeded 75 percent occupancy on all 9 weekend days. Additionally on the two days during opening weekend of hunting season in late September, the campgrounds exceeded 75 percent occupancy.

2011 was an anomaly following a heavy winter. Jackson Meadows did not open until after the July 4th weekend so there were only 16 weekend days between mid-July and the end of August. The occupancy exceeded 75 percent on 13 of those 16 days.
In summary, the trigger in the current Exhibit R (2000) is 14:

Year	Weekend Days meeting trigger Memorial Day to Labor Day	Total weekend days meeting trigger during season	Missing data/& comments
2009	13	15	June data missing
2010	9	11	June & July data missing
2011	13	13	Closed until July 9 due to snow

Based on these three years of data, although there is insufficient information to determine if the trigger has technically been reached, if it has not been reached, it is clear that it is extremely close to being reached.

See additional discussion under <u>Rationale for the Jackson Meadows Development Plan</u>.

<u>Family Campgrounds Construction (Either on NFS or Licensee Lands)</u>

Within 8 years of license issuance: Construct a minimum of 20 additional family campsites with potable water. This may include some expansion of existing campgrounds. Include a host site in each new family campground. The host site should include water, and septic.

As existing facilities are reconstructed, implement opportunities to construct additional campsites as part of the reconstruction (such as providing additional tent and walk-in campsites at East Meadow).

If agreement cannot be reached on occupancy triggers, construct the remaining family campsites called for in the Jackson Meadow development plan within 20 years of license issuance. If agreement is reached on occupancy triggers, construct these additional sites when triggers are reached.

Rationale

As previously noted, Technical Memorandum 8-2b states that the campgrounds at Jackson Meadows may reach full capacity on weekends by 2020 (NID 2010). Licensee needs to ensure that the ultimate development of recreation resources is consistent with the area recreational needs (18 CFR Part 2). If the campgrounds are frequently at capacity on weekends during the high use season (generally when schools are out) and visitors are turned away, the recreation needs are not being met. See additional discussion under Rationale for the Jackson Meadows Development Plan.

<u>Septic Tanks and Disposal Fields (Both NFS and Licensee Lands)</u>

Within 2 years of license issuance, conduct sanitary surveys of all septic tanks and disposal fields. Locating, potholing, and excavating will be required. Depending on the results of this investigation, additional work will be specified which may include improvements, or complete redesign and installation of new systems at some point in the license. When this survey is completed on a septic system, inspection tubes shall be installed in the disposal field, risers shall be installed on the septic tanks and paddle markers shall be installed identifying the underground utility locations.

Rationale

The septic systems are 40 years old and the conditions are unknown. Knowing the location and condition of the septic systems will be beneficial in the event of, and to potentially forestall, septic system failure.

Jackson Meadows Site Specific Modifications and Enhancements

In the next section are site specific modifications needed at existing sites. A few of these actions were included in the FLA. The following rationale applies to recreation sites throughout the Jackson Meadows Recreation Area.

Rationale for all Jackson Meadows Site Specific Modifications and Enhancements

Recreation facilities at Jackson Meadows Reservoir were developed using a state grant obtained through the Davis-Grunski Act Program. There were four stages of development planned; however the third and fourth stages were not completed. The first stage was scheduled to be completed in 1967. The second stage was scheduled for completion in 1975, but due to construction problems they did not go on line until 1976. The actual stage two developments, as defined in the contract between NID and the State of California, called for much larger development. Lengthy negotiations between the State of California, NID, and FS determined, however, that the facilities as built in 1976 represented the actual needs at the time, and the contract was modified (NID 1983).

Since that time, some facilities have been rehabilitated or replaced. Most notably, since 2000, NID has funded the replacement of four toilets, the upgrade of a few toilets to meet accessibility standards and reconstruction of the East Meadows water system. Additionally, in 2008 the FS funded the replacement of three toilets on NID land at Aspen and Silvertip, totaling approximately $100,000. Some facilities have been decommissioned with no plans to replace because they did not meet the visitor's needs. Because most of the facilities were constructed in the 1960's and 1970's, they tend to have several common shortcomings.

The road geometry and spurs dimensions in the existing facilities do not accommodate the vehicle configurations that are currently being used at Jackson Meadows. There has long been a need for additional parking. The 1991 FERC inspection noted "parking spurs are too short to accommodate trailers and recreational vehicles." Today this need is evidenced by visitors attempting to park off the roads and leaving boat trailers unattended at the boat ramp (thus monopolizing boat ramp parking with unattended trailers) because there is not sufficient space to park at the campsite. Furthermore, visitors rated additional parking as high on the list of desired amenities. For instance, in the Pass Creek Complex, over 60 percent of the day users and roughly 50 percent of the overnight users identified additional parking as a desirable improvement (NID 2010). To the degree possible, when a campground is being rehabilitated, provide additional trailer and vehicle parking in all (drive-in) family campgrounds

In many cases, the subgrade of the roads in these facilities is not sufficient to accommodate the current use and is failing. As a long term solution, repaving these roads, without resolving the underlying problem, is not cost effective. When roads are reconstructed, the road should be a paved, and designed with sufficient sub-grade to withstand the expected loads. Road geometry and widths should be reviewed and specified at the time of the design. Until roads are reconstructed, surface treatments shall be implemented as identified in the pavement management system and on the schedule specified in the Transportation Management Plan. Many spurs have retaining walls that are failing and are in need of asphalt surfacing. Reconstruct these retaining walls and repave spurs upon facility reconstruction.

The current water source for Findley, Firtop, Woodcamp and Silvertip Campgrounds (west side) typically dries up before the end of the season. Since the campgrounds in the Woodcamp Complex typically have flush toilets, if there is no potable water, the campgrounds need to be shut down early (CLM 2009). The original Davis Grunsky Feasibility report proposed 60,000 gallon storage tanks—one for the westside and one for the eastside recreation sites. A 40,000 gallon storage tank is currently located on the westside, and a 20,000 gallon tank is located on the eastside where there is the highest occupancy rate. A need for an additional water source has been identified in a letter to NID from FS (USDA Forest Service 1988) asking to develop a supplemental water collection area to augment the existing system. Currently the amount of water available is limited. It is a very common occurrence for one of the two horizontal well on the westside of the reservoir to dry up mid-to late season. Also requested in this letter, is the construction of an additional 40,000 gallon holding tank for fresh water located adjacent to the existing tank for the Pass Creek water system.

Licensee has proposed to convert flush toilets to vault toilets. Based on the results of the survey, it is clear that the visitors value the higher end amenities that Jackson Meadows has to offer. Although the desirability of flush toilets was not addressed in the visitor survey, the majority of users found showers desirable, therefore, it is easy to infer that the public would desire flush toilets unless there is no other alternative. However, flush toilets are problematic when the water system fails (such as a break in the waterline or the water source drying up). A limited number of additional vault toilets are specified below. Providing a limited number of vault toilets in the campgrounds will improve management of the sites.

The picnic areas are under-utilized which may provide for alternate use of some of this land.

Licensee rated the existing facilities in fair to good condition although the FS disagrees in some cases. For instance, the Woodcamp Boat Ramp and Jackson Point Campground are in poor condition and in need of immediate attention. Some facilities do not meet accessibility standards.

Aspen Group Campground

Aspen Group Campground is located on the northeast side of the Reservoir and is on Nevada Irrigation District land. It is currently operated by a concessionaire. It consists of 3 group campsites 2-25 PAOT and 1-50 PAOT and parking available for 35 VAOT. There are three toilets with a total of 5 stalls. One of the three group units has accessible facilities including the vault toilet, water spigot, tables and firerings. Two of the sites lack accessible outdoor recreation access routes (ORAR) and site components (NID 2008).

Recommendations on Licensee Lands:

Within 2 years of license issuance:

- Improve barriers to prevent off road use
- Mark accessible parking.

Within 10 years of license issuance, reconstruct campground including:

- Reconstruct and widen road.
- Expand parking areas especially, in Spring Unit.

Aspen Picnic Area (NFS Lands)

Aspen Picnic Area is located on the northeast shore of Jackson Meadow Reservoir on NFS lands. There are two toilet building with a total of five units. There is informal vehicle parking for 30 vehicles and eleven picnic sites with a site capacity of 55 PAOT. Potable water is available. The site is currently managed by a concessionaire and there is no fee charged for day use. The most common response of visitors regarding top three primary activities they engaged in was fishing 42.9 percent, picnicking 28.6 percent and swimming 40 percent

Within 5 years of license:

- Construct a non-motorized, Class 3 trail from Aspen Group to Aspen Picnic Area parking area.
- Replace 4-unit vault toilet with a 2-unit vault toilet
- Designate accessible parking.
- Meet FSORAG at a minimum of 2 sites. Provide for accessible tables and pedestal grills at these sites. At a minimum, provide a clear, level compacted ground surface with flattened area picnic area around tables, hydrants & grills to meet FSORAG. Provide Outdoor Recreation Access Route (ORAR) between accessible sites, constructed features, toilet and parking area.

Within 10 years of license issuance, reconstruct picnic area including:

- Reconstruct road.

- Review appropriate number of sites based demand. Reduce number of sites appropriately.

Pass Creek Campground (primarily on NFS Lands)

Pass Creek campground is located on the northeast side of Jackson Meadow Reservoir on National Forest land. It was completed in the first phase of construction of the onshore recreation facilities at Jackson Meadow in 1967. Pass Creek Campground currently has 30 sites with two 4-unit flush building and a 2-unit vault toilet. It is currently operated by a concessionaire under a special use permit. The most common response of overnight campground visitors in the Pass Creek Complex regarding the activities they engaged in was camping in developed sites 98.4 percent, followed by reservoir fishing at 76.6 percent (NID 2011).

Within 8 years of license issuance:

- Replace two flush toilet buildings with fully accessible flush toilets.
- Upgrade the host site to include septic/holding tank or leach system.

Within 15 years of license issuance, reconstruct campground including:

- Provide additional vehicle and trailer parking.
- Lengthen and widen spurs. (At a minimum provide 5 spurs at 16'wide; 11 spurs at 13'wide).
- Replace or rehabilitate vault toilets, as needed.

Pass Creek Boat Ramp (NFS Lands)

Pass Creek boat ramp was constructed on NFS during the first phase of development at Jackson Meadows. Construction completed in 1967. The original ramp was constructed as one double lane ramp extending from elevation 6,035 feet to 6,010 feet. Surface treated parking was provided for 23 auto/trailer combinations. In 1995 grant money was awarded from Department of Boating and Waterways to extend the Pass Creek boat ramp. This extension included construction of a two lane launch ramp which allows launching to a water level drawdown of 51 ft. and a paved parking area for a total of 40 car/trailer and 12 single cars including 2 spaces for disabled users. This parking area is below the high water mark and is generally usable starting in the middle of the summer. Construction of a floating courtesy dock and vault toilet, both which are accessible was completed during phase 2 of the 1995 project.

Within 1 year of license issuance:

- Provide asphalt treatment on the high water launch (referred to as ramp A on Licensee's condition surveys).
- Replace wooden barriers with boulders.
- Provide more prominent signing regarding submerged stumps and rocks.

Within 5 years of license issuance:

- Provide 21 additional parking spaces primarily for vehicles with trailers by converting the Pass Creek Overflow sites to boat ramp parking. Construct additional parking spaces by expanding pavement (up to the total of 21 trailer/vehicle spaces) as topography allows. At a minimum provide 12 spaces for vehicles with trailers and 9 spaces for single vehicles.
- Construct a non-motorized, accessible trail from Pass Creek Boat Launch to Aspen Picnic Area beach area. Provide accessible parking spaces at boat launch for trail parking.
- Provide low-water boat launching access below the constructed ramp to provide for fishing access until September 30 in a Critically Dry Years. Maintain this low water access whenever the lake drops below the constructed ramp prior to September 30. (This could include work such as clearing, grading, and installing gravel, but is not intended to be a major capital improvement.)
- Develop at least six RV overflow paved parking sites, with potable water, tables fire rings, and access to a toilet, similar to and to replace the overflow parking at Pass Creek Overflow. These sites should be located in an area that will not require the users to drive on an unpaved road to access the sites.

Within 15 years of license issuance, reconstruct boat ramp to California Boating and Waterways standards; replace toilet and other facilities as needed.

Additional Pass Creek Boat Ramp Rationale

Over half of the parking capacity of the ramp is located below high water. Typically in June and July the lower parking area is under water. Before the water drops to expose the lower parking area, there are only 23 parking spaces and the boat ramp is overcrowded on weekends. For instance, during the July 2010, there was an average of 29 vehicles and a maximum of 42 vehicles parked at this boat ramp on Friday- Sunday of the non-holiday weekends. Technical Memorandum 8-2b states “Of note, weekend day capacities [at Pass Creek Boat ramp] were 83 percent through July and 67 percent after July in 2009, but both time periods are projected to exceed full capacity by 2050. Additionally in this document, visitors indicated a high desire for additional boat trailer parking at Jackson Meadows. For instance, over 50 percent of the day users of the Pass Creek Complex indicated a preference for additional boat trailer parking (NID 2011).

Department of Boating and Waterway standards state that there should be sufficient parking spaces to meet the expected demand on a normal peak day during the boating season.

Although the Aspen Picnic Area tends to be under-utilized, the beach adjacent to this picnic area is very popular. However users of this beach area must haul their equipment down a relatively steep hill to access the beach. The foot trail from the Pass Creek Boat Ramp to the beach will allow for easier beach access, especially for those with limited mobility. Limited mobility is an issue that does or will affect each person, either directly or through one’s family or friends. Fifty four million people in the U.S. have disabilities and this number is increasing by over one million people per year. This group includes more than just those confined to wheelchairs. Nationwide, 7.7 percent of groups visiting NFS land stated that at least one person in their group has a disability. These disabilities also affects the family and friends of the person who has the disability, thereby multiplying by 2 to 3 times the number of people affected by disability. By

2030 over 80 million people in the U.S. population will be over 65 years of age (U.S. Census Bureau) and likely to be looking for improved accessibility.

This lake tends to attract fishermen until the snow flies. FS receives complaints when the lake level drops below the end of this ramp since this makes it difficult to launch, however these users continue to find a way to launch. During critically dry years, providing some (comparatively primitive) access for boat launching will enhance the visitor's experience at a minimal cost. Signing at the boat ramp will warn users of submerged stumps and rocks.

Pass Creek Overflow (aka Henness Pass Campground) (NFS Lands)

Pass Creek Overflow is located on the northeast side of the reservoir. It is a paved parking area with associated tables and fire rings. It was originally constructed for additional boat trailer/vehicle parking and later became an overflow campground. It currently is managed for 7 campsites offering lake views. This site serves a specific segment of the public who prefer using it as a campground where they can park larger recreational vehicles and keep their boats and equipment with them.

Within 5 years of license issuance:

- Construct new 1 unit vault accessible toilet.
- Provide picnic tables (replacing the remaining wood tables) and fire rings, around the edge of the overflow area so that overflow camping can be provided at this site when the lake levels drop. The number of overflow sites will be determined during the site design.
- Provide removable unit markers. Manage the site for temporary boat ramp parking until lower parking area is useable, and then install removable site markers at each overflow campsite and allow overflow camping.

Additional Rationale for Pass Creek Overflow and Pass Creek Boat Ramp

The Pass Creek Overflow will serve three types of users, depending on the lake level:

- Parking for the boat ramp until the lake drops to reveal the lower ramp.
- Overflow camping when all other camping facilities are full (and this facility is not being used for boat launch parking)
- Camping for oversized vehicles or for campers with more equipment than can fit in a standard family campsite (when this facility is not being used for boat launch parking).

When this facility is being used for boat launch parking, there will be a need to accommodate the overflow RV camping in another area. On the average peak-season weekend, typically four sites are occupied (CLM 2009). Providing this replacement facility will minimize impacts to the existing family campgrounds caused when these oversized vehicles try to use campground roads and spurs that are not designed to accommodate this use.

FS and concessionaire experience has shown that the people who drive these very large, expensive RVs would not be willing to drive on an umpaved or bumpy road to reach a campsite.

Therefore, the replacement sites should be in a location where these users do not have to drive on unpaved roads.

Due to the spectacular views and easy access to the lake that this site offers, it is anticipated that it will be the camping area of choice for these users when this facility is available for overflow camping use, therefore providing campsite amenities (e.g. tables, fire rings) will facilitate this use and a minimal cost.

The FS design standard is 35 PAOT/ toilet stall. At day use areas, a design factor of 3.5 PAOT/vehicle is used. There are 23 spaces in the parking area above high water and 2 toilet stall (or sufficient capacity for 20 parking spaces). Additional toilet capacity will be needed for the additional 21 parking spaces; however, since use of boat ramps is transitory, the agency believes that a single stall should be sufficient to meet the demand. The toilet will also serve campers when the area is used for overflow camping.

East Meadows Campground (NFS Lands)

East Meadows Campground is located on the northeast side of Jackson Meadow Reservoir on National Forest land. Construction of it was completed in 1967, during the first phase of construction of the onshore recreation facilities at Jackson Meadow. It has 46 sites, with site #45 as a designated host site. There are three flush toilet buildings, and each site has a bear proof food locker. East Meadows is one of the most popular campgrounds at Jackson Meadows. The most common response of campground visitors regarding activities they participated in was camping in developed sites.

Within 1 year of license issuance: replace two entrance signs (one in campground and one on the 07 road).

Within 5 years of license issuance:

- Expand existing, and provide additional trailer and vehicle parking. At a minimum:
    - Expand the existing parking area by 15' to 25'x60' and provide gravel surfacing
    - Install a second parking area near site #34. This parking area should be at least 30'x60' with a gravel surface.
- Construct/maintain a non-motorized trail (~0.1 mi.) from the campground to the river. The trail should be designed for pedestrian with a native surface.
- Convert the two unit flush toilet building in the lower loop to a two unit vault toilet.
- Upgrade the host site to include septic or holding tank.

Within 15 years of license issuance, reconstruct campground including:

- Lengthen/widen spurs (at a minimum, expand 7 spurs to 16'wide and 19 spurs to 13'wide).
- Rehabilitate/reconstruct road.

Additional Rationale for Trail at East Meadows

Currently, users are accessing the river on steep visitor created trails. Visitor created trails cause more resource damage than properly constructed and maintained trails. Visitor created trails are often run at unsustainable grades, have no consideration for proper drainage, and are braided as users pick different routes. Also see Jackson Meadows Trail Rationale.

Firtop Campground (NFS Lands)

Firtop Campground is located on the southwest side of Jackson Meadow Reservoir on National Forest Land. There are 12 campsites and one 2-unit flush toilet building. It is currently operated by a concessionaire.

Within 10 years of license issuance reconstruct the campground including:

- Rehabilitate/reconstruct road.
- Lengthen/widen spurs & provide pull-thru spurs, where feasible.
- Construct and maintain non-motorized pedestrian native surface trails between Woodcamp Interpretative Trail and Woodcamp, Firtop, and Findley Campgrounds. Install and maintain directional signing.
- Add a single unit vault toilet.

Woodcamp Campground (Primarily on NFS Lands)

Woodcamp Campground is located on the southwest side of the Jackson Meadow Reservoir on National Forest Land. There are 20 campsites with site #20 as the designated host site. There is one 2-unit flush toilet and a 2-unit wooden vault toilet. During periods when the water system at Woodcamp Campground fails, the vault toilet provides sanitation facilities for the entire campground.

Within 3 years of license issuance:

- Replace one wooden 2-unit vault toilet with new double unit accessible vault toilet and provide ORAR to the toilet entrance.
- Replace entrance sign.

Within 10 years of license issuance, reconstruct campground including:

- Lengthen/widen spurs & provide pull-thru spurs, where topography allows.
- Provide additional trailer and vehicle parking,
- Reconstruct road
- Upgrade the host site to include septic/holding tank

Additional Rationale for Woodcamp Toilet

FS design standard for toilets is 35 PAOT/toilet seat. In order to meet this standard, a total of 3 seats are needed. There are currently 4 seats including a 2-unit vault toilet that is nearing the end of its useful life. The FS has recommended replacing the existing 2-unit vault with another 2-

unit vault to provide the needed capacity and a restroom backup in order to meet health and safety standards and provide toilet facilities when the water system fails.

Woodcamp Picnic Area (NFS Lands)

Woodcamp Picnic area is located on the southwest side of Jackson Meadow reservoir on National Forest Land. There are six informal picnic sites with tables and firerings. The parking lot has capacity for approximately 35 VAOT. There is a 1-unit concrete vault toilet in the parking lot and a wooden 4-unit building near the beach area.

Within 5 years of license issuance reconstruct picnic area including (NFS lands):

- Replace 6 picnic tables with accessible tables.
- Provide 6 accessible pedestal grills.
- Replace one 4-unit toilet (by the beach) with 2-unit vault.
- Develop vehicle access via 1-way road to lower toilet with parking for up to 4 vehicles and signing. Two of the spaces will be signed as accessible parking spaces and up to 2 spaces will be designated for loading/unloading. The purpose of this would be to facilitate the use of the beach.
- Construct ORAR from the parking area to toilet and picnic sites; and from lower accessible parking spaces to beach area and toilet.
- Reconstruct road.

Woodcamp Boat Ramp (NFS Lands)

The Woodcamp Boat Ramp is a single lane ramp. It does not meet the water level in the late season. For instance, by September 13, 2007, the ramp was 125 feet short of the water level. The current ramp is crumbling at the edges and unsafe. In 2009, two vehicles with trailers backed off the edge of the ramp. There is no courtesy dock. There is a gravel parking area with a capacity of approximately 36 VAOT, and a two-unit wooden vault toilet.

There is a foot trail with a bridge from the boat ramp to the beach below the Woodcamp Picnic Area. The wooden bridge on this trail is failing. There are no signs indicating the trail exists. NID plans to remove this bridge during the 2012 field season.

Within 5 years of license issuance, if not completed under the current license, reconstruct the boat ramp to California Department of Boating and Waterways and current accessibility standards to provide a 2-lane ramp with an accessible courtesy dock and sidewalk. To the degree topographically feasible, the ramp should provide for launching in dry years until September 30. The following includes, but is not necessarily limited to, additional elements of this reconstruction:

- Pave and stripe parking area; provide & designate accessible parking.
- Replace one 2-unit toilet with an accessible 2-unit vault toilet.
- Provide ORAR between parking and toilets.
- Maintain prominent signing regarding submerged stumps and rocks.

- Provide informational sign that meets FS standards.
- Construct trail from parking lot to the Woodcamp beach and install signing.

Additional Woodcamp Boat Ramp and Picnic Area Rationale

Although the Woodcamp Picnic Area tends to be under-utilized, the beach adjacent to this picnic area is very popular. However users of this beach area must haul their equipment down a relatively steep hill to access the beach. The foot trail from the Woodcamp Boat Ramp and the one way road from the Woodcamp Picnic Area parking lot to the beach will allow for easier beach access, especially for those with limited mobility. See additional discussion on individuals with limited mobility under <u>Additional Pass Creek Boat Ramp Rationale.</u>

The Woodcamp boat ramp was proposed to be expanded to two lanes with a courtesy dock in the 1970s (Jackson Meadow Reservoir, Second Stage Recreation Facilities, EAR 1.A. 3 & 4); however this work was not completed. The California Department of Boating and Waterway's (DBOW) <u>Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities</u> (March 1991) section 201 states the following: "Generally, single lane launching ramps are not practical, particularly if they are over 100' in length. They can be difficult to use because of their narrowness, particularly for inexperienced boaters." The DBOW standard lane width for a two lane ramp is 15'. For a single lane ramp, 16-20 feet is the standard lane width. The Woodcamp Boat Ramp is 12 feet wide by 228 feet long—far exceeding the standards listed above.

<u>Silvertip Group Campground (Licensee Lands)</u>

Silvertip Group Campground is located on the southwest side of Jackson Meadow Reservoir on Nevada Irrigation District Land. There are 2-25 PAOT campsites with 2-2 unit vault toilets and parking for approximately 15 cars.

Within 5 years of license issuance:

- Replace unit marker.
- Replace two information signs.
- Provide accessible routes in both group sites (between cooking and eating areas, restrooms, tent camping areas, parking and group fire ring areas). Address opportunities to provide an accessible route to Lakeside unit or lakeshore from the parking area, if topography allows. Aim to provide a 36" width (with passing and resting areas) with no more than 30 percent of the total trail length being more than 8.33 percent.
- Regrade tent pad areas. Provide for a minimum of 1 accessible tent pad in each group area.
- Regrade group cooking and eating areas.
- Reconstruct interior campground roads and parking area; designate/sign one van accessible parking space per unit. Provide 10 additional paved vehicle parking.
- Replace remaining wooden tables, including serving tables.

Within 20 years reconstruct campground.

Additional Rationale for Silvertip Group Campground

The FS experience managing this campground indicates that there is often insufficient parking to accommodate the user of this group campground.

Visitors to this site must walk down a relatively steep dirt road from the parking area to access the Lakeside campsite or lakeshore. Consequently, the agency recommends Licensee explore opportunities to construct a path to serve individuals with limited mobility. Due to topography, the FS is not recommending that this path meet ADA standards which would require excessive excavation, but rather utilizes FSTAG guidelines which allow for much steeper and prolonged grades as well as more pronounced surface protrusions. See additional discussion on individuals with limited mobility under Additional Pass Creek Boat Ramp Rationale.

Findley Campground (NFS Lands)

Findley Campground is located on the southwest side of Jackson Meadow Reservoir located on National Forest Land. Findley has 14 campsites and a 4-unit toilet building.

Within 3 years of license issuance:

- Repair road damage sufficiently to last until reconstruction.
- Replace water source.

Within 10 years of license issuance, reconstruct campground including:

- Replace retaining walls.
- To the degree feasible, provide additional trailer and vehicle parking.
- Reconstruct and widen circulation road.
- Replace flush toilet with accessible toilet and construct paved pathway to toilet entrance.

Jackson Point Boat-in Campground (NFS Lands)

The Jackson Point boat-in campground is located southwest from the Pass Creek Boat Ramp across the lake. It is on a peninsula that currently does not have road access. It was original constructed with 10 campsites, but two of the sites were rarely used and some of the amenities have been removed. It currently has 8 campsites. It has 2 single unit pit toilets that are currently full and other amenities are in a state of disrepair. The boat-in campground is managed by a concessionaire and there is no fee at this time.

The current Yuba Bear Exhibit R (2000) requires certain work be completed at Jackson Point Boat-In Campground. Because most of the work has not been accomplished, the FS believes that some of the work listed below will be completed during the existing license. Most notably, the waste disposal of the existing toilets needs to be addressed immediately. However, if facility replacements are not completed during the current license:

Within 2 years of license issuance, reconstruct the campground to meet the current FS design standards.

- Replace 2 toilets with toilet facilities that are acceptable to FS and Sierra County Sanitarian. Licensee shall be responsible for the logistics associated with waste disposal.
- Relocate sites that are currently not being used. Remove unused facilities
- Install metal animal resistant food storage lockers.
- Address opportunities to provide for accessibility.

Rationale

The following measures were included in Licensee's Proposed Recreation Improvements in the April 2000 Revised Exhibit R: "Remove concrete stoves and provide firerings and picnic tables at new sites on Jackson Point to promote more efficient use. Jointly evaluate sanitation facility needs at Jackson Point and determine future strategy within three years." Most of these actions have not been completed and the toilets are in need of immediate replacement.

The majority (>62 percent) of respondents at Jackson Point noted evidence of human waste because the existing toilets are full and NID has not developed a strategy for management of human waste, as required in the current Exhibit R. This clearly presents an unacceptable health risk at a developed campground. Possible strategies for human waste management include:

- Floating toilet facility
- Portable chemical toilets
- Securing access across private land to allow Licensee to drive to the campground
- Helicoptering or boating waste out

The FS is willing to entertain any of these or other strategies but will not entertain a pack in-pack out strategy for human waste at this site.

Jackson Vista Point (NFS Lands)

Within 5 years of license issuance, gravel the parking area.

Within 15 years of license issuance, rehabilitate or replace restroom building.

Jackson Meadows Administrative Site (NFS Lands)

This site was constructed by Licensee and provides for the administrative support of the recreation facilities at Jackson Meadows. It consists of a 3 bedroom house, generator shed, warehouse, trailer pads with sewer hook-ups and barracks. All facilities, except for the barracks are regularly being used by the concessionaire to support the recreation use of the project lake. FS also uses approximately one third of the warehouse to support the operation of the project recreation sites. A portion of the Jackson Meadows Administrative Site warehouse is currently being used as a store.

The barracks should not be included as a project facility in the new license.

- Provide landlord type maintenance of all facilities except the barracks. Demolish barracks (and any other facilities within the compound if it is jointly determined by the FS and NID that the facility is no longer needed for administration of the project).
- Landlord type maintenance includes maintenance, reconditioning, renovation or improvement that arrests deterioration improves and upgrades facilities and appreciably prolongs the life of the property. Examples include, but are not limited to, installing a new roof, new floor, new siding or new water barrier envelope; replacing furnace, water heater, pipes, pumps, interior drywall or wallboard; repairing electrical service; paving interior roads, and performing exterior painting and refinishing. (Exterior painting that repairs unsightly visual marks caused by everyday use is not considered landlord maintenance.) If there is temporarily no tenant (e.g. the concessionaire has a base of operation elsewhere) deferred tenant maintenance will default to landlord maintenance until the facility is once again needed to support the operation of the recreation facilities. The concessionaire will continue to provide tenant-type maintenance of these facilities.
- If the entire site is no longer needed for an administrative site, consider alternative uses in the Recreation Development Plan. If the Recreation Development Plan identifies needing this location for recreation development, re-vegetate the site with mature enough vegetation so that it will have sufficient shade when it is developed as a recreation site.

Rationale

The Jackson Meadows Administrative facilities, including housing, were constructed by NID under an agreement between NID and FS to provide for the administrative support of the recreation facilities at Jackson Meadows (USDA Forest Service 1966). Under the 1966 agreement, NID is ultimately responsible for these administrative facilities. Revised Exhibit R April 2000 recommended that the continued inclusion of the barracks in the license with this to be revisited in 5 years. Although the barracks are included in the current license, FS concurs that the barracks are no longer needed for the maintenance of the project recreation sites and should be removed from the new license. However, the other facilities at the administrative site should remain as part of the license since the concessionaire running the project recreation sites use the administrative site facilities as a base of operation. (Note: If FS, rather than a concessionaire, were to become the operating party, these facilities would be used by FS in the operation of the recreation facility. It is possible the barracks would also be needed, but FS management of these facilities is not currently being considered.)

It should be noted that the current concessionaire is able to return more fees for the maintenance of the project recreation facilities because their base of operation is located immediately adjacent to the project. The fees are used to perform landlord type maintenance of the project recreation facilities under Granger Thye fee-offset. Consequently, the Granger Thye fee offset reduces the funds that NID is required to pay to subsidize the campground maintenance. Currently, 85 percent of the gross receipts are used to fund the concessionaire's operation of the Jackson Meadows recreation facilities (including receipts from the store) while 15 percent is returned to FS to be used for landlord type maintenance of facilities within the permit area.

NID proposes to remove the administrative site from the Project boundary since NID does not have any use for this facility; and, if NID chooses to operate and maintain the recreation facilities, NID would develop a different administrative site on NID land.

In order to meet the projected demand for camping, the use of any developable land with easy access to the reservoir shall be prioritized for campground development over the development of an administrative site. Developing any NID land near the reservoir for an administrative site would not serve the interest of the recreating public.

If NID were to build and administrative site away from the lake on NID land and the location of the current administrative site is no longer needed for that purpose, the site would be available for development of additional recreation facilities. The appropriate type of facility would be determined in the Recreation Development Plan but it is most likely best suited for group campsites following site revegetation. Although the site is located on some of the limited flat land around the reservoir, since it is located approximately 1/2 mile from the lake and not within sight of the lake, it does not provide an ideal site for a recreation development. Further reducing the desirability of this location is the unpaved condition of the county road leading to the site and the fact that much of the site has been cleared of mature vegetation. Mature vegetation is a necessary component of recreation sites in this area. It provides shade and recreation sites without shade tend to be unpopular, unless they have some other notable attraction (such as spectacular views or easy lake access). Due to the limited growing season, revegetation of this site with mature trees during this license period would only occur if mature trees were planted. Consequently, since this land is already cleared of vegetation, this may represent the best location for an administrative site under the circumstances.

Finally, if NID were to develop an administrative site on NID land, a store should be included in this administrative site. The existing store has proved to be a valuable enhancement of the Jackson Meadows facilities. Prior to the store, due to the distance to the nearest town or gas station (approximately 30 minutes), non-self-contained campers would tend to leave the area when they ran out of ice. Longer visits are now reasonable due to the presence of the store.

Jackson Sanitary Dump Station Enhancement (NFS or Licensee Lands)

The sanitary dump station is located on NID land and is not listed as project facility in Table 2.3-1 of the April 2011 Recreation Facilities Plan, however it was developed during the second stage of Jackson Meadows facility construction.

The existing dump station has a 7,500 gallon tank but has no leachfield. Due to pumping costs, the current facility is inefficient to operate. However, as noted in the 1970's, when it was constructed, there was (and still is) a demand for this service. Additionally, in 1988 the FS identified the need for a second dump station in the area (FS 1989).

- Within 2 years of license issuance, retrofit riser to prevent the tank from filling with snow melt.
- Consider alternative uses for the site in the Recreation Development Plan, to be constructed as needed when the dump station is decommissioned.

- At the point when any major component of this facility is in need of rehabilitation, decommission and construct a dump station with a leach field, preferably in the vicinity of the eastern portion of the reservoir. The determination of the need for rehabilitation would include at least any of the following items: 1) water system not sufficient for demand, 2) the holding tank is leaking as evidenced through such things as the lack of liquids (indicating that the fluids are leaking out) or being full in the spring after being drawn down over the winter (indicating that liquids are leaking in from the nearby wetland) or 3) subgrade failure of the road. The new location could be on NFS land or NID land. Provide potable water with RV filling station. If feasible, design facility with sufficient space so that if a decontamination station (for aquatic invasive species) is needed in the future, it can be co-located with this facility (unless this potential need for a decontamination station is addressed elsewhere).

Rationale

The concessionaire (CLM) charges 15 dollars per dump—three times to price of dumping at a comparable facility at Stampede Reservoir –yet the income generated at this facility covers roughly half of the cost of pumping (and none of the other costs associated with the other management of this facility).

The road geometry was not designed for today's larger vehicle configurations and is too tight for some vehicles. The tank inlets are covered with standing water in the spring, causing the tank to fill up from snow melt. Finally, the site where the existing dump station is located may be a suitable site for group campground facilities, so when the current facility is decommissioned, this location would be available for redevelopment.

Based on experience in other areas, the concessionaire estimates that the demand for the dump station is roughly three times the existing use (CLM 2010). In other areas, where there is a leachfield, dump stations can be operated on an honor system (e.g. Loganville on Highway 49). With the high cost of pumping this facility, operating on an honor system would be an expensive undertaking for the operating party. Consequently, currently campers wanting to use the dump station will encounter a locked gate and must find a camp host to open the gate, resulting in numerous campers leaving without dumping their waste.

Licensee has proposed to close the dump station based on cost-effectiveness, poor existing system design, lack of suitable locations at Jackson Meadows, and lack of reliable water source. The agency does not concur that this would meet the recreationists' or the resource needs. The next nearest dump station is 34 miles away in Truckee. Without a convenient dump station, some campers dump their waste on the side of the road. Consequently, the Environmental Assessment for the Stage Two development of Jackson Meadows identified the need for the dump station construction in 1973 (USDA, 1973a). With the current management of the dump station, dumping of waste on the side of the road periodically occurs today. Twice during the 2010 season, Larry Farquhar (Jackson Meadow Operation Manager for CLM) personally observed campers emptying their RV's on the side of the road near Jackson Meadows. This indicates that there is a demand for this service and clearly raw sewage dumped on the side of the road presents a public health and resource concern.

As a compromise, until the facility is in need of reconstruction or replacement of a major component, the agency has agreed to allow the concessionaire to charge all self-contained vehicles a surcharge for camping at Jackson Meadows in consideration for permitting free dumping of waste. The agency will direct the concessionaire that, barring unmitigatable circumstances (e.g. water system failure), the dump station will be open and available at all times during the recreation season.

The FS has not done an exhaustive search of the area for other potential dump station locations and is unaware that NID has done such a search. Close proximity to the lake is not important for a dump station like it is for a campground. A dump station that is operated on the "honor system" could be located farther away from the lake since availability of a camp host is not necessary for the management of an "honor system" facility. Topographically, potential locations may include NFS land near the 07 road in T.19N, R.13.E, Section 16 or 22 (near the intersection of the 88 road), although perc tests have not been conducted in this area. Until an exhaustive search has been done in the area, the agency cannot concur with NID's contention that there is a lack of suitable location.

Trails at Jackson Meadow Enhancement and Rationale (NFS Lands)

Woodcamp Interpretive Trail

The Woodcamp Interpretive Trail is a short (approximately 1 mile) trail located next to the access road to the Woodcamp Complex. It is located on NFS land. The parking lot is within the FERC boundary although the trail is not. The trailhead is not well marked.

Annually provide trail maintenance on Woodcamp Interpretive Trail, and the connector trails between this trail and the campgrounds. Work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, performing spring and fall drainage maintenance (including installing new drainage structures as needed), bridge maintenance and loose rock removal. On a five year cycle, trail maintenance will also include brush cutting; embedded rock and root removal; slough and berm removal; and (if appropriate) turnpike, retaining wall and switchback maintenance. Reconstruction needs (including bridge reconstruction) will be addressed on an "as needed" basis.

Within 5 years:

- Install a more prominent trailhead sign at start of Woodcamp Interpretive Trail.
- Improve parking area for Woodcamp Interpretive Trail.
- In consultation with FS develop, install and maintain interpretive signs on Woodcamp Interpretive Trail to replace the existing brochures.

Additional Trail Construction

- Within 5 years, install and maintain trailhead and directional signing on all trails. Include the location of all trails in any maps or information on opportunities in the area.
- Within 5 years of license issuance, construct and maintain a (Class 3) non-motorized trail from the Vista Point and Aspen Group Campground to a lake overlook point above the quarry.
- Within 15 years of license issuance, construct and maintain a new (Class 3) non-motorized trail from the vicinity of Woodcamp Complex to English Dam with interpretation of English Dam site. Construct as much of this trail as possible near the shoreline, (although topography will dictate the location.) If feasible, connect this trail to the Woodcamp Interpretive Trailhead. If it is not feasible to connect with the Woodcamp Trail, provide trailhead facilities.
- Provide annual maintenance of these trails. The work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of construction and maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, bridge maintenance (if appropriate), performing spring and fall drainage maintenance (including installing new drainage structures as needed) and loose rock removal. On a 5-year cycle, trail maintenance will also include brush cutting; loose rock and root removal; slough and berm removal; and turnpike, retaining wall, switchback maintenance and other work needed based on trail design. Reconstruction needs (including bridge reconstruction) will be addressed on an "as needed" basis.

Jackson Meadows Trail Rationale (including trails listed with individual recreation sites)

The 2000 Revised Exhibit R recognized a demand for hiking in this area. Section 5.0 "Licensee Proposed Recreation Improvements" of this document included the following proposal: "Form a joint NID and Forest Service committee to evaluate expansion of trail opportunities related to signs, access and parking for the Pacific Crest Trail and possibly shorter loop trails that would provide views of the reservoir." No such evaluation has been completed at this time.

Hiking is a primary recreational activity by users of Jackson Meadows. Roughly two thirds of the overnight respondents at Jackson Meadows listed hiking as an activity they would participate in, while over 40 percent of the respondents indicated a preference for a shoreline trail. Walking for fitness and day hiking on trails are activities with high latent demand in the adult population according to Licensee's summary of the 2008 California Outdoor Recreation Planning Program (CORP). According to Licensee's summary of future recreation demand, participation in hiking is growing and projected to increase by 50 percent over the term of the license (NID 2010).

Hiking opportunities in this area are limited. Only the Pacific Crest Trail (PCT) and the short Woodcamp Interpretive Trail are located near Jackson Meadows reservoir. It should be noted that the Pacific Crest Trail runs from Mexico to Canada and due to this long distance, has some relatively uninteresting segments that do not offer views or access to other desirable recreation attractions (meadows, lakes etc.). The PCT near Jackson Meadows is one of these uninteresting segments. The only other nearby hiking trail is Mt. Lola trail, located on a dirt road roughly 12 miles east of Jackson Meadows reservoir.

These proposals would provide day hiking opportunities with highly scenic and interesting destinations. These opportunities could enhance the interpretive emphasis at the Jackson Dam Vista (installed as part of the 2000 Revised Exhibit R) which discusses English Dam—an important feature in California history. English Dam was constructed in 1854 to collect water and transport it via canals to a point near Camptonville California. The water was used for various hydraulic mining operations downstream. English Dam provided water until 1883 when it broke. It is still a mystery of how the broke, but the breaking of the dam played a key role in stopping hydraulic mining in California. Remnants of the dam still remain.

Although the FS has not found evidence that the Woodcamp Interpretive Trail was constructed as part of the license and it is not listed as a project facility, the only reason to have a trail at this location is to serve the project-related recreation. Based on observations during the 2009 surveys, the trail currently gets little use. This is, at least in part because there is little evidence that the trail exists. Prominent signing at the trailhead and connecting this trail to the Woodcamp Complex campgrounds (if feasible) will likely result in better utilization of the trail. The trails connecting the campgrounds to the Woodcamp Interpretive Trail would provide the opportunity for evening strolls. The other trails (e.g. trail from East Meadows to the lakeshore, trail from Pass Creek Boat Ramp to Aspen Picnic area) will reduce shoreline impacts by providing a single route for visitors to follow when accessing the lakeshore. As previously mentioned, user created trails create more impacts to soil and water resources than well designed, constructed trails.

The private land, across which a portion of these proposed trails would be located, is owned by Sierra Pacific Industries (SPI). The Truckee Donner Land Trust (TDLT) holds conservation easements over these lands. These conservation easements allow the grantee (TDLT) to construct trails across SPI's land to serve the recreating public. This right can be granted to a third party although SPI will retain the right of review over any trail work. According to SPI, due to the existence of the conservation easement, no trail easement would be needed or granted for this construction. TDLT and SPI are supportive of these trail proposals. Licensee has stated that they would be willing to discuss the trail from the Vista Point to the quarry outside of relicensing.

Milton Reservoir (NFS Lands)

Milton Diversion Impoundment is located on NFS land at an elevation of 5,690 feet. Access to the reservoir occurs by two routes. From the east, access is approximately 2 miles from Jackson Meadows Reservoir via Henness Pass Road (Sierra County Road 301). Access from the west is via Sierra County Road 401 and Henness Pass Road (Sierra County Road 301) approximately 23 miles from Highway 49 (Downieville, CA). At maximum water surface elevation, Milton Diversion Impoundment is 100 acres with 1.3 miles of shoreline. Milton Reservoir is designated as a fishing/special use area and the operation of internal combustion engines is illegal. CDFG manages the reservoir to maintain an abundant population of trophy-size trout. Milton Diversion Impoundment has an ROS classification of "Roaded Natural". The primary recreation activities at Milton Diversion Impoundment are fishing, camping, boating, and picnicking. Most of the use is overnight use (NID, PG&E 2011a). There is a single vault toilet which was constructed as part of the current Exhibit R (2000).

Within 3 year of the license issuance:

- Delineate a total of 6 dispersed campsites, 3 in the area near the boat launch, and 3 existing sites west of the launch area, near the dam. Provide parking for 2 cars at each.
- Address accessibility as required in Development Scale 2 campgrounds.
- Place barriers to prevent vehicle use outside of the designated parking area
- Construct an ORAR to toilet from a nearby parking spot.
- Each year, at the Annual Coordination Meeting, address if there is a need for food lockers. If animal problems arise, install animal resistant food lockers at each campsite the following year.
- Limit shoreline access to one single-lane car-top boat launch with barriers to allow direct vehicle access to the shoreline for boat launching purposes only and prevent driving along shoreline. Gravel boat launch entry above the high and low water mark to prevent resource damage.

Within 15 years, rehabilitate or replace toilet.

Rationale

The 1990 Tahoe National Forest Land and Resource Management Plan (LRMP) stated that Milton has become a popular high quality fishery and, based on recreation monitoring, additional recreation facilities might need to be developed. This plan recognized Milton reservoir as having the best opportunity for additional recreation facilities within the management area. However, based on the user surveys conducted by Licensee and sensing of other users by the FS, there is a strong desire is to keep this area rustic.

Licensee, in the July 2010 version of the Recreation Facilities Plan, proposed designating 4 campsites on the spur road upstream of Milton. Due to the wet meadows in this area, FS recommended against these campsites and Licensee removed the proposal from the next version of the plan. Licensee subsequently proposed providing parking areas and walk-in camping.

User compliance with walk-in sites is expected to be problematic due to the somewhat remote nature of this lake. There is a need to protect the lakeshore from excessive vehicle use however, if vehicle traffic is controlled through the effective use of barriers, most of the lakeshore can be protected from resource damage without the need to limit camping to walk-in sites. A graveled boat launch area will reduce sedimentation.

Although the toilet is has an accessible design, the approach to the toilet is not accessible although the topography would support an accessible approach.

In the interest of keeping this site primitive, amenities including animal resistant food lockers are not required at this time, however, if/when monitoring indicates a need for these facilities, they should be installed in the future.

French Lake (NFS Lands)

At maximum water surface elevation of 6,660 feet, French Lake is 356 acres with 5.3 miles of shoreline. French Lake is within the Grouse Non-Motorized Area and is classified as Semi-Primitive Non-Motorized in FS ROS classification system. In addition, Nevada County classifies French Lake as a “small lake” and, as a result, has a maximum speed limit of 10 mph. Primary recreation activities are hiking, backpacking, camping, and fishing. The reservoir does not have any developed recreation facilities. French Lake provides users a hike-in experience with access along a road that is closed to motor vehicles.

Within 5 years:

- Grade and gravel the existing parking area & install large rock barriers to keep OHVs from accessing lake.
- Install and maintain trailhead sign.

Rationale

It is no surprise that 90.9percent of the visitors at French Lake listed hiking as an activity they participated in, as it is located within the Grouse Non-Motorized Area (NID 2011, table 3.4-254). It is also not a surprise when visitors to the lake, expecting a quiet experience, complained about OHVs that got around the gate and rode to French Lake. French Lake visitors also complained about the rocks in the parking area. Specific comments identified as why they rated access conditions unacceptable at French Lake included:

- “Several OHV users completely ignored the prohibition signs on OHV usage within the recreational area, which had a severe impact on our enjoyment of the area.”
- “Not enough to keep out ATV!”
- “Too narrow, tight turns with big rocks/boulders. Condition same as parking area.”

(NID 2011, table 3.4-261).

The OHV specialist at the Sierraville Ranger District has repeatedly attempted to reinforce the barriers to prevent OHVs from accessing French Lake within the Grouse Non-Motorized Area. Heavier duty barriers (boulders placed by large equipment) are needed to effectively discourage OHV trespass. This FS employee regularly gets questions on how to access French Lake from the Meadow Lake Road (personal communication with Jeff Wiley, 2012). A trailhead sign would alleviate this user confusion. The grading, additional large rock barriers and signage are needed to alleviate the issues identified at French Lake.

Bowman Reservoir Area

The Bowman Recreation Area includes Bowman Reservoir, Sawmill Reservoir, Canyon Creek, and Faucherie Reservoir, which are all hydrologically connected via Canyon Creek. Jackson Creek Campground is also included in the Bowman Recreation Area discussion due to its proximity and campers’ heavy use of the Project lakes. Located just 4 miles from Jackson Meadows Recreation Area, these two areas are significantly different. In contrast to the high speed access to Jackson Meadows, users of the Bowman area experience very slow access on rocky roads which is appropriate for high clearance vehicles only. In contrast to the higher level of development and amenities at Jackson Reservoir, the Bowman area is more rustic with fewer facilities designed for visitor comfort.

The ROS settings designated in the TNF LRMP (USDA Forest Service 1990) for NFS lands in the Bowman Recreation Area include: Semi-Primitive Motorized for Bowman Lake and the lands to the north of Bowman Lake; Semi-Primitive Non-Motorized for the lands to the south of Bowman and Sawmill lakes, and all of Faucherie Lake (these areas are part of the Grouse Non-Motorized Area); and Roaded Natural for Sawmill Lake and the lands to the north of Sawmill Lake. The Bowman Recreation Area tends to attract recreationists that can be labeled as “a rougher crowd” than does Jackson Meadows. The Bowman Recreation Area has a higher degree of user conflict reported as compared to other areas of both the YB and the DS project areas.

In the Bowman Recreation Area, there are two project family campgrounds (30 units) and one group campground (2 units, 50 PAOT). These campgrounds are generally Development Scale 2. There is also one, non-project family campground, Jackson Creek CG, which accommodates primarily project related recreation. There is no potable water in this area. There is no garbage collection provided and no fees are charged, with the exception of Faucherie Group Campground. Much of the camping occurs in dispersed sites where the only amenity is a metal or rock fire ring. Boat launches (BL) are generally hand-off, native surface beach launches, except for the launch next to Bowman Lake Campground, which is surfaced with large gravel created during the Project development. There is room for parking at the Bowman launch, but no other features.

The Bowman Recreation Area is broken down into areas and addressed in the following sections: Bowman Recreation Corridor, the corridor concept is designed to aid in the management of the recreation in this area; Bowman Reservoir; Sawmill Reservoir; Faucherie Reservoir; Canyon Creek, and; Jackson Creek Campground (non-Project facility).

The FS required actions on NFS lands and recommended actions on NID lands within the Bowman Recreation Area are designed to maintain the a relatively primitive experience that the Bowman Recreation Area is known for, and its visitors are generally seeking, while better protecting the environment and sensitive riparian resources within the watershed.

Bowman Recreation Corridor (Both NFS and Licensee Lands)

The Bowman Recreation Corridor encompasses the Bowman, Sawmill and Faucherie Project reservoirs, Canyon Creek (which connects all three lakes), and a ½ mile swath around the roads connecting the Project lakes (¼ mile each side of the road). This corridor is identified to aid in the management of this recreation rich corridor. The Jackson Creek and Prairie Creek Recreation Residence Home Tracts (permitted on NFS land) also fall within this recreation corridor. Though the cabin owners of the Home Tracts undoubtedly utilize the Project lakes within this corridor, they will not be addressed further as the cabins are privately owned.

Specific measures to plan for the protection of the natural resources and provide recreation opportunities to meet the current and future demand in the Bowman Recreation Area, and; for routine heavy maintenance items or enhancement, enlargement, removal, or reduction of a facility are:

Within 2 years of license issuance, prepare a corridor-wide recreation development and management plan for the Bowman Recreation Corridor in consultation with the TNF. This plan shall address:

- Management of both NFS and Licensee land.
- The need to concentrate all overnight camping in this corridor into designated sites and facilities where sanitation, fire prevention and resource protection are provided for.
- Providing for construction of sufficient facilities to meet current use and projected demand of this area through the term of the license to the degree this is topographically feasible for the entire Bowman to Faucherie area, including Jackson Creek Campground. The minimum resource protection needed to serve overnight visitors including - vehicle controls, fire rings, animal resistant food lockers and toilets.
- Implementation of camping restrictions on both NFS and Licensee’s land (restricting camping to designated sites only) to coincide with development of additional camping capacity. A restricted camping area designation on NFS lands will need to be addressed through the Commission’s NEPA process and a subsequent forest order. Additional coordination will be needed with the county sheriff to implement the closures on private and Licensee owned land.
- Assessing the optimal use of the land in this corridor to meet future project induced recreation (due to the limited amount of developable land in the area), including analysis of the physical overnight carrying capacity (based on the suitable land for overnight camping at locations where toilets can be provided.)
- Providing for a variety of experiences appropriate for the ROS, including some sites with more amenities and other sites providing more of a dispersed type (lower density) camping experience but where adequate sanitation and resource protection measures are provided. This corridor spans Semi-Primitive Motorized and Roaded Natural ROS designations. Based on the ROS classes; and the results of the user surveys summarized in Technical Memorandum 8-2b and 2000 Revised Exhibit R, a range of Development Scale 2 and 3 family and/or group campgrounds should be included in this plan.
- Group, family and boat-in developed/designated camping opportunities.
- Opportunities to meet demand for day use facilities (including boating access and picnicking). In determining if picnic sites should be developed, address the benefits and risk of providing these facilities, since these sites have the potential to become de facto campsites. If picnic sites are provided, develop appropriate management responses to assure picnic sites do not attract frequent overnight use such as hosts and patrols.
- Sanitation and litter control corridor-wide.
- Plans to reduce the resource effects of recreation (including uncontrolled vehicle use and fire).
- Information and education.
- Plans for dispersed campsite conversions, closures and rehabilitation.
- Schedule for implementation and construction.

- Development of a centrally located potable water source in this corridor.
- User conflict management.
- Enforcement of regulations.
- User fees with public input and Forest Service approval (facilities on NFS lands).
- Provisions for at least one host site within the basin with potable water, septic or holding tank, and power (preferably solar panels, or quiet generator).
- Continue the existing direction to keep OHVs out of Bowman Reservoir under the high water mark (especially at east end/inflow area of the reservoir) via strategic placement of barriers.

A boat management plan for Bowman and Faucherie Lakes (developed in conjunction with USFS, County and other interested agencies) addressing boat speed, motor size, and type of motor (gas or electric). The FS' recommendation for Bowman Lake water surface is for relatively quiet experiences, i.e. non-motorized water craft and/or limiting the horse power and size of motorized water craft, limiting speeds to under 25 mph, and prohibiting Personal Water Craft.

The Bowman Recreation Corridor Plan is to be approved by FS and other applicable resource agencies. Licensee shall be responsible for the environmental analysis, documentation of the analysis, and construction of all facilities and/or implementation of measures identified in this plan after approval of the plan.

Within 5 years of license issuance:

- Provide a minimum of one potable water system at one of the campgrounds in the Bowman Recreation Corridor. Provide signing at the other campgrounds informing recreationists where they can obtain potable water. If the water system is a single hand pump, then place at a location convenient for campers from other campgrounds, provide a parking space, and strategically place signs within the Bowman Recreation Corridor informing other campers of the potable water opportunity.
- Construct a host campsite within the Bowman Recreation Corridor that includes water (if the potable water system is pressurized provide a hydrant at the host site, if the potable water is a hand pump locate host relatively near hand pump), septic (or holding tank), and preferably power (i.e. solar panels or quiet generator) at the campground where the potable water is provided.

Within 7 years of license issuance, implement the camping closure. By that time, through construction of additional facilities, the developed overnight camping capacity should be sufficient to accommodate the mid-summer non-holiday weekend camping use projected for the following 10 years (see the development measures for the reservoirs and facilities within the Bowman Recreation Corridor). In addition to construction, implementation should include:

- Working jointly with FS and Nevada County to pass ordinances to limit camping (on NFS and NID lands) to developed campgrounds and designated sites only. The closure should encompass approximately all land within 1,500 feet of roads from Bowman Dam on the west, Jackson Creek Campground on the east, and Faucherie Dam on the south. The corridor may need to be widened or narrowed in a few areas (such as the south side of Sawmill Lake) to meet the intent of allowing boat-in camping on the non-vehicle accessible side of these lakes but limiting camping to designated sites where there is vehicle access.

- Closure, barricading, removal, and restoration of all dispersed campsites in this corridor that are not converted to designated camping or day use sites. Provide appropriate signage and maintain these closures throughout the license period.

Rationale

There has long been a concern about unregulated camping and the associated impact on the watershed in this area. Documentation of this concern even predates the project. Prior to the project (in a May 19, 1949 Cooperation Agreement for the Camp Ground Area) NID agreed to allow the TNF to expand Jackson Creek campground onto NID land in recognition "that better management is needed to aim to concentrate campers in specially prepared areas where sanitation facilities and camp stoves may be made available to reduce liability of water pollution and forest fires." This agreement also stated that:

> "it is mutually beneficial for the District and Forest Service to cooperate for the purpose [of] maintaining proper sanitation conditions on timber and brush land watersheds from which water is taken for domestic use [and] it is desirable that intermingled Forest Service and District lands heavily used by the camping public be managed under the same principles to provide facilities to serve concentrated camping."

These statements are no less accurate today than they were in 1949.

In a 1987 FERC inspection the Commission identified the fact that Bowman attracts a fair number of users and the facilities are not adequate to provide for project induced recreation and directed NID to address this issue. This report states that the upstream end of Bowman Reservoir has high potential for additional recreation development that would help meet public demand. According to this inspection report, Licensee's representative voiced strong opposition to even considering development at this site or at Milton Reservoir (FERC 1987).

The 1990 TNF LRMP recognized the need for better sanitary facilities in the Bowman Area. In the Summary of Issues, Concerns, and Opportunities section of the Bowman Management Area (MA 039), it states "There is a need for better sanitary facilities at Bowman Lake; any solution must involve coordination with NID" (USDA Forest Service 1990). For all the scattered dispersed camping that currently occurs around Bowman Lake there is only a single toilet located at Bowman Lake Campground.

In 1993, FS recommended that various measures be taken in this area to limit vehicle access and uncontrolled recreation use in this area and define acceptable campsites. Despite these controls, in 2007, Licensee identified a proliferation of dispersed campsites in the Bowman-Faucherie corridor with roughly 30 dispersed sites at Bowman, 30 dispersed sites at Sawmill Lake and additional dispersed sites scattered along Canyon Creek and near Faucherie. Uncontrolled recreation use is associated with erosion, soil compaction, litter and sanitation concerns.

Based on decades of Forest Service experience of managing recreationists in this area, it is clear that the dispersed camping use of the lands along Canyon Creek and the overnight use at Jackson Creek Campground (outside the project boundary) are tied to the project. The project lakes are historically what draws visitors across the rough roads to the Bowman Recreation Corridor. In NID's current Revised Exhibit R (2000) the Canyon Creek dispersed sites, Canyon Creek Campground and Jackson Creek Campground, among other recreation sites, were included as recreational opportunities that NID would take responsibility for based on a 1966 agreement between NID and the TNF:

> "Licensee will be responsible for the construction and implementation of all recreation improvements. Traditionally the FS was responsible for the operation and maintenance of all Forest Service Recreation improvements. However, based on the agreement between the Tahoe National Forest and Nevada Irrigation District dated June 24, 1966 and June 26, 1966 respectively, TNF and NID have agreed that NID is responsible to administer, operate, and maintain the recreation facilities." (NID 2000, page 44).

The 2000 Revised Exhibit R Table 2.2-1 "Yuba-Bear River Project Recreation Sites" lists all the recreation site opportunities for visitors to the YB Project area (NID 2000). This list specifically includes Canyon Creek dispersed sites, Canyon Creek Campground and Jackson Creek Campground, among others. Therefore, it is reasonable and prudent to include these areas along with the Project lakes when planning for the recreation needs and impacts within the Bowman Recreation Corridor.

In addition to the current use along Canyon Creek, the new license streamflow proposal in Canyon Creek has potential to enhance the fishery and thus increase the recreation component (fishing). The existing minimum instream flow provided less than 40 percent of the waded usable area (WUA) for resident rainbow trout. The new flows will provide up to 95 percent WUA for the fishery which should be a benefit to the system. Fishing groups (NGO's) have indicated that angling will improve with the new flow, which will probably result in more fishermen utilizing this reach.

No formal surveys were conducted at Jackson Creek Campground to determine what activities users participated in or where the campers spent their days. However, there is little attraction at Jackson Creek Campground itself except for its availability as a base with overnight camping facilities from which to explore the nearby Project lakes during the day. Licensee did survey the overnight visitors along Canyon Creek, but they were not asked if they visited Project lakes during their stay. However, the survey responses did indicate that many of them participated in activities that would have occurred at the nearby Project lakes. Of the overnight visitors surveyed along Canyon Creek, 65.6 percent participated in fishing, 57.6 percent participated in swimming, and 24.3 percent participated in flat-water boating (NID 2011, Table 3.4-361). The surveys did not differentiate lake-based fishing and swimming from stream-based fishing and swimming, but it is the FS's experience that a large portion of the users would have been at Faucherie, Sawmill or Bowman lakes. A Forest Service employee surveyed nine groups that stayed at either Jackson Creek Campground or dispersed sites that were in the vicinity but were not on one of the Project lakes within the Bowman Recreation Corridor on Sunday, June 10,

2012. One hundred percent of the groups surveyed indicated that they recreated or planned to recreate at one or more of the three Project lakes (Bowman, Sawmill, or Faucherie) in the Bowman Recreation Corridor during their stay. The results of the spot survey were consistent with Forest Service observations of recreation use patterns in the Bowman Recreation Area.

NID provides FS with some funding to provide regular cleaning and litter policing patrols in this area. The maintenance personnel pick up a great deal of toilet paper around the perimeter of all of the dispersed sites (email from Jerry Cowan 2/17/2010 and personal communications with Mary Furney 2009). Despite these efforts, Licensee's consultant noted toilet paper and large to excessive amount of trash in half of the clusters of campsites in this corridor (NID, PG&E 2010). These impacts are noticeable to the public as well. In the popular dispersed camping areas within the Bowman Recreation Corridor an unacceptable portion of the visitors witnessed signs of human waste; 42.3 percent (Bowman Lake shoreline), 36.6 percent (Sawmill Lake), 30 percent (Canyon Creek) (NID 2010, Tables 7, 6, and 5).

In an effort to limit impacts from recreational use and assure the area is managed for semi-primitive motorized (SPM) recreation, the FS strategy, as documented in the LRMP, has been to keep the Bowman Road in a rough condition, but maintained as necessary for the safety of users and to prevent resource damage. The now common place Sport Utility Vehicle has made this management strategy (developed in the late1980s) ineffective in limiting use. This outdated management strategy has resulted in severely limiting users without higher clearance vehicles, which was not intent of the management direction. The effect of this road management strategy has been to shift the user group to those with more rugged 4x4 vehicles that can easily negotiate the rough road. This, in turn, has also resulted in resource damage caused by off-road vehicles frequently accessing lands off-road, typically to access a dispersed camping spot near a creek or lake. From the very beginning of relicensing discussions between NID and TNF, the FS had made it very clear that the "rough road" management strategy has not been meeting the intended TNF LRMP goal of limiting recreation impacts for a long time and that the TNF and NID needed to pursue a more controlled management approach in the Bowman area to reduce the environmental and social impacts from recreation. The TNF submitted the need to develop a corridor recreation management plan for the Bowman Area in response to NID's Draft Licensee Application, but was rejected as indicated in NID's Final License Application.

Clearly the beauty and rustic/remote aspect of this area is a primary draw. This quality was frequently noted in the open ended responses to the visitor survey. Typically, in a Semi-Primitive Motorized ROS, the agency would strive to provide rustic facilities primarily for site protection, with subtle on-site regimentation. Noticeable on-site regimentation and controls are generally inconsistent with the Semi-Primitive Motorized ROS, but acceptable to meet resource management objectives (USDA 1990).

Licensee and Resource Agencies share a common goal of ensuring the health of the watershed and protecting the rustic aspects of this area. We further agree on the need to limit camping to designated sites where resource protection is provided for. Licensee has proposed the first steps in providing this resource protection in the form of signs and fire rings at several locations along Bowman Lake and establishing a small family and group campground with toilets at Sawmill Lake.

NID refutes that additional resource protection is needed beyond the fire rings and signing at Canyon Creek and Bowman dispersed sites. The primary concern is the costs of providing and maintaining toilets, food storage lockers and barriers for the popular clusters of dispersed sites. Also of concern is the need to provide sufficient litter control and garbage collection. 18 CFR 2.7 f(2) requires Licensee to provide for facilities to process adequately sewage, litter and other wastes.

Although users of this area are often drawn by the undeveloped nature of the camping opportunities in this area, the visitor survey indicated that more users noted a desire for campsites, food storage lockers, restrooms and trash containers than did not desire such facilities (NID 2011, tables 3.4-380 (Canyon Creek), 3.4-483 (Bowman Campground), 3.4-484 (Bowman Dispersed Sites)). This is consistent with Revised Exhibit R 2000 which identified requests (in the Bowman-Faucherie area) to keep the area substantially undeveloped while upgrading the access road, supplying trash bins & toilets. In order to meet the demand (based on the existing and expected increase in use) while limiting use to designated campsites, the Resource Agencies anticipate a need for additional facilities. These additional camping facilities need to be constructed before a camping closure is implemented.

The Bowman Recreation Corridor Management Plan should seek to provide a balance between family, group and boat-in camping considering the available topography. In light of the high occupancy rates at Faucherie (100 percent occupancy on weekends throughout the summer), there is a need for additional group camping facilities in this area. In the short term, this need may be addressed with the addition of a single group site at Sawmill Lake. The need for additional group sites is anticipated in the future based on the projected increases in use of the area. There is also a high demand for boat-in camping facilities, 66 percent of the day users surveyed at Bowman Lake Campground and Boat Launch, and 55.5 percent of the users at Undeveloped Recreation Sites at Bowman Lake preferred to have boat-in campsites (NID 2011, Tables 3.4-482 and 3.4-484). Finally, there is a need for sufficient camping facilities to meet the projected 71 percent increase in camping demand for the Project through the new license period (NID 2011, 4.1 Recreation Use Levels).

The corridor plan should examine how many sites in the corridor are currently used at one time during the prime recreation season. Because the Technical Memorandum 8-2b addresses so many distinct areas, but did not include Jackson Creek Campground (a non-project campground that provides capacity for projected-related recreation), and since the average occupancy for weekends displayed in this Technical Memorandum extends beyond the prime season for the TNF; the number of occupied sites at one time is not readily available from this document although Licensee has the raw data to make these assessments. Adjustments to the resource agency proposed measures would be made based on the findings and disclosure in the corridor-wide plan.

The FS acknowledges that there is a limited amount of developable land in this area. The FS expects that the existing resource concerns can generally be mitigated through standard management action (e.g. construction and maintenance of toilet facilities, barriers to control vehicle access to lakeshores, fire rings located in fire-safe locations, garbage and litter collection). Therefore, only physical carrying capacity needs to be included in this plan. The user surveys did not indicate that crowding in this area is a currently a concern. However, due to changes in the management strategy in this area, it is acknowledged that users may experience a greater perception of crowding associated with being confined to developed sites. Future monitoring will be key in determining the level of development in this area. Due to the potential for changes in perceptions, monitoring of user preferences every six years rather than every 12 years would be appropriate in this area during the period when these changes are being implemented.

By limiting camping to designated sites, it is acknowledged that solitude will be impacted. Requiring users to limit overnight use to a designated site (potentially where a fee is charged) will displace some users who want to avoid fees and regimentation. It is recognized that these users will likely be displaced to other, lesser used areas of NFS lands where Licensee does not have any responsibility.

This corridor recreation plan should address opportunities to reduce user conflict. In the other areas of the Yuba Bear license area, typically fewer than 20 percent of users reported experiencing conflict. However, in the Bowman Recreation Area there is a higher percent of the users that experienced conflict than the other project areas. Approximately 36 percent of the undeveloped campers at Bowman and 54 percent of the group campers at Faucherie experienced conflict, generally in the form of loud and rowdy campers, speeding OHVs and firearms (NID 2011, Tables 3.4-471 and 328). This would indicate that users would benefit from greater law enforcement presence. Camping closure on NID land cannot be legally enforced by FS employees and must be enforced by county sheriff at the request of NID.

A significant portion of the recreationists in the Bowman Recreation Corridor indicated a desire for potable water: 52 percent (Bowman Campground), 44.4 percent (Bowman Dispersed Sites), 32.3 percent (Canyon Creek), and 27.5 percent (Sawmill Overnight) (NID 2011, Tables 3.4-483, 484, 380, and 423). Users in this area must treat surface water, bring all water with them or return to the nearest water which is a substantial drive on a rough road. The nearest potable water is located at Jackson Meadows approximately 5 miles away, or Bear Valley Campground (a PG&E facility) approximately 16 miles from Bowman Campground. Although this may not appear to be a great distance, the driving time from these sources of potable water to Bowman Campground is 40-50 minutes and an hour respectively, plus an additional 30 minutes from Bowman to Faucherie. In the 1965 contract between NID and California Department of Water Resources that granted funds to NID to construct the Jackson Meadows and Faucherie recreation facilities, it specifically required provided drinking water at the Facherie recreation facilities (NID 1965). However, to date there is no potable water available for recreationists anywhere in the Bowman Recreation Corridor. The Feasibility Report Prepared for NID July 1964 included a potable water system in Canyon Creek Campground; however, this system was capped off due to changes in county health regulations (FERC inspection Sept, 1991). In keeping with the rustic ambiance of the area, a single water system at one campground in the area is proposed, with signing at the other campgrounds indicating where potable water can be obtained. In order to attract high quality camp hosts to provide a management presence in this relatively remote area, a camp host site should be provided at the campground with potable water, as well as septic (or holding tank) hookup, and power (solar panels or quiet generator).

Currently the project lakes in this area are generally accessed by informal boat launches. Additionally, historically the first opportunity for recreationists coming in from Bowman Road with boats to access Bowman Lake was a long, narrow, steep (13+ percent grade) road which was built as part of the dam construction. Since this road is eroding, not designed for boat launching and potentially unsafe, the participants agreed to close this road to public motorized use. The 1991 FERC inspection states that the "*approved Recreation Plan stated that Licensee would pursue a grant from the California Department of Boating and Waterways [to] build a boat ramp at this reservoir."* It was reported that the grant was not received, and there have been no improvements to the existing launching facility. Although the participants agreed that the current informal launch at Bowman Lake is sufficient at this time, identifying the best locations for future boat launch improvements will be informative if changes in patterns of use dictate the need for future improvements at all lakes, but especially at Bowman Lake.

Licensee may wish to recoup some of the cost of managing these sites. If so, in order to charge a fee on NFS land, the majority of the following amenities need to be provided:

- Tent or trailer spaces.
- Picnic tables.
- Drinking water.
- Access roads.
- Fee collection.
- Reasonable visitor protection.
- Refuse containers.
- Toilet facilities.
- Fire rings.

Bowman Reservoir (NFS and Licensee Lands)

In an impressive setting of massive granite and high elevation forest Bowman Lake is 827 water surface acres in size with a maximum water surface elevation of 5,562 feet, and has 7.6 miles of shoreline. Bowman Lake Road (FS Road 18) is the primary access for recreationists coming to Bowman Lake. After leaving State Highway 20 visitors drive approximately 10 miles on a curvy, paved Bowman Road where speeds are limited to 15-20 MPH. At this point, the pavement ends. Speeds drop to 5-10 MPH while users proceed to drive another 4 miles to the intersection with Graniteville/Meadow Lake Road (Nevada County Road 843) near the top of Bowman Lake Dam. Visitors then travel on the very rocky and slow County Road 843 at 5-10 mph for another 3 miles along the north edge of Bowman Lake to reach Bowman Lake Campground near its eastern end. Although this road can be navigated with a two wheel drive (2WD) vehicle, it is not recommended for passenger vehicles. By necessity, most users have 4WD or at a minimum a high clearance vehicle. The primary activities at Bowman Lake are camping, hiking/walking, fishing, swimming, and flat-water non-motorized boating. OHV use was also noted, primarily by those staying overnight at the Bowman Lake Campground. Overnight visitors generally stayed in dispersed areas along the north shoreline, with some staying at Bowman Lake Campground.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility, and planning are: At the Bowman Road/Faucherie Road junction maintain the 3 panel kiosk (installed in 2011) with current information/interpretation/map of area/recreation opportunities. On the recreation opportunity map, specifically include location of campsites, picnic sites, potable water, trails, boat launches, etc.

Within 2 years of license issuance, close and gate the informal boat ramp on the west end of Bowman Lake, but continue to allow people to carry their water craft beyond the gate to launch. Allow only day use at this site; remove dispersed campsites/fire rings. Provide 3-5 vehicle parking spaces. Post day-use only signs and sign directing those with boats on trailers to east end of Reservoir.

Within 5 years of license issuance, implement the action items identified in the Bowman Recreation Corridor Management Plan (BRCMP) related to Bowman Lake. Specifically, if consistent with the BRCMP, and among the other items identified in the BRCMP:

- Convert the dispersed sites located approximately one-quarter mile west of Bowman CG ("Peninsula" sites on NFS land) to day-use picnic sites (Development Scale 2). This would include designating and controlling parking with barriers to minimize erosion potential, replacing fire rings with barbeque grills with self-contained ash boxes, installing tables, providing signage and creating walking paths to the sites. If picnic sites are determined to be not desired at this location, close and rehabilitate these campsites.
- At Bowman Lake, within the Bowman Recreation Corridor, eliminate all dispersed primitive campsites and restrict all camping to formal campground facilities by expanding the existing Bowman Lake CG and FS-proposed group and family campgrounds.
- Expand camping on developable lands west of the current campground by constructing approximately 20 sites on NFS land (depending on land development capability) in the Tree Camp area (Development Scale 2). There is an estimated capacity for approximately 10 sites south of the road and 10 sites north of the road. This area already has several metal fire rings in place south of the county road. Provide additional toilets to serve these sites (vault toilet 1 stall per 35 PAOT and no more than 500 feet between toilet and campsites).

Recommendations on Licensee Lands:

Within 5 years of license issuance:

- Bowman Campground - Rehabilitate the existing facilities (restroom, tables, fire rings, and signs) (Development Scale 2). Install self-service fee collection station.
- Establish gravel parking area, barriers, and information kiosk at the inflow to the reservoir.
- Define/construct 20 truck and trailer parking spaces (40 feet long), information panel, (with aquatic invasive materials), use crushed rock in the area of the existing ramp. Ramp will accommodate small trailered boats. The information panel should also provide "light on the land" resource protecting backcountry camping techniques targeted to boat-in dispersed campers.
- At Bowman Lake eliminate all dispersed primitive campsites and get all camping into formal campground facilities by expanding the existing Bowman CG and FS-proposed group and

family campgrounds. Eliminate/rehabilitate or convert to picnic sites all the dispersed campsites in the vicinity and along Bowman Lake shoreline that are not incorporated into the developed campground (either family or group campground identified above).

- Implement the action items identified in the Bowman Recreation Corridor Management Plan (BRCMP) related to Bowman Lake. Specifically, if consistent with the BRCMP, and among the other items identified in the BRCMP:
- At Bowman Campground (along with the rehabilitation of the campground):
    - Add two walk-in campsites at the Bowman Campground west of the small drainage on the west end of the current Bowman CG boundary (tables, fire rings, food lockers (30-cubic feet), site markers).
    - Identify and barrier parking spurs sufficiently to prevent indiscriminate driving, and control vehicle access through the campground.
- Convert the dispersed sites located approximately one-mile east of Bowman Dam (on NID land) to day-use picnic sites. This would include designating and controlling parking with barriers to minimize erosion potential, replacing fire rings with cement BBQ grills with self-contained ash boxes, installing tables, providing signage and creating walking paths to the sites. If picnic sites are determined to be not desired at this location, close and rehabilitate these sites.
- Develop additional designated camping capacity adjacent to the Bowman Lake CG, east of the Milton-Bowman Canal by either:
    - Developing a 25 PAOT Group Campground (Development Scale 2) with a single vault immediately adjacent to the campsite, 5 picnic tables, 2 serving tables, 1 group grill, group fire ring, 4 large food lockers. Parking space for at least 9 vehicles, vehicle barriers to sufficiently prevent indiscriminate driving, and self-service fee collection station (if NID desires to recover some of the operational costs), or;
    - Developing a new 7-10 unit family campground (Development Scale 2), or expand the existing Bowman CG, with toilet(s) (1 stall per 35 PAOT), animal resistant food storage lockers, tables, signing, fire rings, vehicle barriers to sufficiently prevent indiscriminate driving, and self-service fee collection station (if NID desires to recover some of the operational costs).

Rationale

<u>NFS Lands</u>

In 2009, the following percentages of recreationists in the Bowman Lake area rated the information available for interpretation/education/recreation/safety as unacceptable: 32.6 percent (Undeveloped Recreation Sites Bowman Lake), and 24.3 percent (Bowman Campground and Boat Launch) (NID 2011, Tables 3.4-468 and 467). Since the 2009 recreation use survey was conducted, a three panel information board has been installed at the west end of the lake (Junction of Bowman and Graniteville/Meadow Lake roads).

See discussion under Bowman Recreation Corridor Management Plan for the rationale of the need to: change the management of the area to a "camping in designated sites only" policy; increase the developed camping capacity, and; eliminate some of the existing dispersed campsites.

Picnic facilities are desired by Bowman Lake visitors. In response to surveys, 44.4 percent of the recreationists at the Bowman Lake Undeveloped Recreation Sites, and 37 percent of the overnight visitors at Bowman Campground, boat launch and lake preferred new picnic facilities (NID 2011, Table 3.4-484).

The road used as an informal boat launch at the west end of Bowman Lake was not designed for boat launching. It was built for dam construction, and is not safe for use as a boat launch (narrow, drop-offs, and steep slopes); thus, does not warrant re-constructing for boat launching. The existing boat launch at Bowman Lake Campground on the east end of the lake can support boating levels/types and terrain is suitable for launching. It would take very little grading work to make a large parking area for boat trailers.

Licensee Lands

During site condition surveys the Bowman Lake Campground's condition was rated as fair/poor (NID, PG&E 2010). Of the campers surveyed at Bowman Lake Campground in 2009, 44.4 percent indicated that they preferred new campsites (NID 2011, Table 3.4-483).

Both NID and the TNF agree on protecting water quality and sensitive wildlife habitat by prohibiting OHV use under the high water mark at all the Project lakes and by limiting their use to designated routes only (USDA Forest Service 2010). The inflow to Bowman Lake has been a popular OHV use area due to the relatively flat terrain (when dry) and as access to some dispersed sites to the south of the inflow. The 1990 TNF LMRP identified the growing OHV issue back in the late 1980s. In the Summary of Issues, Concerns, and Opportunities section of the Bowman Management Area (MA 039), it states "Off-highway vehicle (OHV) use has increased in recent years. OHV users frequently travel cross-country instead of using designated routes, causing site disturbance" (USDA Forest Service 1990).

NID's 2000 Revised Exhibit R (NID 2000) stated the following concerning the Jackson Creek Inlet location and this issue, "Install signing in the Jackson Creek Inlet area to prohibit off-road vehicle use across the creek and within a specified distance of the shoreline of the reservoir." It also stated, "Provide signing with information regarding litter, escaped campfires, and camping restrictions within a specified distance of water source." The FERC Order issued on July 11, 2001 approving and ordering the implementation of the Revised Exhibit R ordered NID to complete the proposed measures within three years, "(B) The proposed recreational improvements enumerated in Section 5 of the supplement shall be completed by the end of the third recreation season (on or about October 1) following the issuance of this order." While some efforts are being made by NID to prevent OHV use in this area, there is more that needs to be done to implement the order and effectively block OHV use under the high water mark of Bowman Lake. The proposed parking area and signage would help manage this situation.

See discussion under Bowman Recreation Corridor Management Plan for the rationale of the need to: change the management of the area to a "camping in designated sites only" policy; increase the developed camping capacity, and; eliminate some of the existing dispersed campsites.

Picnic facilities are desired by Bowman Lake visitors. In response to surveys, 44.4 percent of the recreationists at the Bowman Lake Undeveloped Recreation Sites, and 37 percent of the overnight visitors at Bowman Campground, boat launch and lake preferred new picnic facilities (NID 2011, Table 3.4-484).

In order to implement the "Camping in Designated Sites Only" policy to better protect the natural resources around Bowman Lake, additional developed camping capacity will be necessary. The expansion of the Bowman Lake Campground (on both east and west sides) is a logical location to provide additional camping capacity because there is developable terrain, and equipment can access the area for the construction and maintenance of facilities (including pumping toilets).

Group camping is a limited commodity in the license area, as evidence by the fact that all of the group campgrounds (Faucherie, Silvertip and Aspen Group Campgrounds) have been at or near 100 percent capacity on weekends for at least a decade as evidenced by the 2000 Revised Exhibit R (NID 2000, Section 3. Recreation Use). Based on population trends, Licensee projected a 52 percent increase in general use of Faucherie over the next 40 years, however, there is no available land to expand the existing group campground at Faucherie. Experience indicates that group campgrounds help to minimize inter-user conflicts by separating larger (frequently louder) groups from other users.

For the area east of the current Bowman Lake Campground the Bowman Recreation Corridor Management Plan should consider and determine which type of campground would best meet the recreation demand in the Bowman Recreation Area, either a family or group camp.

Sawmill Lake (NFS and Licensee Lands)

This scenic high mountain lake is 113 water surface acres in size with a maximum water surface elevation of 5,860 feet, and has 2.6 miles of shoreline. To reach Sawmill Lake, from the Bowman Campground recreationists continue traveling east on the Graniteville/Meadow Lake Road (Nevada County Road 843) for 0.6 miles to FS Road (843-37), and then one mile on the rocky native surface FS Road 843-37 to an access road to Sawmill dispersed sites and the dam. Four-wheel drive or at a minimum a high clearance vehicle is needed to access Sawmill Lake. Primary activities at Sawmill Lake were hiking/walking, fishing, and flat-water non-motorized boating. Overnight visitors generally stayed in dispersed areas along the north shoreline. The Grouse Ridge Trail and Grouse Non-Motorized Area is just on the other side (south side) of Sawmill Lake and Canyon Creek, which visitors must venture to cross Sawmill Dam or Canyon Creek in order to access. There are no existing developed recreation facilities at Sawmill Lake.

Within 5 years of license issuance, prior to the implementation of the "Camping in Designated Sites Only" policy within the Bowman Recreation Corridor :

- Construct a 25 PAOT Group Campground (near former BSA camp) (Development Scale 2) at least 100 feet away from the water's edge:
    - Install single-unit vault toilet.

  - Facilities shall include five picnic tables, two serving tables, one group fire ring, 4 large animal-resistant lockers, site markers, and gate.
  - Install a Site Identification sign to Forest Service sign standards.
  - Install a three panel information/regulation bulletin board at campground entrance.
  - Install self-service fee collection station at campground entrance (If NID desires to recover operating costs).
  - Provide animal resistant garbage containers and garbage service.
  - Barricade roadway and parking area to prevent off road travel.
  - Barrier the existing adjacent informal boat ramp to allow only car-top launching.
- Construct a trail from this campground to the proposed Sawmill Trail and the family campground (See Bowman Recreation Corridor Trail Development).

Recommendations on Licensee Lands:

Within 5 years of license issuance:

- Install information kiosk at day use parking by dam.
- On the north edge of Sawmill Lake construct a 15-20 unit Development Scale 2 family campground (may include a few walk-in sites developed on the flat benches at the east end of the campground – develop parking for walk-in sites prior to the point that the terrain steepens (over 20 percent). Campsites should be located at least 100 feet from the lake.
- Enhance the views from the campsites that overlook the lake by selectively thinning trees between the lake and the campsites.
- Facility shall provide: vault toilet in the quantity of 1-stall per 35 PAOT, distributed so that there is no more than 500 feet between a campsite and restroom; 30-cubic foot animal-resistant food storage lockers; site markers; tables, and; fire rings (plus the items in the NID proposal listed above).
- Construct one lane native-surface road with turnaround and a minimum of one parking spur per campsite (barricaded with boulders to keep vehicles on road and spurs).
- Identify and sign the informal boat launch opportunity at the dam. Improve the road to the launch and provide parking for day use only.
- Install an information/regulation kiosk at campground entrance/self-service fee collection station.
- Dismantle all dispersed campsites not incorporated and converted into developed campsites.

On both Licensee and NFS lands within 5 years of license issuance:

- Allow boat-in dispersed camping on south shore unless resource degradation occurs.
- Post "Camping at Designated Sites Only" signage at vehicle access points.

Rationale

<u>NFS Lands</u>

See discussion under Bowman Recreation Corridor Management Plan for the rationale of the need to: change the management of the area to a "camping in designated sites only" policy;

increase the developed camping capacity, and; eliminate some of the existing dispersed campsites.

Developed group camping (with full amenities) is a limited commodity in the license area, as evidenced by the fact that all of the group campgrounds in the larger area (Faucherie, Silvertip and Aspen Group Campgrounds) have been at or near 100 percent capacity on weekends for at least a decade as evidenced by the 2000 Revised Exhibit R (NID 2000, Section 3. Recreation Use). Based on population trends, Licensee projected a 71 percent percent increase in overall recreation use of the Yuba-Bear Project over the next 40 years (NID 2011, 4.1 Recreation Use Levels). However, there is no available land to expand the existing group campground at Faucherie (only group site within the Bowman Recreation Area). There is a desirable and suitable location on NFS land for a group campground on the north shore of Sawmill Lake, which used to be used as a Boy Scouts of America dispersed group camp. "Roughly, 25 percent of visitors reported conflicts with other users at Sawmill Lake." (NID 2011, Executive Summary). Experience indicates that group campgrounds help to minimize inter-user conflicts by separating larger (frequently louder) groups from other users.

See discussion under Bowman Recreation Corridor Trail Development for rationale for trail development needs for recreationists at Sawmill Lake.

<u>Licensee Lands</u>

See discussion under Bowman Recreation Corridor Management Plan for the rationale of the need to: change the management of the area to a "camping in designated sites only" policy; increase the developed camping capacity, and; eliminate some of the existing dispersed campsites.

FS concurs with providing for a variety of recreation opportunities consistent with the ROS designations for the Bowman Recreation Area. The south side of Sawmill Lake is designated as Semi-Primitive Non-Motorized and the limited dispersed camping use that would occur via boat access would allow for dispersed camping opportunities while limiting resource impacts from recreation use (USDA Forest Service 1990). The information kiosk at the dam should provide "light on the land" resource protecting backcountry camping techniques targeted to boat-in dispersed campers.

NID proposes to construct a walk-in 10-unit family campground. This will not meet the demand for camping at this popular lake. Clearly, Sawmill Lake is a popular destination. Section 2.3.3.2 of Licensee's recreation plan describes at Sawmill, ten steel fire rings and 29 rock rings. FS estimates that there is space for 15-20 campsites (75' spacing between sites) at Sawmill Lake's north shoreline (some sites being on the north side of the dam access road). Most of the sites would be in the same location as the existing dispersed sites. The additional developed camping capacity will be needed with the shift in management of the Bowman Recreation Corridor to "Camping in Designated Sites Only" policy. Enhancing the views of the lake from the constructed campsites would enhance the visitors' camping experience.

Restricting OHV use to designated roads has been a resource issue for a longtime in the Bowman Recreation Area. Because of the relatively remote aspect of this area, which requires a 50-minute drive just to traverse eight-miles of rough roads after leaving the pavement on Bowman Road, the users generally have high clearance vehicles in order to navigate the rough road safely, and many participate in OHV activities while in this area. Based on FS's experience managing users in the area (and the need to routinely re-barricade areas that had been previously closed) it is likely that barriers in a walk-in campground would be breached by users trying get vehicles closer to the campsite. Therefore, the Resource Agencies recommend that the campground be designed as a well barricaded drive-in campground, with the campsites located 100 feet away from the lake to protect the lakeshore. Licensee has proposed to use logs, boulders and wooden posts as vehicle barriers, but, due to the number of users who have vehicles with winches, barriers should consist of large, partially buried boulders to minimize the number of breached barriers.

Faucherie Lake

Nestled in a massive granite bowl with scattered conifers, Faucherie Lake is arguably the most scenic of all the YB and DS Project lakes. At its maximum water surface elevation of 6,660 feet, it has 150 water surface acres, and 2.4 miles of shoreline. From Sawmill Lake, visitors access Faucherie by continuing east on the rocky native surface FS Road 843-37 for 2.4 miles. Four-wheel drive or at a minimum a high clearance vehicle is needed to access Faucherie Lake. Primary recreational activities at Faucherie are camping, hiking/walking, fishing, non-motorized flat-water boating, and wildlife viewing. Anglers comprised slightly more than half of the visitors. Nearly 65 percent of the overnight visitors stayed either at the group campground or at the undeveloped camping clusters along Canyon Creek (non-Project) below Faucherie Lake. Faucherie Group Campground's 2-25 PAOT campsites are reserved 100 percent of the weekends throughout the summer.

Recommendations on Licensee Lands:

Within 2 years of license issuance, prevent vehicle access across dam by placing a gate on the west end of the dam.

Within 5 years of license issuance:

- Replace the toilets and picnic tables at Faucherie Group Campground.
- Replace the toilet at the Day Use Area.
- Expand group campground parking, create and sign van accessible parking space.
- Provide trailhead with information board.
- Provide parking signage and an information kiosk addressing the Grouse Lakes non-motorized area at the Faucherie day use/boat ramp/trailhead area. Include information about fire, sanitation and safety; and interpretive information about the natural resources, such as prevention of the spread of amphibian chytrid fungus.

Within 10 years of license issuance:

- Rehabilitate the remainder of the Group Campground facilities including meeting ADAAG standards.
- Rehabilitate day use parking area and circulation road (either repave or grind asphalt and convert to graded gravel road (Maintenance Level 3).
- Rehabilitate informal boat ramp, block at high water mark and sign for car-top launch only. Designate a minimum 2 load/unloading parking spaces just uphill of the barrier.
- Address opportunities to provide vegetative screening between the 2 group units or move units farther apart to provide privacy, if feasible.

Rationale

NID proposed restricting vehicle access across Faucherie dam for several reasons, including safety. The gate closure would also prevent OHVs from crossing the dam and making their way across Canyon Creek below the spillway and traveling into the Grouse Non-Motorized Area.

The existing toilet at Faucherie Group Campground is from the 1960's or 1970's era. It is not accessible, has served out its useful life and needs to be replaced to better serve the recreating public at the group campground. Of the Faucherie Group Campground visitors surveyed, a very high percentage of them (63.7 percent) indicated that they preferred new toilet facilities (NID 2011, Table 3.4-341). This is a strong statement of the need for the restrooms to be replaced. The wooden tables at Faucherie Group Campground are aged and in need of replacement.

The existing toilet at Faucherie Day Use is from the 1960's or 1970's era, it is not accessible, has served out its useful life and needs to be replaced to better serve the recreating public at the group campground. Of the Faucherie Day Use visitors surveyed, 1/3 indicated that they preferred new toilet facilities (NID 2011, Tables 3.4-343, 344 and 345).

Accessible parking for a van would enable a physically challenged person with a wheelchair the ability to drive and unload at the Group Campground, and with the other accessible features at the campground would be able to experience camping at this special place.

See discussion under Bowman Recreation Corridor Trail Development for rationale for trail development needs for recreationists at Faucherie Lake.

Information about recreational opportunities and resources is sought after by the recreationists visiting Faucherie. Of the day users surveyed 42.9 percent highly preferred, and 37.3 percent of the overnight group campers preferred signage to recreation areas (NID 2011, Tables 3.4-344 and 341), indicating the need for more information. Individuals provided the following comments regarding the information available at Faucherie (NID 2011, Table 3.4-326):

- "Educate campers to water quality, NID and camping requirements per comment above."
- "I didn't see any interpretive/education/recreation visitor or safety warning info posted - not obvious."
- "No trail maps at lake."
- "Would have liked to have this info. Didn't find it or wasn't accessible."

Currently there is relatively short brush and a few trees that separate the two group sites, which do not provide good visual screening. Improving the visual screening, or increasing the distance between the two sites would help the separate groups feel less crowded and would enhance their recreational experience. Over half of the group camp visitors (54.5 percent) indicated that they experienced conflict with other visitors. This is clearly indicating a need to provide more separation between the two group sites. (NID 2011, Table 3.4-328).

Canyon Creek Campground (Development Scale 3 Campground)

Licensee's FLA describes this recreational facility as:

> "A single Project campground, Canyon Creek Campground, is located along Canyon Creek at an elevation of 6,010 feet on NFS land. The campground is situated approximately 1.1 miles downstream of Faucherie Lake and 0.7 mile upstream of Sawmill Lake. The campground is located on lands classified as Roaded Natural in FS ROS classification system. The rustic campground consists of 16 campsites, each with a picnic table and fire ring. In addition, seven of the campsites also have animal-resistant food lockers. The campground also has a paved asphalt circulation road and two, double-unit vault toilets. Currently, the campground does not require a camping fee." (NID, PG&E 2011a, page E6.6-12)

This campground facility was constructed to provide developed overnight facilities to accommodate recreationists attracted to the area by the high mountain lakes to be created by the construction of Faucherie and Jackson Meadows Reservoirs, and to mitigate watershed impacts (fires/contamination) from recreational use (USDA Forest Service 1966). The flat terrain of the site was a large factor in the campground's location. The western end of the campground is not well used due to the fact that there is very little shade as a result of the soils that are not conducive to supporting a dense stand of mature trees.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, and reduction of a facility are:

Within 5 years of license issuance:

- Reconstruct the campground and make 100 percent accessible, or to the degree topographically feasible.
- Redesign and convert the west end of the campground into a minimum of a 25 PAOT group site. Provide group campground facilities including 2 serving and 5 picnic tables, a group campfire ring, group grill, tent pads, and graded cooking area. If in the Bowman Recreation Corridor Management Plan it is determined that there is not a sufficient projected demand for group camping in this area to justify a group campground, decommission this portion of the campground.
- Replace the two restrooms. Provide paved or compacted graveled turnout in front of each toilet.
- Provide large food lockers (minimum 30-cubic foot) for each site and 4 for the 25 PAOT group camp.

- Provide an information/interpretive display about the recreation opportunities in the area. Include information about fire, sanitation and safety; and interpretive information about the natural resources (including protection of resources, such as prevention of the spread of amphibian chytrid fungus and aquatic invasive mussels).
- Install a self-service pay station with 3 panel information board (if NID desires to recover some of the operational costs).
- Provide road surface treatment of all interior campground roads & spurs as prescribed by the Pavement Management System. Or, grind up asphalt once it has deteriorated and relay/compact to a Maintenance Level 3 Road and spurs.
- Provide a paved or compacted gravel parking turnout adjacent to the entrance station.

Rationale

FS policy (USDA 1998) is to provide 100 percent barrier-free access where possible, consistent with the intent of the Region 5 (R5) "Universal Access Strategy." One hundred percent accessibility may be achievable due to the flat terrain at this site. Work toward this goal at reconstruction.

Open ended comments as to the reasons why visitors rated Canyon Creek facilities as unacceptable were:

- "Need more camping spaces."
- "No trash receptacle, restrooms run-down and dirty."
- "Potable water is very hard to find."

A survey of the Canyon Creek visitors revealed that 38.8 percent of them preferred new campsites, 41.1 percent preferred to have food lockers, 45.6 percent preferred new restrooms, and 54.9 percent desired trash receptacles (NID 2011, Table 3.4-380). The existing restrooms are 1960's or 70's era facilities, and they are not accessible. With the flat terrain at this campground there is high potential to provide fully accessible camping opportunities. The existing restrooms are a large hindrance to making that a reality. The comment about the lack of potable water supports the concept of having at least one localized potable water source in the Bowman Recreation Area.

As discussed in the other facilities within the Bowman Recreation Area above, there is a need for additional group campgrounds in this area (as evidenced by the occupancy rates at Faucherie). About 1/3 of the visitors surveyed (30.1 percent) at Canyon Creek indicated that they preferred new group camps (NID 2011, table 3.4-380). The family campsites northwest of the Canyon Creek Campground entrance area are lightly used due to lack of shade. The soils in the area will not support an extensive canopy. A large group needing a place to camp is more likely to accept a campsite with little shade than would a small group of campers whom would have more options available to them. Therefore, it is expected that a group camp at this location would be better utilized. To take advantage of the site work that has already been invested in this site, this portion of the campground may meet the need for group facilities at a lesser cost to Licensee than other sites. However, this will be less desirable (and therefore a lower priority) than a group campground at Sawmill. Due to the lack of shade, it is acknowledged that this portion of the site will probably have lower use. However, with the management shift to restrict camping to designated sites only within the Bowman Recreation Corridor, it is expected that the overnight capacity at this site will be needed soon after implementing the new camping policy.

In NID's current Revised Exhibit R (2000) Canyon Creek Campground was included as one of the facilities that NID would take responsibility for based on a 1966 agreement between NID and the TNF:

> "Licensee will be responsible for the construction and implementation of all recreation improvements. Traditionally the FS was responsible for the operation and maintenance of all Forest Service Recreation improvements. However, based on the agreement between the Tahoe National Forest and Nevada Irrigation District dated June 24, 1966 and June 26, 1966 respectively, TNF and NID have agreed that NID is responsible to administer, operate, and maintain the recreation facilities." (NID 2000, page 44).

The 2000 Revised Exhibit R Table 2.2-1 "Yuba-Bear River Project Recreation Sites" lists Canyon Creek Campground as one of the facilities that provide recreational opportunities for visitors to the YB Project area (NID 2000). NID has proposed to include Canyon Creek Campground as a Project site and adjust their Project boundary to include it since evidence shows that this was constructed as part of the license.

Canyon Creek Dispersed Sites

Only about 100 yards east of the Canyon Creek Campground starts a series of about 6-8 popular dispersed campsites along Canyon Creek ending just upstream of the large culverts used by Forest Service Road 843-037 to cross Canyon Creek. These sites consist of no more than a metal or rock fire ring. NID, working with the FS, has set some rock barriers in an attempt to control vehicles from driving in the riparian areas. There are no sanitary or other facilities.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, and reduction of a facility are:

Within 5 years of license issuance:

- Create a new linear layout 10-15 unit campground (Development Scale 2) that maintains some of the dispersed "feel" of the existing dispersed campsites along Canyon Creek. Maintain 100 feet distance from the creek's edge. Encompass the existing 6-8 dispersed campsites to east of the existing campground up to the culverts within a mature stand of trees. Develop 4-7 additional campsites in a similar layout along Canyon Creek.
- Install 2, 1-unit vault toilets to service all 10-15 sites in a layout so that there is no more than 500 feet between toilets and the campsites, and a minimum of one toilet per 35 PAOT.
- Rather than expand the formal campground by constructing extensive road system to expand, use existing native surface spurs off main road as "campsite" spurs and keep the "dispersed" feel to the sites, or create new native surface spurs of similar design for new sites. Place rock barriers around spurs to prevent vehicles from driving beyond the spurs.

- Install table, food locker, tent pads, fire ring and site marker at each site.
- Install a Site Identification sign (Forest Service sign standard), entrance station and signs.
- Install a self-service pay station if Licensee wishes to recover some of the operating costs.
- Remove and restore all remaining dispersed sites along Canyon Creek that are not incorporated into the expansion of Canyon Creek Campground.

Rationale

See discussion under Bowman Recreation Corridor Management Plan for the rationale of the need to: change the management of the area to a "camping in designated sites only" policy; increase the developed camping capacity, and; eliminate some of the existing dispersed campsites.

There is the opportunity to incorporate many of the existing popular dispersed sites along Canyon Creek into the new campground. There will be a need to close and rehabilitate any dispersed campsites not converted to developed campsites as part of the new campground. Canyon Creek Cluster #2 would not fit logically into this expansion but offers an attractive creekside experience which would be enjoyed by day users of the area.

A survey of the Canyon Creek visitors revealed that 38.8 percent of them preferred new campsites, 41.1 percent preferred to have food lockers, 45.6 percent preferred restrooms, and 54.9 percent desired trash receptacles (NID 2011, Table 3.4-380). Thirty percent of the Canyon Creek visitors indicated that they observed signs of human waste (NID 2010a, table 5). The human waste from the dispersed camping along Canyon Creek is placed near or in the riparian area of the creek.

Since Canyon Creek would have very little water in it in the latter half of the summer without regulated flows, the Resource Agencies maintain that recreation along Canyon Creek during this period is, at least in part, project-related. Additionally, campers at the dispersed Canyon Creek sites are there in large part because of the Project lakes in the Bowman Recreation Area. Because Licensee surveys did not ask visitors at non-lake locations if they visited Project lakes, the FS did an impromptu survey on Sunday June 10, 2012. A Forest Service employee surveyed nine groups that stayed at either Jackson Creek Campground, Canyon Creek dispersed or other dispersed sites that were not on one of the Project lakes within the Bowman Recreation Corridor. One hundred percent of the groups surveyed indicated that they recreated or planned to recreate at one or more of the three Project lakes (Bowman, Sawmill, or Faucherie) during their stay. The results of the spot survey were consistent with Forest Service observations of recreation use patterns in the Bowman Recreation Area. The Project nexus of the Canyon Creek dispersed sites is acknowledged in the existing Revised Exhibit R (2000). Table 2.2-1 "Yuba-Bear River Project Recreation Sites" lists Canyon Creek dispersed sites "CC2 through CC9" as recreational opportunities for visitors to the YB Project area (NID 2000).

<u>Jackson Creek Campground (Development Scale 3 Campground)</u>

This small (12-unit) campground was developed by Forest Service in cooperation with NID after establishing a Cooperation Agreement in 1949. It is located approximately ½ mile upstream of

Bowman Lake. NID agreed to allow the TNF to expand Jackson Creek campground onto NID land in recognition "that better management is needed to aim to concentrate campers in specially prepared areas where sanitation facilities and camp stoves may be made available to reduce liability of water pollution and forest fires." The flat terrain of the site was a large factor in the campground's location. The campground has a 60's era non-accessible double-unit toilet. The campsites have fire rings, cement tables and animal resistant food lockers.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, and reduction of a facility are:

Ongoing: At the Bowman Road/Faucherie Road junction maintain the 3 panel sign (installed in 2011) for information/interpretation/map of area with current information and recreation opportunities, i.e. show campgrounds, location of potable water, etc.

Within 10 years of license issuance, redesign and reconstruct the campground including:

- Evaluate opportunity to provide accessibility at all campsites and (to the degree topographically feasible) implement these opportunities.
- Replace double-unit toilet with two single-unit accessible toilets to reduce distances between campsites and toilets. Provide paved or gravel turnout in front of each toilet, and paved access route to the toilet entrances.
- Replace bulletin boards and signs.
- Replace wood barriers with rock barriers and replace unit markers
- Replace fire rings & picnic tables
- Reconstruct entrance station & signs. Install a self service pay station if Licensee wishes to recoup some of the operating costs.
- Install animal resistant food storage lockers (minimum 30-cubic feet).
- Pave or gravel all interior campground roads and spurs. Include a paved parking turnout adjacent to the entrance station.
- Replace toilets with new accessible vault toilet.
- Replace bulletin boards and signs.

Rationale

Licensee did not conduct recreation surveys for Jackson Creek Campground. Although Jackson Creek Campground was not constructed as part of the project, the use of this campground is largely associated with the nearby project lakes and the Project enhanced flows in Jackson Creek. Campground visitors are drawn to the Project lakes in the Bowman Recreation Area and without the Project (Jackson Lake); Jackson Creek would dry to an intermittent stream in drier years. Because Licensee surveys did not ask visitors at non-lake locations if they visited Project lakes, the FS did an impromptu survey on Sunday June 10, 2012. A Forest Service employee surveyed nine groups that stayed at either Jackson Creek Campground, Canyon Creek dispersed or other dispersed sites that were not on one of the Project lakes within the Bowman Recreation Corridor. One hundred percent of the groups surveyed indicated that they recreated or planned to recreate at one or more of the three Project lakes (Bowman, Sawmill, or Faucherie) during their stay. The results of the spot survey were consistent with Forest Service observations of recreation use patterns in the Bowman Recreation Area.

As overnight use is concentrated into developed campgrounds with the management shift to restrict camping to designated sites only, this campground will see more project-induced recreation users. Since this campground is only at an estimated 55 percent occupancy on weekends, there is currently capacity for additional project induced recreation use to occur here.

FS policy (USDA 1998) is to provide 100 percent barrier-free access where possible, consistent with the intent of the Region 5 (R5) "Universal Access Strategy." One hundred percent accessibility may be achievable due to the flat terrain at this site.

In NID's current Revised Exhibit R (2000) Jackson Creek Campground was included as one of the facilities that NID would take responsibility for based on a 1966 agreement between NID and the TNF:

> "Licensee will be responsible for the construction and implementation of all recreation improvements. Traditionally the FS was responsible for the operation and maintenance of all Forest Service Recreation improvements. However, based on the agreement between the Tahoe National Forest and Nevada Irrigation District dated June 24, 1966 and June 26, 1966 respectively, TNF and NID have agreed that NID is responsible to administer, operate, and maintain the recreation facilities." (NID 2000, page 44).

The 2000 Revised Exhibit R lists and describes Jackson Creek Campground as one of the facilities that provide recreational opportunities for visitors to the YB Project area (NID 2000, page 13-14). Improvement work at Jackson Creek Campground was identified in Section 5.0 (*Licensee Proposed Recreation Improvements*) of the Revised Exhibit R, which stated, "Jackson Creek Campground – Complete rock work to define road through area as well as campground roads and spurs." (NID 2000, page 41). The 2000 Revised Exhibit R Table 2.2-1 "Yuba-Bear River Project Recreation Sites" lists Jackson Creek Campground "B12" as one of the facilities that provide recreational opportunities for visitors to the YB Project area (NID 2000). A letter from the TNF to NID dated September 24, 1997 (USDA Forest Service 1997) referred to the 1966 agreement and confirmed NID's responsibility for the maintenance of Jackson Creek Campground (and Canyon Creek Campground). The letter was in response to the then NID General Manager's (Jim Chatigny) question as to why NID would be responsible for maintaining a Forest Service owned toilet at Jackson Creek. The letter stated:

> "Let me answer the questions you raised:
>
> 1. You asked why NID would be responsible to pump a Forest Service owned comfort station (Jackson Creek).
>
> In implementing Clause C.4 of the 1966 Agreement between NID and FS, the administration, operation and maintenance of all recreation facilities, regardless of ownership, become the responsibility of NID. (Reference paragraph #3 of my

> 12/12/96 letter.) Certain facilities have been deemed necessary to accommodate "project-induced recreation". We are talking about all of these facilities on National Forest land, whether it be a single comfort station at Jackson Creek, two comfort stations at Canyon Creek or an entire, large complex at Jackson Meadows Reservoir which must be administered, operated and maintained at NID expense. So the ownership of the facility, or whose land it sits upon, has no bearing on the issue at this time. The bottom line is that NID, as the FERC license holder, is responsible for the expense of managing project recreation facilities." (USDA Forest Service 1997)

The 1966 agreement between the TNF and NID, the 2000 NID Revised Exhibit R and the 9/24/1997 TNF letter clearly demonstrate that NID is ultimately responsible for the needs associated with Jackson Creek Campground.

<u>Bowman Recreation Corridor Trail Development (both Licensee and NFS Lands)</u>

The public comes to Yuba-Bear Project reservoirs to enjoy reservoir-induced recreational opportunities, including walking/hiking. Despite the popularity of hiking/walking within the DSYB Projects, the Bowman Recreation Corridor has no formal trails readily available to recreationists. The Grouse Ridge Trail (13E28) on the south side of Sawmill Lake, which connects to a large trail network in the Grouse Non-Motorized Area, is the only formal trail that comes into the Bowman Recreation Corridor. However, accessing the trail from the roaded side of Sawmill Lake is difficult and potentially hazardous because there is no bridge over the typically fast running Canyon Creek or pedestrian walkway across Sawmill Dam. Hikers often choose to walk over the dam rather than attempt to cross Canyon Creek to access the Grouse Ridge Trail, which is definitely not a safe practice.

To meet the demand for hiking opportunities and to enhance the recreation experience of visitors to the Bowman Recreation Area reservoirs, the specific measures for trail enhancements recommended by FS are: (includes both NID and NFS lands)

Sawmill Trail

If not completed under the current license, within 2 years of license issuance, construct and maintain one of the following:

- Option A) (Licensee Lands) - at or near Sawmill Lake construct a pedestrian bridge crossing (to current Forest Service Trail Bridge Standards at the time of design) over Canyon Creek, or walkway across Sawmill Dam to enable recreationists to safely access Grouse Ridge Trail, and trail connections to the existing Grouse Ridge Trail and parking area by the dam.
- Option B) (NFS Lands) – a trail from the family and group campgrounds along the north east shoreline and around the east end of Sawmill Lake, bridge across Canyon Creek and connect to the Grouse Ridge Trail on the south side of Sawmill Lake.
- Option C) (Both NFS and Licensee Lands) - utilizing the day use parking opportunity at Faucherie to also serve as a trailhead, construct an approximately 2-mile primitive trail from

Faucherie to Sawmill Lake on the south side of Canyon Creek (no bridge needed). FS would then construct a trail from Sawmill Lake to the Grouse Ridge Trail.

For Any Option - The primitive trail would be a Trail Class 2 single-track (12”-18”), natural surface tread trail with a general grade of 10 percent slope or less and stretches up to 20 percent for up to 200’ and 30 percent up to 50’ (over rock). Due to sections of solid rock terrain, cairns and other small signs may be utilized in these short segments to identify the trail tread and be used to keep visitors on the designated trail.

French Lake Trail

Construct and maintain either:

- Option A) (Both NFS and NID lands) - an approximately 2-mile primitive trail (Trail Class 2) from Faucherie to French Lake with a pedestrian bridge over Canyon Creek below the Faucherie spillway, or;
- Option B) (Both NFS and NID lands) - an approximately 3-mile primitive trail (Trail Class 2) from the FS 843-37 Road, at the bend below the large culvert crossing of Canyon Creek, to French Lake (no bridge needed). Create a trailhead with parking for 6-10 vehicles near the start of the trail and provide information panels. Coordinate the location of toilet for the Canyon Creek Dispersed Site Conversion to a developed campground to also serve the trailhead toilet.

Either Option the trail would be a Trail Class 2 single-track (12”-18”), natural surface tread trail with a general grade of 10 percent slope or less and stretches up to 20 percent for up to 200’ and 30 percent up to 50’ (over rock). Due to sections of solid rock terrain, cairns and other small signs may be utilized in these short segments to identify the trail tread and be used to keep visitors on the designated trail.

- Provide assurances of a perpetual public right to use the trails developed and currently existing (Grouse Ridge Trail) on NID lands. This could be through the grant of an easement to an NGO or appropriate agency; an exclusive easement to FS on standard USDA Forest Service form providing the U.S. jurisdiction over the trails developed on Licensee lands including rights to grant the use of the trail to other agencies and members of the public; or other assurances of perpetual access for the public to use the trails and, if appropriate, the right of access to FS to maintain the trail.
- Install trail and lake directional signs at the trail entry points.
- Provide trail system information on a bulletin boards and kiosks in the Bowman Recreation Corridor.
- Provide maintenance on these trails annually. Work shall be performed in compliance with Standard Specifications for Construction and Maintenance of Trails EM-7720-103 (or equivalent at the time of maintenance). Annual maintenance will include logging out trails, imminent danger tree removal, drainage maintenance (including installing new drainage structures as needed), bridge maintenance and loose rock removal. On a five year cycle, trail maintenance will also include brush cutting; embedded rock and root removal; slough and berm removal; and (if appropriate) turnpike, retaining wall and switchback maintenance.

Reconstruction needs (including bridge reconstruction) will be addressed on an "as needed" basis.

Rationale

The 2008 California Outdoor Recreation Plan (CORP) identified "walking for fitness or pleasure" as the #1 outdoor recreational activity that Californians participated in:

> "Generally, Californians tend to participate in activities that are less expensive, require less equipment, and need fewer technical skills. The Public Opinions and Attitudes Survey 2007 discovered that Californians' top 15 activities (by participation) were: 1. Walking for fitness or pleasure 74.2 percent..." (CORP, 2009)

Hiking is an activity that a notably high percentage of the recreationists in the Bowman Recreation Area participate in. One hundred percent of the Faucherie Group Campground users, 89.5 percent of the Faucherie Shoreline users, 96.2 percent of the Faucherie Dam parking users, 75.8 percent of the Canyon Creek users, 80 percent of the Sawmill Lake users, and 80 percent of the Bowman Campground users reported hiking as an activity they participated in (NID 2011, Tables 3.4-301, 305, 309, 361, 402, 452 respectively). For all the interest in hiking/walking by Project visitors, there are no formal hiking facilities in the Bowman Recreation Area that are readily accessible. Commenters at Faucherie who expressed their reason for rating access conditions as unacceptable wrote the following, "It is hard to hike around south and western side of Lake Faucherie.", and "Trail from Faucherie to French Lake should be blazed. People have tried to make one but it was not possible this trip. This would be a wonderful hike for backpacking or day trips." (NID 2011, table 3.4-322).

The Commission identified public safety issues associated with the Sawmill spillway in a July 21, 1987, letter to NID. The Commission urged NID to install safety barriers at the Sawmill spillway. This is especially important since there is a system trail (the Grouse Ridge Trail) which takes off on the far side of the Sawmill Lake. This trail is inaccessible when Sawmill is spilling. The pictures below shows the unsafe spillway that hikers are crossing to access the Grouse Ridge Trail:

Picture - Sawmill Spillway (unsafe crossing)

The picture below shows Canyon Creek below Sawmill dam, which separates recreationists on the roaded side (north) of the creek/reservoir from the Grouse Ridge Trail on the south side of the creek:

Picture - Canyon Creek below Sawmill dam (the other portion of Canyon Creek below the

Under Section 5.0 (Licensee Proposed Recreation Improvements) of NID's current Revised Exhibit R (2000), it states the following under the discussion of Sawmill Reservoir:

"Construct a trailhead for hiking/backpacking into the Grouse Ridge area. Provide a safe crossing across Canyon Creek if feasible and cost effective. NID and Forest Service to coordinate on this issue and determine if bridge or other alternative trail locations are feasible and desirable."

Under the same Section 5.0 it states the following under the discussion of Faucherie Reservoir:

> "Forest Service in consultation with NID will evaluate needs for formal trail construction from Faucherie to French Lake. Evaluation should weigh the merits of keeping French lake more remote versus providing easy trail access to French lake".

The FERC Order Amending Recreation Plan (2266-073) issued on July 11, 2001 stated the following:

> "Sawmill Reservoir
> Construct a trailhead at trail to Grouse Ridge
> Consider better access/stream crossing
> …
>
> Faucherie Reservoir
> Consider (in consultation with FS) the need and practicality of a trail from the reservoir to French Lake"

In the Order's Discussion and Conclusion section, it states:

> "The improvements are intended to provide safer access for recreationists, including disabled persons. Overall, the improvements will provide a benefit to the public seeking various recreational opportunities at the project."

Item (B) of the Directors orders state:

> "The proposed recreational improvements enumerated in Section 5 of the supplement shall be completed by the end of the third recreation season (on or about October 1) following the issuance of this order."

Neither has a safe crossing at Sawmill Lake, alternate trail connection to Grouse Ridge Trail, nor a trail from Faucherie to French Lake been provided. The intention of the FERC Order to, "provide safer access for recreationists" has not been met. The intention of the FERC Order that "improvements will provide a benefit to the public seeking various recreational opportunities at the project" was not met in regard to hikers in the Bowman Recreation Corridor Area. During relicensing discussions the TNF consistently reiterated the need for NID to provide the Sawmill Dam or Canyon Creek pedestrian crossing and trail connection between Faucherie and French Lake for the benefit and safety of the recreationists.

As mentioned, NID's revised Exhibit R 2000 stated that FS, in consultation with NID would evaluate the need for a formal trail to French Lake, weighing the merits of keeping French Lake remote. This lake is already accessed by hiker on a closed road off Meadow Lake Road and on visitor created trails from Faucherie Lake, so it is not a pristine inaccessible lake. Hikers find that single tract trails provide far superior recreation experiences than closed roads.

In NID's Technical Memorandum 8-2b, Recreational Use and Visitor Survey, Section 4.3 Project's Range of Primary Recreational Opportunities, it states that hiking/walking has a projected growth rate of 50 percent through the license (NID 2011). Within the same section it also makes the following statements about hiking opportunities:

> "The Project provides opportunities for hiking/walking at all of the reservoirs, to varying degrees. Jackson Meadows Reservoir and Sawmill Lake have trailheads adjacent to the reservoirs that link into established trail networks including the Pacific Crest Trail (Jackson Meadows Reservoir) and the Grouse Lakes Area (Sawmill Lake). French Lake, Faucherie Lake, and Bowman Lake all have informal hiking opportunities in and around
> the reservoirs."

The Tech Memo's statement about the Sawmill trailhead linking to an established trail network does not mention the difficult and often hazardous crossing in order to access the trail network. The informal trail opportunities in and around French, Faucherie and Bowman lakes also means that there are no formal hiking opportunities of sufficient length desirable for a hiking experience.

The FS is open to cost effective options that meet the demand for safe hiking opportunities in the Project area. Both Option C for the Sawmill to Grouse Ridge Trail connection and Option B for the Faucherie to French Lake trail projects would avoid the need to construct pedestrian bridges, and are feasible, cost effective and appropriate for the ROS designations of the NFS lands involved. Rather than building trails at each project reservoir in the Bowman Recreation Area, with their potential bridge structures, the Bowman Recreation Corridor Trail Development would provide desirable trails and access to many miles of additional existing trails with a minimum of development and expense.

It is the FS's determination that the original FERC 7/11/2001 ordered actions related to trail development, or the options listed above, is important to providing for the full recreation potential of the Project lakes in the Bowman Recreation Area. The Bowman Recreation Corridor Trail Development projects would provide trail opportunities that would greatly enhance the recreational experiences and provide for the safety of the Bowman, Sawmill or Faucherie lake visitors seeking hiking opportunities.

Langs Crossing

Langs Crossing is a heavily used dispersed recreation area on the South Fork of the Yuba River with no sanitary or other facilities. It is located one mile below Spaulding dam near the Bowman Road (FS Road 18) crossing of the South Yuba River. There are popular swimming areas both upstream and downstream of the bridge. There are four land ownerships involved in the recreation use at Langs Crossing: TNF, NID, PG&E, and a private parcel. The parking occurs predominately on NFS lands, some parking occurs on the south side of the bridge on PG&E land, the river flows are maintained throughout the summer from releases out of PG&E's Spaulding dam, swimming upriver of the bridge occurs on NID land, and swimmers use pools downstream predominately on private land, but some on PG&E land.

Specific measures for routine heavy maintenance items or enhancement, enlargement, removal, reduction of a facility that Forest Service recommends are:

Within 5 years of license issuance, work cooperatively and financially with FS and PG&E to install and maintain the following facilities on NFS lands adjacent to Bowman Road for the benefit of the users and protection of NID, PG&E and NFS lands:

- A single unit vault toilet.
- A gravel parking area for a minimum of 10 vehicles.
- Construct a 3 unit picnic site with tables and BBQ grills with self contained ash boxes.
- If litter is not adequately addressed through a pack-in/pack-out trash management strategy at Lang's Crossing, as determined by annual monitoring, then provide trash containers and service.

<u>Rationale</u>

The popular swimming holes in the South Yuba River both upstream and downstream of the Bowman Road bridge are consistently fed and levels maintained throughout the summer by flows out of Spaulding dam. These attractive pools and flows entice a steady stream of recreationists to Langs Crossing as they seek relief from the hot summer days. There is a large flat on NID land that is adjacent to the pools upstream from the bridge where a camping and picnicking are common. Evidence of human waste in common on the NID flat and NFS lands downstream of the Bowman Road. The Langs Crossing area has a particular attraction to recreationists from the Reno Nevada area, as several articles have highlighted this location in newspapers and college campus social media. However, the fact that there are no sanitation facilities at this popular site has created a human waste problem and thus, health concern. In June of 2002 the TNF issued a forest order to prohibit camping in this area in response to sanitation and litter issues at the site. Despite the camping closure on NFS lands, signs of human waste are still common place from the day use in this area.

PG&E's FLA says the following about Langs Crossing:

> "The site is popular as a swimming hole, which is approximately 100 feet across and long, and depths ranging from 10-15 feet with rock slabs for sunning. The are additional pools upstream that are suitable for swimming, which is popular during summer months when water and air temperatures are warmer and flows are lower (10 to15 cfs)." (PG&E 2011, 6.6.1.4.2 Non-Whitewater Boating Recreation).

PG&E's Recreation Resource Study Atlas (Copyright 1980) identifies this site as an Undesignated Existing Recreation Area. Because this is not currently a project facility, no formal recreation surveys occurred at this site. However, due to the site's heavy use Forest Service personnel monitor the site and consistently see trash and evidence of human waste on NID and NFS lands. A toilet at this site would reduce the health threat to recreationists from exposed human waste.

It is the intent of the recreation 4(e) condition that the management of these Project-affected recreational areas be a shared responsibility between FS and Licensees.

Bear River Corridor

<u>Dutch Flat Afterbay</u>

Currently the general public does not have legal access to the afterbay where there is adequate parking, reasonable access to the reservoir, access grades are less than 20 percent, and Day Use facilities are available to accommodate for recreation activities such as fishing, swimming and picnicking, There currently are no restroom facilities available to the public anywhere on the reservoir and the sign of human waste and trash is apparent. There are signs of trespass on the private property parcel which is the ideal parcel for the improved Day Use Area. BLM believes NID needs to acquire property by aquisition, lease, or easement and provide these facilities and amenities for the public. If property cannot be acquired BLM believes NID has property along the reservoir that could provide for these amenities but they are not the first priority. NID property is large enough but access to the reservoir is steeper than and not as suitable as the private property parcel where most of the day-use activity occurs currently.

Bear River Trail Project

The Bear River Trail Project is a 33-mile riverine recreation trail proposal along the Bear River in Placer and Nevada Counties starting at the headwaters of the Bear River in Bear Valley and ending at NID's Combie Reservoir. Approximately 15.5 miles of the trail would be on PG&E property, 6 miles on NID, 4.9 miles on FS lands, 4.4 miles on BLM lands, 2.7 miles on Placer County lands (Bear River Campground) and 3 miles on private lands.

FS recommends that NID provide the following to support the development of the Bear River Trail:

- Cooperate with trail planners to determine the alignment of the trail across Licensees' lands along Bear River, including Project canals, and for trailheads on Licensees' lands (see Large scale map of alignment concept below).
- Provide for the perpetual public access and use of the trail and roads to reach the trail across NID lands. Easements could be held by Placer and Nevada counties in their respective jurisdictions, or by a Land Trust entity (i.e. Bear Yuba Land Trust).
- Provide support for trailhead development, sanitation and signage needs related to the trail on NID lands.

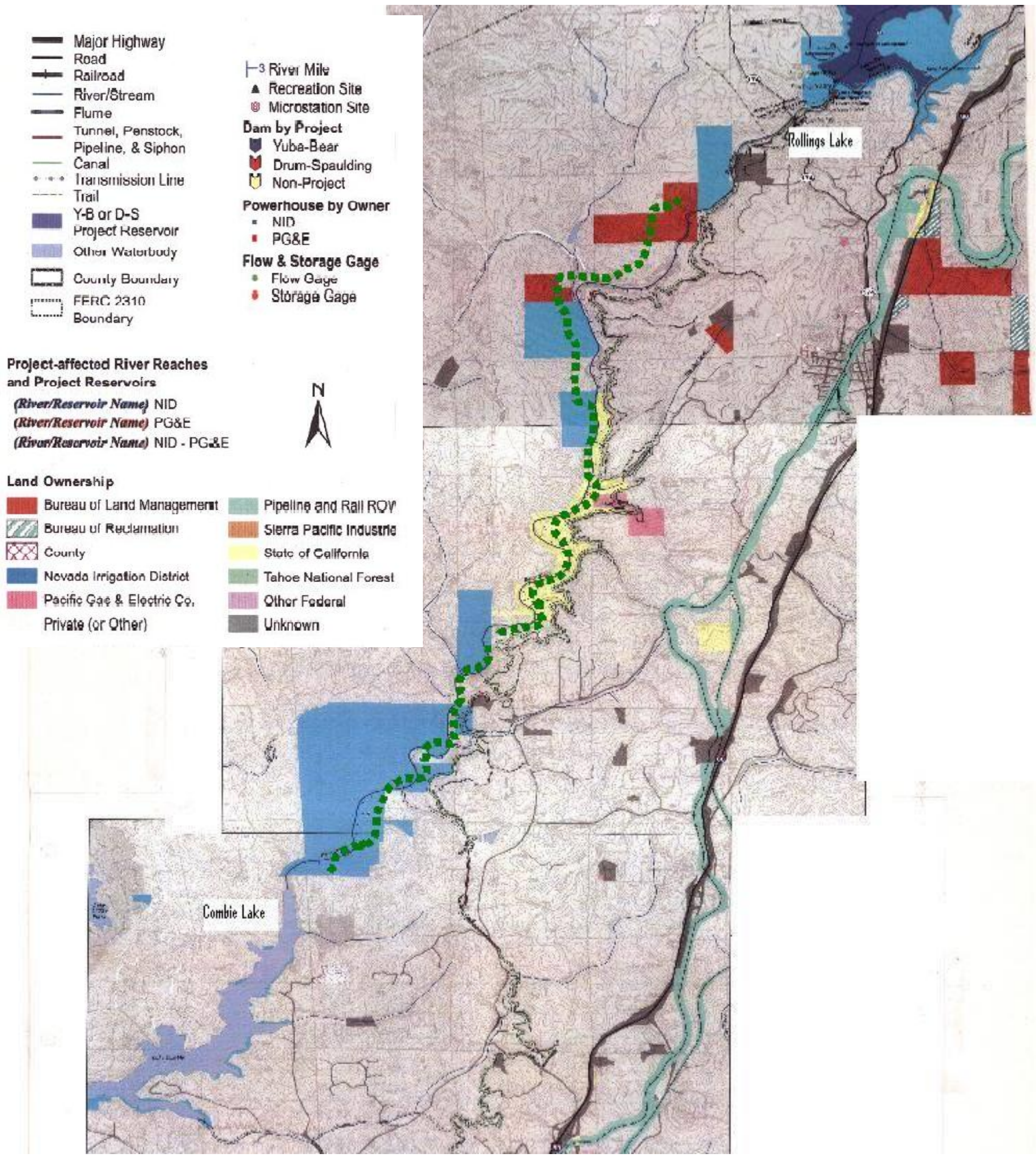
Rationale

Under current conditions, the Bear River offers little public access and recreation facilities despite its proximity to the I-80 corridor and high population and recreation centers such as Auburn, Grass Valley, Nevada City, Colfax, and Lake of the Pines. The Bear River Watershed is the most densely populated of major Sierra rivers, but has surprisingly little developed recreation. The only developed recreation is Placer County's popular Bear River Campground, which has a network of trails, full campground facilities, and two group camps. A measure of the demand for recreation is the fact that when reservations for the two group camps open on the first day of each calendar year, the two group camps are fully reserved for the season within six hours of non-stop phone calls to County Parks.

The Bear River corridor itself provides numerous and substantial open space and potential recreation opportunities due to the land ownership pattern in the river corridor, which is dominated by PG&E, NID, BLM, and the State of California. The existing access points already receive a lot of informal public use; however, the lack of recreation infrastructure, unsafe parking on public roads, inadequate sanitation facilities and unsafe and unmarked trails greatly curtails the public's ability to experience the resource. The Dutch Flat to Combie Reservoir stretch crosses over BLM, Placer County, NID and other private lands. Fifteen miles of Bear River Canal below Rollins Reservoir prevents access to the river, and provides an attractive nuisance with a dangerous maintenance trail along the canal that is used by hikers who have no appropriate recreational access trails to and along the river.

Together the PG&E Drum-Spaulding and NID Yuba-Bear Projects extend along the entire length of the 33 miles of river. With the exception of the immediate area of the Bear River Campgrounds, there are no provisions for public recreation – no maintained trails, no sanitary stations, and no available parking. Although most of the present and potential public recreation uses of the Bear River corridor occur within the boundaries of the current DSYB, Licensees do not provide riverine recreation opportunities for the very large demand for public recreation along the Bear River.

The proposed Bear River Trail project will mitigate these project impacts, and provide the public with safe access to swimming, fishing, hiking, whitewater boating, inner-tubing, historic sites, biking, recreational gold panning, and overall riverine recreational opportunities. Much of the trail would be built on historic mining canal grades, historic railroad beds and stagecoach roads, and does not require large amounts of newly constructed trail. The trail concept has widespread local support among citizen groups, federal and local governments, including the Tahoe National Forest, unanimous endorsement from Placer County Fish & Game Commission, Foothill Water Network, Placer County Parks Commission, Weimar-Applegate-Colfax Municipal Advisory Council, and Placer County District 5 Supervisor Jennifer Montgomery (Placer County 2012).



RATIONALE FOR RECREATION MEASURES - RECREATION PLAN REVISION (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Over the term of the Project Licenses, unforeseen recreation needs, changes in visitor preferences and attitudes, and new recreation technologies may occur. The frequency with which the Plan is revised or updated shall depend on significant changes to existing conditions, monitoring results, and management responses made over time. The frequency of Plan updates shall be based on consultation, review of recreation use and facilities condition reports, and through other appropriate sources. Agreed upon changes to this Plan will be incorporated into a revised document or an amendment to this document, and after approval by the Resource Agencies, the revised plan will be submitted to the Commission for approval.

Factors that may trigger a revision include but are not limited to:

- Revisions and updates to FS, BLM, or other applicable management plans.
- Substantial changes (>25 percent change) of Recreation Visits in any activity recreationists of the Project participate in, as revealed in the National Visitor Use Monitoring (NVUM) of the Tahoe National Forest (using the 2010 surveys as a base), similar survey conducted by FS/BLM or documented in Licensee's periodic observation and recreation survey.
- Documented substantial changes in demographic use patterns (e.g. increases in size or amount of RV use, changes in types of boats using the lake), visitor needs, recreation preferences, types or patterns of use, season of use changes (perhaps due to school schedule changes) or other social factors affecting recreation facilities within the Project area.
- Changes in road maintenance standards or similar physical factors affecting the use of the recreation facilities within the Project area.
- Reaching occupancy (or other) triggers where new, but previously unanticipated, facilities will be required.
- Catastrophic natural events, such as major forest fires or natural disasters, and significant effects of social disorder.
- New federal or state policies, regulations, and laws (including Wilderness designation of land within or near the Project) that significantly affect recreation resources in the Project area.
- Acquisition by the agency of non-Licensee private land around project lakes which would allow for improvements where there is a demand, but suitable land was previously unavailable for construction of such improvements.

Despite the best efforts to make projections and use of models that predict growth and trends, all factors that may significantly affect future demands, area populations and recreational trends that will affect future uses of the Project areas can not be fully anticipated, especially for a license period that spans 40 or 50 years. Therefore, to be able to adjust to and meet changing recreational demands, and to adequately protect natural resources from unanticipated uses or quantities of use, it is imperative that there is the ability to revise the Recreation Facility Plan in cooperation with the land management agencies.

RATIONALE FOR RECREATION MEASURES – RECREATION PLAN COSTS OF MANAGING PROJECT-RELATED RECREATION (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS)

Within the DSYB Hydroelectric Projects, Licensees' roles in facility and infrastructure development have significantly modified visitation within the Project area. Currently, about 100,000 recreationists are drawn each season to NFS or immediately adjacent Licensee lands to enjoy and experience the high sierra mountain outdoor recreational and scenic opportunities created by the Project. A recreation study conducted by Licensees in 2009 estimated that the Project drew recreationists to spend between 92,600 to 143,600 RDs (Recreation Days) on NFS or immediately adjacent Licensee lands during the May through September recreation season (does not include recreational use at Licensee facilities outside TNF boundaries) (NID 2011, PG&E 2011). As described in the Rationale for Specific Recreation Measures, below, Licensees are responsible for creating and/or maintaining the water impoundments and most of the recreation development within the DSYB Project Area, or for providing the streamflows that have created or augmented the recreation opportunities. The recreationists attracted to the Project area bring with them a demand for recreational facilities and services from, and impacts to, the Tahoe National Forest, Bureau of Land Management and Licensees lands. FS should not be expending limited federal recreation funds in managing and administering Project induced recreation. As such, providing for the operation and maintenance on these facilities and areas, as well as providing for the monitoring of use, conducting visitor compliance and fire patrols, and visitor information dissemination, are critical aspects of Licensees' recreation program.

Routine Recreation Facility Maintenance Project-wide

There is a large responsibility and substantial effort required to maintain all FS recreation facilities related to the Projects to the appropriate current standards of safety and cleanliness for the sake of the public's health and enjoyment. The standards should be consistent with the cleaning and policing requirements in "Cleaning Recreation Sites," USDA Forest Service, San Dimas Technology and Development center, August 1995 (SDTC 9523-1206), or its replacement and meet Recreation Sites National Quality Standards, February 5, 2002, or their replacement. Recreation facility maintenance requirements that apply to recreation facilities Project-wide include the following.

Management and Maintenance Operations

The PG&E developed recreation facilities are currently operated by a concessionaire under a contract with PG&E. PG&E has opted to have their facilities operated by a concessionaire since this has been perceived as the most cost effective method of operating the Project facilities located on Licensee's and NFS land. This strategy has resulted in little FS uniformed presence in the campgrounds on NFS land.

The NID developed recreation facilities are currently either operated by a concessionaire under a permit to the USFS, or directly by the USFS utilizing, in part, funding provided by NID and receipts from fee collections. There are numerous reasons for the management strategy of NID's facilities, some of which include: (a) there are operational flexibilities attained by Licensee, concessionaire and the respective agency by operating the facilities under the current strategy; (b) the diversity in managing authority allows for better reactions to changing budgets, personnel, and regulations; (c) the smaller and more remote facilities cost more to operate than the revenues that can be developed at the site, making them unattractive to concessionaires (conversely, the largest facilities are most attractive to concessionaires because they have highest revenue earning opportunities); (d) the Service Contract Act (USDOL 1978) precludes concessionaires from operating sites where fees are not charged and (e) having uniformed FS presence would be required for public contact and visitor management, regardless of the number of concession operated facilities.

The individual facilities and adjacent use areas are "lumped" into discrete geographic areas that serve as individual "management units". This provides the most efficient means of managing the recreation at and between recreation facilities along the reservoirs and river reaches. The following section has been organized to follow this “management unit” strategy, and each individual “unit” is described.

The total annual Forest Service expenses associated with: recreation facility operation and maintenance (including some NID Project sites on NID lands); monitoring; planning; fire and law enforcement patrols and responses, trail maintenance and; administration of the YB Project related recreation is estimated to be $218,000 and for DS at $173,000 (DS costs does not include operations and maintenance of recreation developed facilities) as described in the summary table below.

Licensees and Forest Service are working toward agreement within which funding can be consolidated for FS operation, maintenance, patrol, administration, and public information associated with Project induced recreation. This Rationale Report displays the specific rationale for each of the geographic areas. The funding levels displayed in these sections show the total annual normal costs incurred by the FS due to Project induced recreation. These figures do not include any maintenance of facilities constructed as part of the project in the future. These figures may, or may not, be more than the amount that the FS and Licensees eventually settle on. However, it is believed that it is beneficial to display the rationale for each specific amount. The Recreation Plan should contain a provision that provides for review and adjustment of these funding levels in the event they are incorrect and to adjust for inflation.

Summary of Forest Service Project Related Costs Spreadsheet

Yuba-Bear Project	
Recreation Area	**Total**
Bowman (3 reservoir + Canyon Creek)	$98,631
Jackson Creek (not a Project facility)	$19,320
Jackson Meadows (3 reservoirs)	$44,226
Administration/Law Enforcement	$56,084
Yuba-Bear Total (rounded)	**$218,000**
Drum-Spaulding Project	
Recreation Area	**Total**
Spaulding (4 reservoirs)	$23,334
Grouse (8 reservoirs)	$23,952
Fordyce (2 reservoirs)	$30,259
Kidd (2 reservoirs)	$4,715
Lake Valley (2 reservoirs)	$4,634
Meadow White Rock (2 reservoirs)	$24,704
Administration/Law Enforcement	$60,897
Drum-Spaulding Total (rounded)	**$173,000**

Yuba-Bear Project Area

The Yuba-Bear Project area covers many acres within the Tahoe National Forest. The project facilities on NFS land are managed by the FS with some financial assistance from NID via a collection agreement. Through the collection agreement, the FS also operates and maintains recreation facilities on NID lands in the Bowman and Jackson Meadows areas. The FS operates and maintains the Jackson Meadows recreation facilities through a concessionaire under FS permit. NID depends on the FS to provide fire prevention, law enforcement, additional public contacts, contract with county sheriff departments for law enforcement patrols, and provide a monitoring role. As stated by Licensee in the Fire Prevention and Response Plan, escaped campfires are the primary source of wildfires in the Project area (NID 2011b, page 9). The number of human-caused fires indicates a continuing presence of ignition sources that may be reduced by the increased implementation of fire prevention measures that specifically target recreation-based users in the national forests.

Bowman Recreation Area

The Bowman Recreation area facilities and the associated dispersed recreation areas are operated and managed by the FS. Bowman and Faucherie recreation facilities were constructed by NID on their lands; Canyon Creek campground was originally constructed by Licensee on NFS lands with no funds provided to the TNF for operation and maintenance of these facilities. Jackson Creek Campground predates the project and was constructed by the FS under an agreement with NID. Due to the attraction of and close proximity to several Project lakes, the long slow trip necessary to access Jackson Creek campground, and the minimal attractions at the campground itself, the majority of the use of this campground is project related. Over half of the overnight use in this Recreation Area is dispersed camping (NID 2011).

Since 1998, NID has been providing some of the funding for necessary operation and maintenance of the recreation facilities (NID 2008). The operation, maintenance, and administration costs are directly a result of Licensee's Project. On-site operations and maintenance by seasonal and permanent FS staff is required to meet health and safety standards, maintenance standards, and to ensure recreation visitors are having a quality experience and not impacting the natural resources. The FS currently provides fire and law enforcement patrols in and around the project lakes without reimbursement.

Cost: The costs are to manage for the recreation use at the recreation facilities around Bowman Recreation area, including the land generally within ¼ mile of the project lakes, and along Canyon Creek. For this area, these funds would be utilized to provide cleaning, operation, and routine maintenance of the Project facilities, conduct patrols, pick up litter, provide public information, enforce rules and regulations, rehabilitate impacted areas, address sanitation, maintain day use sites (such as concentrated use areas), respond to fires and other emergencies, and assist in search and rescue. Patrols include both recreation patrols and fire patrols and fire prevention services on both NFS lands and Licensee lands within the TNF Direct Protection Area (DPA). In addition to the facility maintenance, there will be shoreline cleanup and resource protection measures within and immediately adjacent to the reservoirs and along Canyon Creek. The following estimate shows the cost to manage for these visitors and their impacts.

Operation, Maintenance, Patrol, Coordination Costs				
Area:	Bowman			
Reservoirs:	Bowman, Sawmill, Faucherie, Canyon Creek			
Personnel	**Days**	**Cost/Day**	**Total**	
Rec Tech GS-6 (FPO)	85	$200	$	17,000
Rec Tech GS-5 temp	85	$150	$	12,750
Rec Mgr GS-9	25	$245	$	6,125
Public Service Officer GS-11	10	$405	$	4,050
Fire Prevention Tech GS-7	40	$240	$	9,600
Resource Business Mgr GS-7	10	$193	$	1,930
Campground Host			$	750
Subtotal Personnel			*$*	*52,205*
Vehicles	**Months**	**Miles**	**Total**	
Rec Tech vehicle (4052)	4	5000	$	3,018
Maint Tech vehicle (1898)	4	5000	$	5,450
Rec Officer vehicle (4048)	0	1000	$	450
Fire Tech water vehicle	3	3500	$	3,760
Subtotal Vehicles			*$*	*12,678*
Project Materials, Supplies, Contracts			**Total**	
Maintenance supplies			$	4,000
Signs, posts			$	1,000
Uniforms			$	500
Garbage			$	2,500
Annual Project Work			$	5,000
Equipment maintenance			$	500
Toilet pumping ($4,500 pre development)				
($6,000 post dvelopment)			$	6,000
Water permits (Post installation)			$	1,200
Water testing (Post installation)			$	108
Subtotal Matreials & Supplies			*$*	*20,808*
Subtotal O&M Costs			$	85,691
Overhead	19%		$	16,281
Total			$	101,972

Though the recreationists that use Jackson Creek Campground are predominately drawn to the area because of the Project lakes, the costs related to the management of recreational activities and use at Jackson Creek Campground are displayed separately from the Bowman Recreation Area costs because the campground is not a Project facility.

Operation, Maintenance, Patrol, Coordination Costs				
Area:	Jackson Creek			
Reservoirs:	Campground on Canyon Creek (Not a Project Facility)			
Personnel	**Days**	**Cost/Day**		**Total**
Rec Tech GS-6 (FPO)	15	200	$	3,000
Rec Tech GS-5 temp	15	150	$	2,250
Rec Manager GS-9	5	245	$	1,225
Public Staff Officer GS-11	2	405	$	810
Fire Prevention Tech GS-7	5	240	$	1,200
Resource Business Mgr	2	193	$	386
Subtotal Personnel			*$*	*8,871*
Vehicles	**Months**	**Miles**		**Total**
Rec Tech vehicle (4052)	2	1000	$	834
Maint Tech vehicle (1898)	2	1000	$	1,450
Rec Officer vehicle (4048)	0	200	$	90
Fire Tech water vehicle	0	500	$	340
Subtotal Vehicles			*$*	*2,714*
Project Materials, Supplies, Contracts				**Total**
Maintenance supplies			$	750
Signs, posts			$	150
Uniforms			$	-
Garbage			$	500
Toilet pumping			$	1,500
Equipment maintenance			$	250
Annual Project Work			$	1,500
Subtotal Matreials & Supplies			*$*	*4,650*
Subtotal O&M Costs			$	16,235
Overhead	19%		$	3,085
Total			$	19,320

Jackson Meadows Recreation Area (including Milton Reservoir)

The Jackson Meadows recreation facilities are managed by the FS, although most operation and maintenance of facilities are conducted by a concessionaire under FS permit. The facilities were originally constructed by Licensee with no funds provided to the FS for operation and maintenance of these facilities. More recently, Licensee has been providing funding for administration of the concessionaire permit and other necessary operation and maintenance of the recreation facilities (NID 2008). The operation, maintenance, and administration costs are directly a result of Licensee's recreation development. Permanent and seasonal FS staff administers the concession permit as well as assist the permittee to meet customer service and public health and safety needs (e.g. repair water systems) and maintenance standards. The FS also ensures that if resources are impacted by recreation operations or visitors that those impacts are mitigated, that recreation visitors are having a quality experience.

Milton Reservoir is managed directly by the FS, although the FS sometimes contracts for cleaning of this facility and the Woodcamp Interpretive Trail is maintained by the FS either directly or through maintenance contracts.

Cost: The costs are to manage for the recreation use at the recreation facilities around Jackson Meadows Reservoir and generally within ¼ mile of the reservoir. For this area, these funds would be utilized to conduct patrols, administer the concessionaire special use permit (including dealing with appeals, Freedom of Information Act requests, and financial audits) pick up litter, provide public information, enforce rules and regulations, rehabilitate impacted areas, address sanitation, respond to fires and other emergencies, assist in search and rescue, and conduct facility cleaning, operation and maintenance at those recreation facilities not operated by the concessionaire to meet existing maintenance standards. Patrols include both recreation patrols and fire patrols and fire prevention services on both NFS lands and Licensee lands within the TNF Direct Protection Area (DPA). In addition to the facility maintenance, there will be shoreline cleanup and resource protection measures within and immediately adjacent to the reservoirs. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Operation, Maintenance, Patrol, Coordination Costs				
Area:	Jackson Meadows Rec Area			
Reservoirs:	Jackson Meadows, Milton, French			
Personnel	**Days**	**Cost/Day**	**Total**	
Recreation Officer (GS-11)	5	315	$	1,575
Recreation Manager (GS-9)	50	294	$	14,700
Recreation Technician (GS-5)	40	150	$	6,000
Fire Prevention Technician (GS-7)	20	240	$	4,800
Forest Administrative Support	10	252	$	2,520
Subtotal Personnel			*$*	*29,595*
Vehicles	**Months**	**Miles**	**Total**	
Rec Tech vehicle	0	600	$	270
Recreation Manager (GS-9)	0	800	$	360
Fire Prevention Vehicle	0	1000	$	680
Subtotal Vehicles			*$*	*1,310*
Project Materials, Supplies, Contracts			**Total**	
Signs, posts			$	1,000
Minor Project Work			$	1,000
Milton toilet maintenance			$	3,500
Subtotal Matreials & Supplies			*$*	*5,500*
Subtotal O&M Costs			$	36,405
Overhead	19%		$	6,917
Total			$	43,322

<u>FS Administration</u>

The recreational use and demand within the YB Project area and generated by the YB project facilities and operations, as described above, has also led to the need for the land management agencies to provide administrative oversight of the public recreation services being provided. These oversight duties include, but are not limited to such tasks as program development and oversight, planning and budgeting, hiring and supervision, coordination and correspondence with the Commission and Licensee, participation in FERC inspections; reporting and record keeping; review and coordination of recreation use monitoring efforts and results; marking, cruising and selling hazard trees to commercial interests or to the license, answering public inquiries about project recreation, and annual coordination meetings with Licensee. The following estimate shows the cost to provide for the administrative oversight associated with management of the recreation use.

The following estimate also includes the need for 35 days for uniformed Forest Service Law Enforcement Officers (LEOs). In addition to the specialized training and skills required for a LEO by FS policy, all violation notices and incident reports written by Forest Protection Officers (FPO) must be processed by a LEO within 10 days. FPOs do the majority of the patrol on NFS lands. Many violation notices written by FPOs end with a court appearance to assist the US Attorney and substantiate the government's case. This requires LEO interaction and involvement as well. The Law Enforcement & Investigations Management Attainment Reporting System (LEIMARS) for the TNF reports 28 enforcement incidents associated with use at or near the DSYB Project lakes in 2011 (USDA Forest Service 2011). The most common enforcement actions were related to illegal and abandoned campfires, followed by occupancy issues, then sanitation and OHV violations.

Though the FS is not requesting reimbursement from Licensee for Nevada, Sierra and Placer County deputy patrols, the following information highlights the need for full Peace Officer authority presence within the Project Areas. The TNF annually pays the local counties to have their deputies assist in patrolling the TNF, and specifically at DSYB Project lakes, within the counties of Nevada ($21,000), Sierra ($24,000) and Placer ($22,000) (USDA Forest Service 2012a,b,c). Though there is a need for additional patrol by County Sheriff's Departments on the TNF, including the DSYB Project lakes, there are not sufficient funds available. According to Nevada County Sheriff's Department approximately 30 percent of the dedicated deputy's time is spent in the DSYB Project Areas due to recreation based use and issues (Bennet 2012).

Administration/Law Enforcement			
Area:	All Reserviors		
Reservoirs:	Administrative/LE		
Personnel	**Days**	**Cost/Day**	**Total**
Forest Rec Officer GS-12	6	436	$ 2,616
YR Public Staff Officer GS-11	15	405	$ 6,075
EZ Public Staff Officer GS-11	10	405	$ 4,050
YR Rec Manager	20	245	$ 4,900
TNF - LA/Engineer/COR	30	413	$ 12,390
YR LEO	20	320	$ 6,400
EZ LEO	15	320	$ 4,800
Forest Admin. Support	5	252	$ 1,260
Subtotal Personnel			*$ 42,491*
Vehicles	**Months**	**Miles**	**Total**
YR Public Staff Officer vehicle (4048	0	1000	$ 450
YR Rec Manager vehicle (4052)	0	1000	$ 450
YR LEO vehicle (5130)	2	6000	$ 3,738
Subtotal Vehicles			*$ 4,638*
Subtotal O&M Costs			$ 47,129
Overhead	19%		$ 8,955
Total			$ 56,084
	NID Total Total		**$ 220,697**

Drum-Spaulding Project Area

The Drum-Spaulding Project area covers many acres within the Tahoe National Forest. The project facilities on NFS land are managed by PG&E which in turn contracts the operation to a concessionaire. PG&E depends on the FS to provide fire prevention, law enforcement, additional public contacts, contract with county sheriff departments for law enforcement patrols and provide a monitoring role. Up until 2005 the USFS operated these facilities without reimbursement from Licensee. Prior to the 2005 recreation season the FS informed Licensee that it no longer had the ability to continue operating and maintaining the Project facilities on NFS lands, and requested that either PG&E reimburse the FS for the operation and maintenance of the facilities, or that PG&E operate and maintain the facilities under an agreement. PG&E put the operation out to a competitive bid and the operation was awarded to a private concessionaire. At that point, the FS no longer operated or maintained the Project facilities on NFS lands, but continued to perform certain tasks without reimbursement. For instance, around 2007 the FS installed animal resistant food lockers at Rucker Campground. The FS also continues to provide fire and law enforcement patrols in and around the project boundary. As stated by Licensee in the Fire Prevention and Response Plan, escaped campfires are the primary source of wildfires in the Project area (PG&E 2011c). The number of human-caused fires indicates a continuing presence of ignition sources that may be reduced by the increased implementation of fire prevention measures that specifically target recreation-based users in the national forests.

Spaulding Recreation Area

Cost: The costs are to: monitor/manage for the project induced recreation impacts to NFS lands that are not directly tied to the management of the facilities and provide fire prevention services on Licensee's lands generally within ¼ mile of Fuller, Rucker, Blue, and Spaulding reservoirs. For this area, these funds would also be utilized to conduct fire (both NFS and PG&E lands within the Direct Protection Area) and recreation patrols, pick up litter, provide public information, enforce rules and regulations, monitor sanitation, inspect concentrated use areas, monitor compliance to terms of the recreation facilities operation and maintenance agreement between PG&E and FS, respond to visitor-caused fires and other emergencies, and assist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination, Patrol & Trail Mntc Costs				
Area:	Spaulding Recreation Area			
Reservoirs:	Spalding, Rucker, Fuller, Blue, Bear Valley, SD Trail			
Personnel	**Days**	**Cost/Day**		**Total**
Rec Tech GS-6 (FPO)	20	$200	$	4,000
Rec Manager GS-9	15	$245	$	3,675
Public Staff Officer GS-11	5	$405	$	2,025
Fire Prevention Tech GS-7	20	$240	$	4,800
Resource Business Mgr	1	$193	$	193
Subtotal Personnel			*$*	*14,693*
Vehicles	**Months**	**Miles**		**Total**
Rec Tech vehicle (4052)	0	1000	$	450
Rec Officer vehicle (4048)	0	500	$	225
Fire Tech water vehicle	3	2000	$	2,740
Subtotal Vehicles			*$*	*3,415*
Project Materials, Supplies, Contracts				**Total**
Annual Project work			$	1,500
Subtotal Matreials & Supplies			*$*	*1,500*
Subtotal O&M Costs			$	19,608
Overhead	19%		$	3,726
Total			$	23,334

Grouse Recreation Area

Cost: The costs are to: monitor/manage for the project induced recreation impacts to NFS lands that are not directly tied to the management of the facilities generally within ¼ mile of Carr, Feeley, Lindsey (3), Culbertson, Rock (2) reservoirs. For this area, these funds would be utilized to conduct fire (both NFS and PG&E lands within the Direct Protection Area) and recreation patrols, pick up litter, provide public information, enforce rules and regulations, monitor sanitation, inspect concentrated use areas, monitor compliance to terms of the recreation facilities operation and maintenance agreement between PG&E and FS, respond to visitor-caused fires and other emergencies andassist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination, Patrol & Trail Mntc Costs				
Area:	Grouse Perimeter Recreation Area			
Reservoirs:	Carr, Feeley, Lindsey (3), Culbertson, Rock (2)			
Personnel	**Days**	**Cost/Day**		**Total**
Rec Tech GS-6 (FPO)	20	$200	$	4,000
Rec Manager GS-9	15	$245	$	3,675
Public Staff Officer GS-11	5	$405	$	2,025
Fire Prevention Tech GS-7	20	$240	$	4,800
Resource Business Mgr	1	$193	$	193
Subtotal Personnel			*$*	*14,693*
Vehicles	**Months**	**Miles**		**Total**
Rec Tech vehicle (4052)	0	1200	$	540
Rec Officer vehicle (4048)	0	700	$	315
Fire Tech water vehicle	3	2500	$	3,080
Subtotal Vehicles			*$*	*3,935*
Project Materials, Supplies, Contracts				**Total**
Annual Project Work			$	1,500
Subtotal Matreials & Supplies			*$*	*1,500*
Subtotal O&M Costs			$	20,128
Overhead	19%		$	3,824
Total			$	23,952

<u>Fordyce Recreation Area</u>

Fordyce and Sterling Lakes see a large amount of Off-Highway Vehicle use and are difficult to access due to the rugged 4 wheel-drive road access. Travel to access these lakes is long and slow, which makes this area less efficient in terms of costs to manage and patrol.

Cost: The costs are to monitor/manage for the project induced recreation impacts to NFS lands that are not directly tied to the management of the facilities generally within ¼ mile of Fordyce and Sterling reservoirs. For this area, these funds would be utilized to conduct fire (both NFS and PG&E lands within the Direct Protection Area) and recreation patrols, pick up litter, provide public information, enforce rules and regulations, rehabilitate impacted areas, address sanitation, inspect and maintain concentrated use areas, monitor compliance to terms of the recreation facilities operation and maintenance agreement between PG&E and FS, respond to visitor-caused fires and other emergencies, and assist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination, Patrol & Trail Mntc Costs				
Area:	Fordyce Recreation Area			
Reservoirs:	Fordyce, Sterling			
Personnel	**Days**	**Cost/Day**	**Total**	
Rec Tech GS-6 (FPO)	20	$200	$	4,000
Rec Manager GS-9	15	$245	$	3,675
Public Staff Officer GS-11	5	$405	$	2,025
Fire Prevention Tech GS-7	40	$240	$	9,600
Resource Business Mgr	1	$193	$	193
Subtotal Personnel			*$*	*19,493*
Vehicles	**Months**	**Miles**	**Total**	
Rec Tech vehicle (4052)	0	1000	$	450
Rec Officer vehicle (4048)	0	500	$	225
Fire Tech water vehicle	3	2000	$	3,760
Subtotal Vehicles			*$*	*4,435*
Project Materials, Supplies, Contracts			**Total**	
Annual Project work			$	1,500
Subtotal Matreials & Supplies			*$*	*1,500*
Subtotal O&M Costs			$	25,428
Overhead	19%		$	4,831
Total			$	30,259

Kidd Recreation Area

Cost: The costs are to monitor/manage for the project induced recreation impacts to NFS lands that are not directly tied to the management of the facilities generally within ¼ mile of Kidd and Upper and Lower Cascade reservoirs. For this area, these funds would be utilized to conduct fire (both NFS and PG&E lands within the Direct Protection Area) and recreation patrols, pick up litter, provide public information, enforce rules and regulations, monitor sanitation, respond to visitor-caused fires and other emergencies, and assist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination & Patrol Costs			
Area:	Kidd Recreation Area		
Reservoirs:	Kidd, Cascade Lakes		
Personnel	**Days**	**Cost/Day**	**Total**
Fire Prevention Tech GS-7	15	$240	$ 3,600
Subtotal Personnel			*$ 3,600*
Vehicles	**Months**	**Miles**	**Total**
Rec Tech vehicle	0	200	$ 90
Fire Tech water vehicle	0	400	$ 272
Subtotal Vehicles			*$ 362*
Subtotal O&M Costs			$ 3,962
Overhead	19%		$ 753
Total			$ 4,715

Lake Valley Recreation Area

Cost: For this area, these funds would be utilized to conduct fire patrols and provide fire prevention services primarily on PG&E lands within the Direct Protection Area surrounding these lakes; provide public information, respond to visitor-caused fires and other emergencies, and assist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination & Patrol Costs				
Area:	Lake Valley Recreation Area			
Reservoirs:	Kelly, Lake Valley			
Personnel	**Days**	**Cost/Day**	**Total**	
Fire Prevention Tech GS-7	15	$240	$	3,600
Subtotal Personnel			*$*	*3,600*
Vehicles	**Months**	**Miles**	**Total**	
Rec Tech vehicle	0	200	$	90
Fire Tech water vehicle	0	300	$	204
Subtotal Vehicles			*$*	*294*
Subtotal O&M Costs			$	3,894
Overhead	19%		$	740
Total			$	4,634

Meadow/ White Rock Recreation Area

Cost: The costs are to monitor/manage for the project induced recreation impacts to NFS lands that are not directly tied to the management of the facilities generally within ¼ mile of Meadow and White Rock reservoirs. For this area, these funds would be utilized to conduct fire (both NFS and PG&E lands within the Direct Protection Area) and recreation patrols, pick up litter, provide public information, enforce rules and regulations, rehabilitate impacted areas, monitor sanitation, respond to visitor-caused fires and other emergencies, and assist in search and rescue. The following estimate shows the cost to manage for these visitors and the impacts from their visits.

Monitor, Coordination & Patrol Costs			
Area:	Meadow/White Rock		
Reservoirs:	Meadow, White Rock		
Personnel	**Days**	**Cost/Day**	**Total**
Rec Tech GS-4	12	$ 130	$ 1,560
Fire Prevention Tech GS-7	32	$ 254	$ 8,128
Rec Mgr GS-9	16	$ 294	$ 4,704
Rec Officer GS-11	4	$ 315	$ 1,260
Subtotal Personnel			*$ 15,652*
Vehicles	**Months**	**Miles**	**Total**
Rec Tech vehicle	4	600	$ 1,258
Fire Tech water vehicle	4	1600	$ 2,816
Rec Mgr vehicle	4	800	$ 1,664
Subtotal Vehicles			*$ 5,738*
Project Materials, Supplies, Contracts			**Total**
Subtotal Matreials & Supplies			*$ -*
Subtotal O&M Costs			$ 21,390
Overhead	19%		$ 4,064
Total			$ 25,454

FS Administration

The recreational use and demand within the DS Project area and generated by the DS project facilities and operations, as described above, has also lead to the need for the FS to provide administrative oversight of the public recreation services being provided on agency lands. These oversight duties include, but are not limited to such tasks as program development and oversight, planning and budgeting, hiring and supervision, coordination and correspondence with the Commission and Licensee, participation in FERC inspections, reporting and record keeping, review and coordination of recreation use monitoring efforts and results, marking, cruising and preparing contracts to sell hazard trees to commercial interests or to the license, annual coordination meetings with Licensee, answering public inquiries about project recreation opportunities and accompanying PG&E on concessionaire site inspections. The following estimate shows the cost to provide for the administrative oversight associated with management of the recreation use.

The following estimate also includes the need for 50 days for uniformed Forest Service Law Enforcement Officers (LEOs). In addition to the technical training and skills required for a LEO by FS policy, all violation notices and incident reports written by Forest Protection Officers (FPO) must be processed by a LEO within 10 days. FPOs do the majority of the patrol on NFS lands. Many violation notices written by FPOs end with a court appearance to assist the US Attorney and substantiate the government's case. This requires LEO interaction and involvement as well. The Law Enforcement & Investigations Management Attainment Reporting System (LEIMARS) for the TNF reports 28 enforcement incidents associated with use at or near the DSYB Project lakes in 2011 (USDA Forest Service 2011, map of incident clusters). The most common enforcement actions were related to illegal and abandoned campfires, followed by occupancy issues, then sanitation and OHV violations.

Though the FS is not requesting reimbursement from Licensee for Nevada, Sierra and Placer County deputy patrols, the following information highlights the need for full Peace Officer authority presence within the Project Areas. The TNF annually pays the local counties to have their deputies assist in patrolling the TNF, and specifically at DSYB Project lakes, within Nevada ($21,000), Sierra ($24,000) and Placer ($22,000) USDA Forest Service 2012a,b,c). Though there is a need for additional patrol by County Sheriff's Departments on the TNF, including the DSYB Project lakes, there are not sufficient funds available. According to Nevada County Sheriff's Department approximately 30 percent of the dedicated deputy's time is spent in the DSYB Project Areas due to recreation based use and issues (Personal Communication 2012).

Administrative & Law Enforcement Costs				
Area:	All Reserviors			
Reservoirs:	Administrative			
Personnel	**Days**	**Cost/Day**	**Total**	
Forest Rec Officer GS-12	6	$436	$	2,616
YR Public Staff Officer GS-11	15	$405	$	6,075
EZ Public Staff Officer	10	$405	$	4,050
AR Public Staff Officer	5	$405	$	2,025
YR Rec Manager	20	$245	$	4,900
TNF - LA/Engineer/COR	20	$413	$	8,260
Forest Admin. Support	5	$252	$	1,260
YR LEO	40	$320	$	12,800
EZ/AR LEO	10	$320	$	3,200
Subtotal Personnel			*$*	*45,186*
Vehicles	**Months**	**Miles**	**Total**	
Rec Tech vehicle	0	1000	$	450
Rec Tech vehicle	0	1000	$	450
Fire Tech water vehicle	2	9000	$	5,088
Subtotal Vehicles			*$*	*5,988*
Subtotal O&M Costs			$	51,174
Overhead	19%		$	9,723
Total			$	60,897
	Drum-Spaulding Total		**$**	**177,082**

RECREATION AND FIRE PATROL (DRUM-SPAULDING AND YUBA-BEAR HYDROELECTRIC PROJECTS

Within 1 year of license issuance, Licensee shall coordinate with FS and BLM to develop a plan to address the costs of managing the project induced recreation on NFS and BLM lands, within ¼ mile of all Project reservoirs. At the Annual Coordination Meeting, Licensee shall coordinate with FS and BLM to review information from the prior season and plan any adjustments for the next recreation season. In addition to addressing the management of the Project facilities, this component shall address, at a minimum, the following considerations:

- Monitor and seek compliance with safety, camping closures, fire clearance, fire restrictions, and other measures.

- Patrol, or provide for patrols, through the recreation season with personnel that have the ability to extinguish abandoned and escaped campfires and perform fire prevention duties.
- Provide for patrols, through the recreations season with personnel that have the authority to enforce federal 36 CFR 261 regulations on NFS lands.
- Install and maintain signs; adjust as seasonally needed.
- Disperse information to the public including appropriate OHV and firearm use, campfire safety, leave no trace, and other messages to reduce resource impacts and inter-user conflicts.
- Patrol dispersed public use areas within one-quarter mile of all Project and Project-affected waterways.
- Monitor and report vandalism of facilities, cultural sites or other resource damage.
- Report illegal activities and cooperate with law enforcement agencies.
- Monitor and seek compliance with regulations associated with camping, parking, food storage, whitewater boating, and other uses.
- Remove trash, remove evidence of human waste and clean fire rings from dispersed campsites and other areas of concentrated public use within 1/4 mile of all Project lakes and Project-affected waterways.
- Maintain fuels clearance within 100 feet of all dispersed campsites (including fire clearance around both Project-provided steel fire rings and user created fire rings) surrounding Project lakes.
- Remove visitor created fire rings in areas where camping is limited to designated sites.
- Perform other duties that provide for the safety of the public and protection of Project-affected resources.

The Project Patrols are needed to address a wide array of Project-associated resource concerns. It should be noted that many, but not all of the needs listed above, may be addressed through a collection agreement in which Licensees reimburse the agencies for some of these duties, thus reducing the frequency of Licensee-provided patrols. The Recreational Use and Visitor Surveys (Technical Memorandums 8-2a & 8-2b, PG&E 2011 & NID 2011) enumerate many examples of concerns at Project facilities or from Project-induced recreational use. A sample of references from the visitor surveys and other sources include:

- Rowdiness, firearms, loudness are consistent complaints expressed by visitors in the “Type of negative conflict visitors experienced with other recreationists” tables for recreation facilities that are not directly accessed by, or near, paved roads (PG&E 2011 and NID 2011).
- Faucherie Lake Table 3.4-328 provides the Number of visitors who experienced a negative interaction with other recreationists: Group campground users 54 percent; Shoreline users 30.4 percent, and; Dam users 38.2 percent (NID 2011). The types of conflict included rowdiness, loudness and litter (NID 2011, table 3.4-329).
- Table 3.4-379 of the Recreational Use and Visitor Surveys lists Why visitors felt unsafe - Canyon Creek: Firearm discharge 11.8 percent; Speeding vehicles 2.9 percent; Unattended campfires 2.9 percent, and: Excessive drinking 2.9 percent (NID 2011).
- Table 3.4-471. Number of visitors who experienced a negative interaction with other recreationists - Bowman Lake shows that over one-third of the undeveloped recreation site users reported negative interactions with other recreationists. Conflicts were with rowdy and littering users, loud OHV users and unsafe shooters.

- For the NID project as a whole Section 4.8 Conflict of the Recreational Use and Visitor Surveys Technical Memorandum 8-2b reveals that almost 30 percent of users overall experienced conflicts with other users. Most attributed the conflict to loud OHVs and boats and partiers (NID 2011).
- Table 3.4-473 Number of visitors who experienced a negative interaction with other recreationists by recreation site at Carr-Feeley Lakes documents that 29.4 percent of the campers reported conflicts with other users; 28.3 percent at Lindsey lake Campground (Table 3.4-538); 24 percent at Sterling Lake (Table 3.4-151) (PG&E 2011).
- As stated by Licensee in the Fire Prevention and Response Plan, escaped campfires are the primary source of wildfires in the Project area and the number of human-caused fires indicates a continuing presence of ignition sources that may be reduced by the increased implementation of fire prevention patrols and measures that specifically target recreation-based users in the national forests (PG&E 2011c).
- Both the FS and Licensees desire to restrict OHV use under the high water mark at DSYB Project reservoirs. Uncontrolled OHV use under the high water mark at Fordyce and Bowman reservoirs is a common activity that will take a concerted effort, including patrols, in order to effect a change in this established use pattern.
- The Law Enforcement & Investigations Management Attainment Reporting System (LEIMARS) for the TNF reported 28 enforcement law enforcement incidents at or near the DSYB Project lakes in 2011 (USDA Forest Service 2011). The most common enforcement actions were related to illegal and abandoned campfires, followed by occupancy issues, then sanitation and OHV violations. These statistics report documented incidents. For every documented incident in the Project Areas there are easily 5 times more FPO/LEO related incidences/contacts that go undocumented.
- The following information highlights the need for full Peace Officer authority presence within the Project Areas. The TNF annually pays the local counties to have their deputies assist in patrolling the TNF, and specifically at DSYB Project lakes, within counties of Nevada ($21,000), Sierra ($24,000) and Placer ($22,000) (USDA Forest Service 2012a,b,c). Though there is a need for additional patrol by County Sheriff's Departments on the TNF, including the DSYB Project lakes, there are not sufficient funds available. According to Nevada County Sheriff's Department approximately 30 percent of the dedicated deputy's time is spent in the DSYB Project Areas due to recreation based use and issues (Bennet 2012).

FS recognizes that Licensee is not solely responsible for all activities that occur on or around the Project. Public agencies share in this responsibility. FS also recognizes Licensee is not a law enforcement agency. However, currently the public agencies are unable to keep up with the demand placed on them by Project-induced use and Licensee has not assisted to date in this workload. One example of current cooperation between the TNF and Project-affected agencies is the law enforcement agreement between FS and the three counties affected by the Project facilities.

Forest Service responses to incidences at the DSYB recreation facilities are increasing as the population increases. Technical Memorandum 8-2a projects a 71 percent increase in use during the term of the license (PG&E 2011, page 488).

In summary, the Project has induced recreational use requiring management; Licensees have acknowledged issues with OHV abuse, litter, conflicts with user behavior, sanitation issues, concerns with lack of law enforcement, unattended campfires etc. that can only be resolved through human intervention. The public agencies alone are not able to keep up with this project induced management demand and shared responsibility is necessary to be effective.

The requirement to provide Project patrol is common on hydro relicensing projects; even some law enforcement positions have been required on specific projects due to extenuating circumstances. The requirement is neither an unusual nor unprecedented requirement. Public agencies are already fulfilling their responsibility for managing Project-induced recreation; Licensee is only being requested to assist with management of their direct and indirect Project impacts.

RATIONALE FOR RECREATION MEASURES – FISH STOCKING

Project operations have altered the river and its associated biota both upstream and downstream of Project facilities in several significant ways. Among other things, fish movement is limited, downstream flow regimes are altered, habitat is inundated, and recreational areas are created that would not exist if the Project did not exist (project-induced recreation).

The restriction of fish movement has several potential consequences including limiting access to spawning areas, reducing survival by reducing or eliminating access to overwintering or oversummering areas, and causing gene flow between and among populations to be essentially one-directional (downstream). Project facilities and operations have caused habitat fragmentation and loss, created fish migration barriers, and genetically isolated fish populations throughout the project area.

Fish may pass over or through a dam, canal, or tunnel, but survival can be affected by disorientation, physical trauma, stress and predation. If they do survive downstream passage past a dam or through another project facility, they are unable to migrate back upstream to re-populate upstream areas. Dams have been shown to significantly affect the survival of upstream fish populations. Morita and Yamamoto (2002) found that the extirpation of populations of white-spotted char (*Salvelinus leucomaensis*) above dams in Japan was associated with increasing isolation period, decreasing watershed area (i.e., habitat size), and decreasing gradient.[19] Neraas and Spruell (2001) note that upstream populations of bull trout (*Salvelinus confluentus*) in the Clark Fork River have been declining since the construction of Cabinet Gorge Dam in 1952.[20]

Project dams also affect the streamflow and modify habitat below projects. Native fish evolved with seasonal flow regimes that no longer exist below the project dams. Although stream habitat in much of the Project Area was modified by hydraulic mining during the California gold rush,

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[19] Morita, Kentaro and Soichiro Yamamoto. 2002. Effects of Habitat Fragmentation by Damming on the Persistence of Stream-Dwelling Charr Populations. Conservation Biology 16(5) pp. 1318-23

[20] Neraas LP, Spruell P. 2001. Fragmentation of riverine systems: the genetic effects of dams on bull trout (Salvelinus confluentus) in the Clark Fork River system. Molecular Ecology. May 10(5) pp. 1153-64

the flow regimes in each stream remained relatively unchanged until dam construction. Current flow regimes below project reservoirs are completely altered from the natural hydrograph, often with very low (sometimes no) flow or artificially high flows during incorrect times of the year. These altered flow regimes can have a multitude of effects on the biota below the dams, affecting fish recruitment and mortality due to such things as stressful or lethal temperatures, scouring flows, stranding when flows drop precipitously, and an overall reduction in instream usable area for some lifestages. Under the current license conditions, stream fish populations in Project-affected reaches are not considered to be in "good condition" by the Resource Agencies (see the Minimum Instream Flow Rationale for the respective reaches below Project facilities).

Resident or stocked fish within individual Project reservoirs can be subject to entrainment into Project facilities, reducing reservoir angling opportunities. According to the Aquatic Resources section in the Yuba-Bear Pre-Application Document:

> "Often, planted fish will migrate out of an upstream reservoir into accessible inlet and outlet streams or into other conduit-connected reservoirs, sometimes through a long series of reservoirs, conduits and streams into other watersheds."

The PAD also indicates that fish in the Project area are potentially able "to move from watershed to watershed through Project conduits." It is recognized that entrainment is occurring to some extent at all project diversions. Normally fish screens should be required where entrainment occurs, but due to physical and structural limitations associated with facilities, and logistics associated with location, the Resource Agencies are not at this time recommending fish screens at most project facilities. Stocking of hatchery fish can mitigate for angling opportunities lost through entrainment into project facilities when fish screens are not a feasible option.

The Resource Agencies are of the opinion that stream fish condition will improve considerably under the new FERC license once new flow regimes are implemented. However, impacts associated with entrainment, blocked passage, and habitat inundation caused by project facilities will not be fully mitigated by the new flow regime alone. We recognize that in general, hatchery trout do not solve resource or habitat problems. Fisheries resources are restored by rehabilitating habitat, providing adequate stream flows, and maintaining conditions suitable for aquatic resource reproduction and growth within the aquatic ecosystem. To the extent that the aquatic ecosystem cannot be restored due to project facilities, hatchery trout can mitigate for losses by creating enhanced recreational angling opportunities.

Project impoundments have created reservoir fishing opportunities for the general public. In accordance with Article 33 of the current Project 2310 license, Licensee "shall allow the public free access… to project waters …for the purpose of full public utilization of such …waters for navigation and recreation purposes including fishing …". This Article is in compliance with Fish and Game Code 5943. For the recreational use of anglers, CDFG currently administers an ongoing fish stocking program for most Project reservoirs. The people of the State of California have been paying for this stocking for the entire term of the current FERC license. The Commission approved Study 2.8.2 (Recreation Use and Visitor Surveys, July 11, 2008) and Study 2.3.12 (Reservoir Fish Populations, December 2, 2008) both list reservoir fish stocking as one of the Potential License Conditions for this project. Fish stocking in project reservoirs can be considered mitigation for the on going project impacts described above. Therefore it is appropriate that Licensee be required to fully fund fish stocking in the future.

As mitigation for lost historic recreational stream fishing opportunities, and to maintain or improve project-induced recreational opportunities, Licensee is responsible for providing reservoir-based recreation, including angling opportunities, at all Project reservoirs that are currently or have been stocked by CDFG.

In the Drum Spaulding Final License Application, Licensee has proposed paying CDFG up to $15,000 per year for the term of the license toward stocking in Spaulding Reservoir (see Measure DS-AQR3 of the Final License Application). The rationale for Measure DS-AQR3 states, "Funding fish stocking practices would support continued recreational fishing opportunities." While Licensee's proposal is commendable, the Spaulding Reservoir is not the only reservoir within the FERC No. 2310 project boundary; angling opportunities exist throughout the project area. Recreational surveys conducted 2009 in accordance with the FERC-approved study plan (Recreation Use and Visitor Surveys, July 11, 2008) indicated that fishing was an important recreational activity at each of the Project reservoirs (see excerpts from Technical Memorandum 8-2a below). As part of a new Drum-Spaulding Project license, the Resource Agencies recommend that Licensee fund fish stocking for the following reservoirs: Blue Lake, Carr Lake, Culbertson Lake, Feeley Lake, Fordyce Lake, Fuller Lake, Halsey Forebay, Rock Creek Lake, Lake Valley Reservoir, Lower Lindsey Lake, Upper Lindsey Lake, Meadow Lake, Lower Rock Lake, Upper Rock Lake, White Rock Lake, Sterling Lake, and Spaulding Reservoir.

In the Yuba-Bear Final License Application Licensee proposed reimbursing CDFG for stocking in Bowman Lake and Rollins Reservoir (Measures YB-AQR2 and YB-AQR3, respectively). These measures would require Licensee to reimburse CDFG for CDFG's stocking of fish in Bowman Lake and Rollins Reservoir up to current stocking levels and if requested by CDFG. The rationale for each measure states in part: "This measure would assure that the reservoir would continue to be a viable fishing reservoir and support recreational fishing." While Licensee proposal is commendable, the Project affects more than just Bowman Lake and Rollins Reservoir; recreational angling opportunities exist throughout the project area. Recreational surveys conducted 2009 in accordance with the FERC-approved study plan (Recreation Use and Visitor Surveys, July 11, 2008) indicated that fishing was an important recreational activity at each of the Project reservoirs (see excerpts from Technical Memorandum 8-2b below). As part of a new Yuba-Bear Project license, the Resource Agencies recommend that Licensee fund fish stocking for the following reservoirs: Bowman, Faucherie, French Lake, Jackson Meadows, Rollins and Sawmill Reservoirs.

CDFG stocking strategies and requirements (including species stocked) may change over time, but Licensees shall not be required to fund additional stocking in these reservoirs should CDFG decide additional stocking is necessary during the term of this license.

Drum-Spaulding Project

The stocking requirements for the Drum-Spaulding Project reservoirs are as follows:

Blue Lake

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 290 and 1,404 RDs… Most visitors participated in …fishing… activities. Fishing was also a popular activity with most anglers spending roughly two and one-half hours per day fishing, primarily for trout, and from the shoreline…nearly 80 percent rated their fishing experience as from very poor to average, overall.

The fishing experience rating of very poor to average could be due to the fact that Blue Lake is not currently stocked by CDFG. The 2000 through 2011 average stocking of Kamloops rainbow trout in Blue Lake was approximately 1,500 fingerlings. Therefore, Licensee shall be responsible for funding the stocking of 1,500 Kamloops rainbow trout in Blue Lake should CDFG decide it is in the best interest of the public and the natural resources to resume stocking.

Carr Lake

From Technical Memorandum 8-2a (Note – information from Carr and Feely lakes were combined in Technical Memorandum 8-2a):

> "The peak season recreation-use estimate was between 847 and 1,406 RDs… Most visitors participated in hiking, camping, fishing, backpacking, and wildlife viewing activities. Anglers spent roughly three hours per day fishing, generally for trout and from the shoreline. [Most anglers] rated their fishing experience as ranging from average to very good, overall."

The annual management target of Kamloops rainbow trout aerially planted in Carr Lake is approximately 4,000 fingerlings. The 2000 through 2011 average stocking of Kamloops rainbow trout in Carr Lake was approximately 4,000 fingerlings. Therefore Licensee shall fund the aerial stocking of 4,000 fingerling Kamloops rainbow trout in Carr Lake.

Culbertson Lake

From Technical Memorandum 8-2a (Note – information for Middle Lindsey, Culbertson, and Upper and Lower Rock Lakes were combined in Technical Memorandum 8-2a):

> "The peak season recreation-use estimate for these hike-in access reservoirs was between 175 and 1,526 RDs… Most visitors participated in camping, hiking, and fishing activities…Anglers spent roughly three hours fishing per day, generally for brown trout, and from the shoreline…[most anglers] rated their fishing experience as ranging from average to very good."

The annual management target of Kamloops rainbow trout aerially planted in Culbertson Lake is approximately 10,000 fingerlings. The 2000 through 2011 average stocking of fingerling Kamloops rainbow trout in Culbertson Lake was approximately 8,500 fingerlings. Therefore

Licensee shall fund the aerial stocking of 8,500 fingerling Kamloops rainbow trout in Culbertson Lake.

Feeley Lake

From Technical Memorandum 8-2a (Note – information from Carr and Feely lakes were combined in Technical Memorandum 8-2a):

> "The peak season recreation-use estimate was between 847 and 1,406 RDs… Most visitors participated in hiking, camping, fishing, backpacking, and wildlife viewing activities. Anglers spent roughly three hours per day fishing, generally for trout and from the shoreline. [Most anglers] rated their fishing experience as ranging from average to very good, overall."

The annual management target of Kamloops rainbow trout aerially stocked in Feely Lake is approximately 5,000 fingerlings. The 2000 through 2011 average stocking of Kamloops rainbow fingerlings trout in Feely Lake was approximately 4,250 fingerlings. Therefore Licensee shall fund the aerial stocking of 4,250 fingerling Kamloops rainbow trout in Feely Lake.

Fordyce Lake

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 1,185 and 3,592 RDs… Most visitors participated in OHV, camping, fishing, and hiking activities…Anglers spent roughly six hours per day fishing, generally from the shoreline..[most anglers] rated their fishing experience as good to very good overall"

The annual management target of Kamloops rainbow trout stocked in Fordyce Lake is approximately 10,000 fingerlings. The 2000 through 2011 average stocking of fingerling Kamloops rainbow trout in Fordyce Lake was approximately 10,000 fingerlings. Therefore Licensee shall fund the stocking of 10,000 fingerling Kamloops rainbow trout in Fordyce Lake.

Fuller Lake

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 11,998 and 20,358 RDs …Most visitors participated in fishing. Anglers spent roughly four hours fishing per day, generally from the shoreline… most anglers rated their fishing experience as good to very good, overall."

The annual management target of catchable rainbow trout stocked in Fuller Lake is approximately 8,000 lbs. The 2000 through 2011 average stocking of catchable rainbow trout in Fuller Lake was approximately 6,000 lbs. The 2000 through 2011 average stocking of catchable brown trout in Fuller Lake was approximately 2,200 lbs. Therefore, Licensee shall fund the stocking of 8,200 lbs of catchable fish in Fuller Lake.

Halsey Forebay

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 3,043 and 9,245 RDs… Most visitors participated in fishing and hiking activities…Anglers spent roughly 3.4 hours per day fishing, generally from the shoreline, for rainbow trout…most [anglers] rated their fishing experience from average to good."

The annual management target of catchable rainbow trout stocked in Halsey Forebay is approximately 4,000 lbs. The 2000 through 2011 average stocking of catchable rainbow trout in Halsey Forebay was approximately 3,000 lbs. Therefore Licensee shall fund the stocking of 3,000 lbs of catchable fish in Halsey Forebay.

Rock Creek Reservoir

From Technical Memorandum 8-2a:

> "The reservoir is situated on rolling hills, in an urban area. The area provides day-use opportunities only (overnight camping is not allowed), ***including shoreline fishing*** and hiking/walking. The reservoir does not have any developed recreation facilities, shows few signs of use impact, and was not designed for accessibility. The peak season recreation use estimate was as high as 167 RDs, comprised almost entirely of day-use."

Rock Creek Reservoir is not currently stocked by CDFG. However, due to it's proximity to the City of Auburn and the high potential for the development of recreational angling opportunities, Licensee shall fund the stocking of 3,000 lbs of catchable fish in Rock Creek Reservoir.

Lake Valley Reservoir

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 15,415 and 20,953 RDs… Anglers spent roughly three hours fishing per day, generally from the shoreline, for rainbow trout…most [anglers] rated their fishing experience as ranging from average to very good, overall"

CDFG gages reservoir fishing success by examining the catch-per-unit-effort (CPUE). This is typically expressed in number of fish caught per hour fished. CDFG seeks to attain CPUEs of 1.0 fish per hour or greater. A reservoir fishery is classified as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour. In 2009, CDFG surveyed 29 anglers at Lake Valley Reservoir; the CPUE was 1.1 fish per hour, which would classify fishing in this reservoir as good to excellent.

The annual management target of catchable rainbow trout stocked in Lake Valley Reservoir is approximately 4,000 lbs. The 2000 through 2011 average stocking of catchable rainbow trout in Lake Valley Reservoir was approximately 2,400 lbs. Therefore Licensee shall fund the stocking of 2,400 lbs of catchable fish in Lake Valley Reservoir.

Lower Lindsey Lake

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 2,125 and 2,840 RDs… Most visitors surveyed participated in camping, hiking, picnicking, swimming, and fishing activities. … Anglers spent roughly three hours fishing per day, generally for brown trout, and from the shoreline…most [anglers] rated their fishing experience as ranging from average to very good, overall."

The annual management target of Kamloops rainbow trout aerially stocked in Lower Lindsey Lake is approximately 8,000 fingerlings. The 2000 through 2011 average stocking of fingerling Kamloops rainbow trout in Lower Lindsey Lake was approximately 6,000 fingerlings. Therefore Licensee shall fund the aerial stocking of 6,000 fingerling Kamloops rainbow trout in Lower Lindsey Lake.

Upper Lindsey Lake

The annual management target of Kamloops rainbow trout aerially stocked in Upper Lindsey Lake is approximately 4,000 fingerlings. The 2000 through 2011 average stocking in Upper Lindsey Lake was approximately 4,500 fingerlings. Therefore Licensee shall fund the aerial stocking of 4,000 fingerling Kamloops rainbow trout in Upper Lindsey Lake.

Meadow Lake

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 4,852 and 5,301 RDs… Anglers spent roughly six hours per day fishing, generally from the shoreline…. most anglers rated their fishing experience as average to good."

The annual management target of Lahontan cutthroat trout aerially stocked in Meadow Lake is approximately 5,000 fingerlings. The 2000 through 2011 average stocking of Lahontan cutthroat trout in Meadow Lake was approximately 5,000 fingerlings. Therefore Licensee shall fund the aerial stocking of 5,000 fingerling Lahontan cutthroat trout in Meadow Lake.

Lower Rock Lake

From Technical Memorandum 8-2a (Note – information for Middle Lindsey, Culbertson, and Upper and Lower Rock Lakes were combined in Technical Memorandum 8-2a):

> "The peak season recreation-use estimate for these hike-in access reservoirs was between 175 and 1,526 RDs… Most visitors participated in camping, hiking, and fishing activities…Anglers spent roughly three hours fishing per day, generally for brown trout, and from the shoreline…[most anglers] rated their fishing experience as ranging from average to very good."

The annual management target of Kamloops rainbow trout aerially stocked in Lower Rock Lake is approximately 2,000 fingerlings. The 2000 through 2011 average stocking of Kamloops rainbow trout in Lower Rock Lake was approximately 2,000 fingerlings. Therefore Licensee shall fund the aerial stocking of 2,000 fingerling Kamloops rainbow trout in Lower Rock Lake.

Upper Rock Lake

From Technical Memorandum 8-2a (Note – information for Middle Lindsey, Culbertson, and Upper and Lower Rock Lakes were combined in Technical Memorandum 8-2a):

> "The peak season recreation-use estimate for these hike-in access reservoirs was between 175 and 1,526 RDs… Most visitors participated in camping, hiking, and fishing activities…Anglers spent roughly three hours fishing per day, generally for brown trout, and from the shoreline…[most anglers] rated their fishing experience as ranging from average to very good."

The annual management target of Kamloops rainbow trout aerially stocked in Upper Rock Lake is approximately 5,000 fingerlings. The 2000 through 2011 average stocking in Upper Rock Lake was approximately 4,500 fingerlings. Therefore Licensee shall fund the aerial stocking of 4,500 fingerling Kamloops rainbow trout in Lower Lindsey Lake.

White Rock Lake

From Technical Memorandum 8-2a:

> "The peak season recreation use estimate was between 442 and 1,875 RDs… Most visitors participated in camping, hiking, fishing, flat-water non-motorized boating, and swimming activities… Anglers [fished from] shoreline or boat…nearly 30 percent [of anglers] rated their fishing experience as average to very poor."

The fishing experience rating of average to very poor could be due to the fact that White Rock Lake is not currently stocked by CDFG. The 2000 through 2011 average aerial stocking of Kamloops rainbow trout in White Rock Lake was approximately 1,500 fingerlings. Therefore, Licensee shall be responsible for funding the aerial stocking of 1,500 Kamloops rainbow trout in White Rock Lake should CDFG decide it is in the best interest of the public and the natural resources to resume stocking.

Lake Sterling

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 470 and 1,250 RDs… Most visitors participated in hiking, camping, and fishing activities. …Anglers spent roughly three and a half hours fishing per day, generally from the shoreline...most anglers rated their fishing experience as average to good, overall."

Lake Sterling is not currently stocked. The 2000 through 2011 average aerial stocking of Kamloops rainbow trout in Sterling Lake was approximately 5,000 fingerlings. Therefore, Licensee shall be responsible for funding the aerial stocking of 5,000 Kamloops rainbow trout in Lake Sterling should CDFG decide it is in the best interest of the public and the natural resources to resume stocking.

Lake Spaulding

From Technical Memorandum 8-2a:

> "The peak season recreation-use estimate was between 13,614 and 17,107 RDs… Most visitors participated in camping, hiking, fishing, and flat-water motorized and non-motorized activities… Anglers spent roughly five hours fishing, per day, generally from a boat…most rated their fishing experience from very poor to good, overall."

CDFG gages reservoir fishing success by examining the catch-per-unit-effort (CPUE). This is typically expressed in number of fish caught per hour fished. CDFG seeks to attain CPUEs of 1.0 fish per hour or greater. A reservoir fishery is classified as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour. In 2011, CDFG surveyed 125 anglers at Spaulding Reservoir; the CPUE was 0.1 fish per hour, which would classify fishing in this reservoir as poor to fair.

Historically, Spaulding Reservoir has been stocked by CDFG with catchable rainbow trout. CDFG does not currently stock trout in Spaulding Reservoir, but given the results of both Technical Memorandum 8-2a and the CDFG 2011 angler surveys, we are recommending that stocking of catchable rainbow trout be resumed. We recommend that Spaulding Reservoir be stocked with up to 7,000 pounds of catchable rainbow trout or 20,000 fingerlings, at CDFG's discretion. CDFG does currently stock Spaulding Reservoir with Chinook salmon. The annual management target of Chinook salmon stocked in Lake Spaulding is approximately 25,000 fingerlings. The 2000 through 2011 average stocking of Chinook salmon in Lake Spaulding was approximately 25,000 fingerlings. Therefore Licensee shall fund the stocking of 25,000 fingerling Chinook salmon and up to 7,000 pounds of catchable rainbow trout or 20,000 fingerlings in Lake Spaulding.

Yuba-Bear Hydroelectric Project

The stocking requirements for Yuba-Bear Project reservoirs are as follows:

Bowman Lake

From Technical Memorandum 8-2b:

> "Bowman Lake had an estimated use level of between 5,647 and 7,337 RDs annually… The primary activities were camping, hiking/walking, fishing, swimming, and flat-water nonmotorized boating…Anglers comprised approximately half of the visitors at Bowman Lake [and] and rated their fishing experience as good, overall. Most anglers fished from the shore and some by boat."

The average annual management target of rainbow trout stocked in Bowman Lake is approximately 20,000 fingerlings. The 2000 through 2011 average stocking of rainbow trout in Bowman Reservoir was approximately 20,000 fingerlings. The average annual management target of kokanee salmon stocked in Bowman Lake is approximately 10,000 fingerlings. The 2000 through 2011 average stocking of kokanee salmon in Bowman Reservoir was approximately 20,000 fingerlings. Therefore Licensee shall fund the stocking of 30,000 fingerling fish in Bowman Lake.

Faucherie Lake

From Technical Memorandum 8-2b:

> "Estimated recreation use was between 4,366 and 5,100 RDs annually… Primary activities were camping, hiking/walking, fishing, non-motorized flat-water boating, and wildlife viewing. Anglers comprised slightly more than half of the visitors…[anglers] rated their fishing experience as average. Most anglers used artificial lures and fished while wading."

The annual management target of brown trout aerially planted in Faucherie Reservoir is approximately 5,000 fingerlings. The 2000 through 2011 average stocking of Kamloops rainbow trout fingerlings in Faucherie Reservoir was approximately 4,500 fingerlings.
The 2000 through 2011 average stocking of catchable rainbow trout is 1,200 (the stocking of catchable rainbow trout is currently on hiatus). Therefore Licensee shall fund the stocking of 9,500 fingerling fish and 1,200 catchable rainbow trout in Faucherie Lake.

French Lake

From Technical Memorandum 8-2b:

> "Overall, recreation use was very low at French Lake, with an estimate of between 182 and 533 RDs annually, comprised mostly of overnight use…Primary activities generally consisted of fishing, hiking/walking, camping, and wildlife viewing. Anglers comprised more than half of the visitors at French Lake…Most anglers…rated their fishing experience as average, overall."

French Lake is not currently stocked by the Department. The 2000 through 2011 average aerial stocking of Kamloops rainbow trout in French Lake Reservoir was approximately 23,000 fingerlings. Therefore, Licensee shall be responsible for funding the stocking of 23,000 Kamloops rainbow trout in French Lake should CDFG decide it is in the best interest of the public and the natural resources to resume stocking.

Jackson Meadows Reservoir

From Technical Memorandum 8-2b:

> "[Recreation use was estimated] between 20,191 and 24,772 Recreation Days (RD) annually…Visitors to Jackson Meadows Reservoir generally engaged in camping, hiking/walking, fishing, swimming, off-highway vehicle (OHV) use, and flat-water non-motorized and motorized boating activities... Angling was a popular activity at Jackson Meadows Reservoir, with most anglers spending roughly four hours per day fishing, generally from the shoreline. Rainbow trout was the most common fish species caught and kept. Nearly 75 percent of anglers rated their fishing experience as average to good overall."

CDFG gages reservoir fishing success by examining the catch-per-unit-effort (CPUE). This is typically expressed in number of fish caught per hour fished. CDFG seeks to attain CPUEs of 1.0 fish per hour or greater. A reservoir fishery is classified as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour. In 2008, CDFG surveyed 125 anglers at Jackson Meadows Reservoir; the CPUE was 0.6 fish per hour, which would classify fishing in this reservoir as fair to good. This concurs with Licensee visitor surveys.

The annual management target of rainbow trout stocked in Jackson Meadows Reservoir is approximately 50,000 fingerlings. The 2000 through 2011 average stocking of fingerling rainbow trout in Jackson Meadows Reservoir was approximately 50,000 fingerlings. The annual management target of catchable rainbow trout stocked in Jackson Meadows Reservoir is approximately 7,000 lbs. The 2000 through 2011 average stocking of catchable rainbow trout in Jackson Meadows Reservoir was approximately 9,000 lbs. The annual management target of brown trout stocked in Jackson Meadows Reservoir is approximately 10,000 fingerlings. The 2000 through 2011 average stocking of fingerling brown trout in Jackson Meadows Reservoir was approximately 11,000 fingerlings. Therefore, Licensee shall fund the stocking of 60,000 fingerling fish, and 7,000 lbs of catchable rainbow trout in Jackson Meadows Reservoir.

Sawmill Lake

From Technical Memorandum 8-2b:

> "Recreation use was estimated between 2,529 and 5,410 RDs annually... Primary activities at Sawmill Lake were hiking/walking, fishing, and flat-water non-motorized boating. Anglers comprised nearly one-third of visitors at Sawmill Lake…[anglers rated] their fishing experience as very good to good, overall."

The annual management target of Kamloops rainbow trout aerially planted in Sawmill Lake is approximately 5,000 fingerlings. The 2000 through 2011 average aerial planting of fingerling Kamloops rainbow trout in Sawmill Lake was approximately 5,000 fingerlings. Therefore Licensee shall fund the stocking of 5,000 aerially planted Kamloops rainbow trout in Sawmill Lake.

Rollins Reservoir

From Technical Memorandum 8-2b:

> "Rollins Reservoir accounted for most of the recreation use on the Project. NID estimated use at 115,456 RDs annually… On average, anglers spent four hours fishing, used bait, and fished from the shoreline…Anglers rated their fishing experience as average, overall."

CDFG gages reservoir fishing success by examining the catch-per-unit-effort (CPUE). This is typically expressed in number of fish caught per hour fished. CDFG seeks to attain CPUEs of 1.0 fish per hour or greater. A reservoir fishery is classified as good to excellent if the CPUE is 1.0 fish per hour or greater, fair to good if the CPUE is 0.5 to 1.0 fish per hour, and poor to fair if the CPUE is 0.0 to 0.5 fish per hour. In 2009, CDFG surveyed 62 anglers at Rollins Reservoir; the CPUE was 0.19 fish per hour, which would classify fishing in this reservoir as poor to fair.

The annual management target of catchable rainbow trout stocked in Rollins Reservoir is approximately 5,000 lbs. The 2000 through 2011 average stocking of catchable rainbow trout in Rollins Reservoir was approximately 5,200 lbs. The 2000 through 2011 average stocking of kokanee fingerlings in Rollins Reservoir was approximately 31,000 fingerlings. The 2000 through 2011 average stocking of catchable brown trout in Rollins Reservoir was approximately 1,500 lbs. Therefore, Licensee shall fund the stocking of 6,500 lbs of catchable fish and 31,000 fingerling kokanee in Rollins Reservoir.

RATIONALE FOR RECREATION MEASURES – RESERVOIR LEVELS

The DSYB reservoirs receive recreational use throughout the summer and fall periods. This recreational use includes boating, fishing, swimming and other forms of water play or shoreline use.

Operations of the projects with the new minimum streamflows and the reservoir minimum pools should allow for continued recreational use of the Project reservoirs, and to maintain the aesthetic quality of the recreation experience, while still meeting other recreational needs, resource objectives, and hydropower generation. Factors considered in developing desired reservoir levels included: 1) maintaining the functionality of facilities and improvements serving recreation visitors, such as boat ramps, picnic areas, etc.; 2) maintenance of aesthetic qualities and public perceptions, and; 3) continuing to provide for the recreation activities visitors have come to enjoy, and meeting anticipated future uses and trends.

At a minimum, the goal would be that at least one constructed boat ramps at the reservoir should usable through Labor Day weekend in all water years except a critically dry year (unless specified differently at a specific boat launch.)

Jackson Meadows Reservoir

Jackson Meadows Reservoir provides a variety of recreation opportunities including fishing, boating (motorized and non-motorized), swimming and water play, and other shoreline recreation. The desired condition for management of Jackson Meadows Reservoir, from a recreation perspective, is to maintain the reservoir level as high as possible during the recreation season, to restrict encounters with physical hazards associated with stumps and other protrusions, to maintain reasonable access to the shoreline from developed recreation facilities and to allow for fishing access through September. The recreational use season at Jackson Meadows Reservoir typically extends from snowmelt (typically in early June) through November although use drops off after September. There are two boat ramps at Jackson Meadows reservoir. The minimum reservoir level at which at least one of the boat ramps is useable is 5,996.5 feet in elevation.

Lake Spaulding

Lake Spaulding provides a variety of recreation opportunities including fishing, boating (motorized and non-motorized), swimming and water play, and other shoreline recreation. The desired condition for management of this reservoir, from a recreation perspective, is to maintain the reservoir level as high as possible during the recreation season, and to maintain reasonable access to the shoreline from developed recreation facilities. The recreational use season at this typically extends from snowmelt (typically in April) through November although this reservoir gets year round use. Use tends to drop off sharply in August when the water level drops. The minimum reservoir level at which the boat ramp is useable is 4,942.6 feet in elevation.

Fuller Lake

The p*rimary use of Fuller Lake is fishing. The desired condition for management of this reservoir, from a recreation perspective, is to maintain the reservoir level as high as possible during the recreation season, and to maintain boat launch access. The recreational use season at this typically extends from snowmelt (typically in April) through November although this reservoir gets year round use. The minimum reservoir level at which the boat ramp is useable is 5,328.9 feet in elevation.

Lake Valley Reservoir

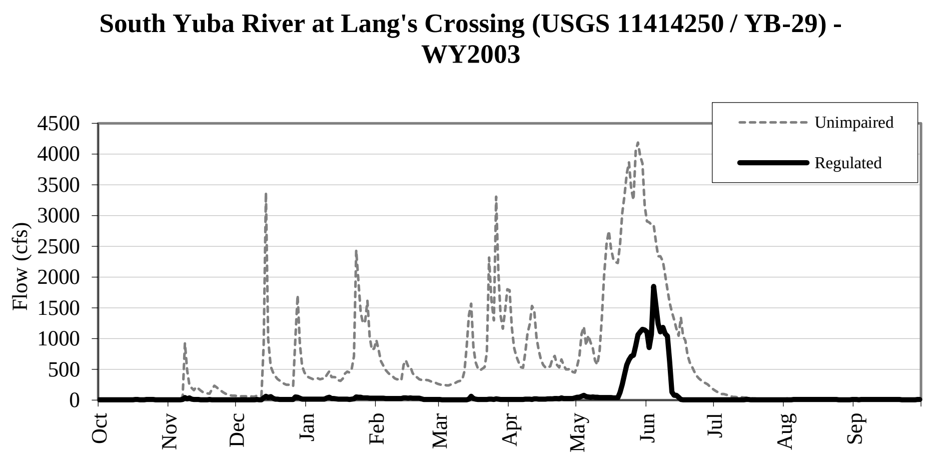
Lake Valley Reservoir provides a variety of recreation opportunities including fishing, swimming, and boating and other shoreline recreation. The desired condition for management of this reservoir, from a recreation perspective, is to maintain the reservoir level as high as possible during the recreation season, and to maintain reasonable access to the shoreline from developed recreation facilities. Licensee plans to extend the boat ramp to meet the goal stated above.

RATIONALE FOR RECREATION MEASURES – RECREATIONAL STREAMFLOWS

South Yuba River Below Spaulding Reservoir Dam

The 40 miles of the South Fork Yuba River below Spaulding Reservoir contain some outstanding whitewater resources. Within this 40-mile reach are six different popular whitewater boating runs. These include: Yuba Gap, Golden Quartz, Washington to Edwards, Edwards to Purdons, Purdons to Highway 49, and Highway 49 to Bridgeport. These runs range in difficulty from the class V+ Yuba Gap run below Lang's Crossing, to the easier class III/IV runs on Washington to Edwards and Edwards to Purdons.

Current project operations have significantly impacted whitewater recreation opportunities on the South Yuba River. These impacts have been the most dramatic on the uppermost reach - Yuba Gap below Lang's Crossing. The Recreation Flow Study (TM 8-1) stated that the Yuba Gap reach below Lang's Crossing was found to be boatable between 250 and 420 cfs, with an optimal flow of 300 cfs. The following figure shows a typical example of how in years when Spaulding Dam spills, there have historically been limited whitewater opportunities on this particular reach. In this example, flows decreased from 619 cfs to 130 cfs in one day, missing the entire boatable flow range. The unregulated flow record shows that 6 days in the boatable flow range would have occurred during this same snowmelt recession period.



This license condition will improve whitewater recreation opportunities by providing 6 consecutive whitewater boating days in an above normal year, 4 consecutive days in an above normal water year and 2 consecutive days in a below normal year. While this condition specifically targets flows on the Yuba Gap reach, boating opportunities will be improved throughout the 40-mile reach between Spaulding dam and Englebright reservoir. The spill cessation measure for flows below 250 cfs will also improve boating opportunities in the downstream reaches by providing a more gradual and predictable flow recession.

Fordyce Creek

Fordyce Creek has been a popular whitewater boating run since the 1980s. This twelve mile run includes 10 miles on Fordyce Creek and a 2 mile paddle out on Spaulding Reservoir. This run is suitable for kayaks, inflatable kayaks and rafts, and is a favorite among skilled class V boaters. In addition to having high quality rapids and spectacular scenery, this run is also popular because it typically runs during the summer months. Fordyce Reservoir is used by Licensee to store water from snowmelt, which is then delivered later in the season to provide water for hydropower and consumptive uses downstream. This area also provides important recreational opportunities for OHV enthusiasts. The preferred flows for whitewater boating range from 500 cfs down to 250 cfs. These flows were based on the results of the recreation flow study (TM 8-1) and information gathered from American Whitewater. During relicensing meetings, OHV groups expressed that they had a preference for a range of flows to allow for crossing of Fordyce Creek at several locations along Fordyce the OHV trail. Creating a flow condition for this particular reach required finding a balance between the needs of Licensee in providing additional storage for the purpose of generating hydropower, providing higher flow conditions to meet the interest of whitewater recreation, and providing lower flow conditions to meet the interest of OHV enthusiasts. Additionally, the FS and other Resource Agencies preferred to have higher flow levels as early in the season as possible in order to be protective of the aquatic ecosystem.

The Fordyce Lake drawdown described in Condition No. 30 requires Licensee to release a high target flow starting at 475 CFS. This flow will gradually decrease as the head in the reservoir drops. Licensee will begin releases as soon as possible, provided that these releases will not cause additional spill at Spaulding Dam. By moving these high releases to as early as possible, flows will be lower earlier in the season, which will allow for the use of the Fordyce OHV Trail. This will also meet the resource goal of avoiding high late season flows. Having the drawdown flow schedule publicly noticed each year, will further improve the all recreationist ability to take advantage of the area impacted by flows from Fordyce Dam.

Canyon Creek Below Bowman Reservoir Dam

Canyon Creek is a major tributary to the South Yuba entering above the town of Washington. There are two separate sections on Canyon Creek below Bowman Dam. The uppermost section from Bowman Dam down to Artic Mine is very high gradient, ranging from 400 to 600 feet per mile. Based on the information gathered in the recreation flow study, the 6.7 miles of Canyon Creek downstream from Bowman to Artic Mine is extremely challenging whitewater and may not yet have been run successfully. Thus, no flow information was gathered for this reach and there were no flows specifically targeted to improve whitewater recreation.

The 3.2-mile section of Canyon Creek from Artic Mine to the confluence with the South Yuba is a relatively new run that has become very popular with whitewater paddlers. Thirty seven paddlers completed surveys for this particular reach, 36 of which were paddling hardshell kayaks and one was a canoeist. While not a particularly long, run this section of Canyon Creek is dropping an average of 230 feet per mile and has 14 named Class IV and V rapids. The optimal flow range is 250 - 400 cfs. To access the run, boaters either park at the Golden Quartz Forest Service day use park and walk up the road to the put-in, or some have made arrangements with local residents to unlock the gate so vehicles can get closer to the put-in.

The measure included in license Condition No. 30 will provide whitewater boating for five consecutive days at 275 cfs when flows are 275 cfs or greater at gage 11416500 (located downstream of the Bowman-Spaulding Diversion Dam) after April 1. This condition will improve whitewater recreation opportunities on Canyon Creek by making flows more predictable and less erratic. This, combined with improved public flow information, will allow whitewater paddlers to access Canyon Creek in the spring during spill events.

RATIONALE FOR RECREATION MEASURES – VISUAL RESOURCE MANAGEMENT PLAN

Summary of Measures (Yuba-Bear Hydroelectric Project)

NFS Lands

- Jackson Meadows reservoir dam. Paint white concrete guard rail (Re: Tech Memo 10.1 JK-6 and JK-11) dark grey to match surroundings.
- Jackson Meadows Spoil Pile (Re: Tech Memo 10.1 Photo JK-10). Remove and regrade to flat area.
- Milton Diversion Dam Storage Gage Building (Re: Tech Memo 10.1 Photo MI-5). Paint the building dark green to match surroundings,

BLM Lands

- Dutch Flat No. 2 Forebay Dam Area (Re: Tech. Memo 10.1 Photo D-17A). Paint the light colored building a dark green to match surroundings.
- Dutch Flat Afterbay Dam (Re: Tech. Memo 10.1 Photo D-13D). Paint the trash rack and associated facilities to match the existing green facilities.

Recommendations on Licensee Lands

- Faucherie Storage Gage Building (YB 307, Re: Tech. Memo 10.1 Photo FA-3 and FA-5) : Paint building and flow gage box to blend with surrounding landscape.
- Bowman Lake/Milton Bowman Tunnel outlet Flow Gage Building (YB 303, Re: Tech. Memo 10.1 Photo BO-2). Stain concrete block building to better blend with surroundings.
- Bowman Spaulding Conduit trash rack and associated fence at Fuller Lake (Re: Tech. Memo 10-1 Photo FU-2a and FU-1b). Replace fence with color that better blends with surroundings.

Summary of Measures (Drum-Spaulding Hydroelectric Project)

NFS Lands

- Lower Peak Lake. Paint bridge over spillway (Re: Tech Memo 10.1 Photo AC-6) dark green to match surroundings.

- Upper Peak Lake. Paint bridge (Re: Tech Memo 10.1 Photo C-2A) dark green to match surroundings.
- Lake Spaulding Flow Gage YB-29 (Re: Tech Memo 10.1 Photo SY-5). Paint the building and grey railing dark green to match surroundings,
- Lower Lindsey Lake Spillway Bridge. Paint bridge (Re: Tech Memo 10.1 Photo LL-3) over the spillway dark green to match surroundings.

BOR Lands

Newcastle Powerhouse Metal Storage Building. Paint metal building (Re: Tech Memo 10.1 Photo A-16 and 17) the same color as the powerhouse or a uniform brown color.

Recommendations on Licensee Lands

- Upper Rock Lake. (Re: Tech Memo 10.1 Photo RU-1A). Paint the gage structure dark green to match surroundings,
- Middle Lindsey Lake. (Re: Tech Memo 10.1 Photo LM-2). Paint the white storage gage dark green to match surroundings,
- Rucker Lake Storage Gage Building YB-10. (Re: Tech Memo 10.1 Photo R-5). Paint the white storage gage building dark green to match surroundings,
- Fuller Lake Bridge over Spillway (Re: Tech Memo 10.1 Photo FU-1B, 2B and 4). Paint the bridge over the spillway dark green to match surroundings,
- Lake Spaulding Penstock to Powerhouse #3 (Re: Tech Memo 10.1 Photo SP-5, SP-8A and 8B). Paint the silver penstock dark green to match surrounding vegetation and educe strong visual contrast,
- Meadow Lake Dam Handrails (Re: Tech Memo 10.1 Photo M-3). Paint the yellow handrail dark green to match surroundings,
- Fordyce Lake Storage Gage Building (Re: Tech Memo 10.1 Photo FO-30). Paint the garage roof structure and walls dark green to match.
- Fordyce Lake Garage (Re: Tech Memo 10.1 Photo FO-37). Paint the storage gage roof structure dark green to match surroundings and reduce strong visual contrast.
- Drum Penstocks #2 and #3 (Re: Tech Memo 10.1 Photo DP-4 and D20A). Paint the penstocks dark green to match conifer forest surroundings,
- Dutch Flat Penstock #1 to Powerhouse #1 (Re: Tech Memo 10.1 Photo D-19A, D-21A and D14). Paint the penstock dark green to match conifer forest surroundings,

Rationale

The Tahoe National Forest Land and Resource Management Plans and BLM's Visual Resource Management Objectives set in the SRMP define visual quality objectives for public lands in the Project areas. Some Project facilities and operations are visible on the landscape and contrast with the surrounding forested setting. Project roads, ampgrounds, and facilities are obvious to the casual observer. Generally speaking, the visual resource measures (painting, or staining with a darker, more natural color) would reduce color contrast, and allow the project facilities or features to better blend into the forested surroundings and therefore move toward the desired

Visual Quality. High quality, naturally appearing scenery is an important resource to outdoor recreationists, "In the study on Public Opinions and Attitudes on Outdoor Recreation in California 2007, 98 percent of the respondents indicated that viewing the scenic beauty is an important part of the enjoyment of their most favorite activities" (CORP 2008). Conditions and recommendations in this section are intended to decrease conflicts with visual management objectives of the National Forests, yet allow continued operation of the Project.

RATIONALE FOR PRELIMINARY CONDITIONS AND RECOMMENDATIONS – CULTURAL RESOURCES

Existing Conditions

There are current and past cultural resource management resulting from Project-related operations and activities that directly and indirectly affect cultural resource sites within the project's Area of Potential Effect (APE).

Desired Conditions

The desired condition within the APE is to mitigate impacts to eligible historic properties pursuant to the National Historic Preservation Act of 1966, as amended.

Objectives Addressed by Cultural Resource Measures

Cultural Resource Objectives

Information Used to Establish Cultural Resource Measures

- Technical Memorandum 12-01a Historic Properties—Drum Spaulding Project
- Technical Memorandum 12-01c Historic Properties—Yuba-Bear Project
- Technical Memorandum 13-01a Native American Traditional Cultural Properties—Drum Spaulding
- Technical Memorandum 13-01c Native American Traditional Cultural Properties—Yuba Bear

Rationale for Cultural Resource Measures

The licensing of the Project is a federal undertaking requiring compliance with Section 106 of the National Historic Preservation Act, which requires any Federal undertaking to consider historic properties and afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking before issuance of the license (16 U.S.C.). Sections 32 and 33 will fulfill these Federal obligations.

RATIONALE FOR PRELIMINARY CONDITIONS AND RECOMMENDATIONS – TRANSPORTATION MANAGEMENT

Existing Conditions

Licensee uses NFS Roads (NFSR) and Trails (NFST) for the general access to the operation and maintenance of project facilities and the public uses these roads for access to the recreation opportunities provided by the facilities. In addition to the Project Roads, they provide the sole road access to Licensee's facilities. Licensee uses all of these routes throughout the year for the operation and maintenance of their facilities. These are all NFS Roads under the jurisdiction of the Tahoe National Forest.

FS does not maintain winter access to any destinations or to other permitted activities over the general access roads nor does FS routinely remove snow. Licensee's requires year around access to portions of the project over roads and removes snow to achieve that access. They annually remove snow on roads to gain early season access to the remainder of their facilities for planned outages, repairs and modifications. Snow removal activities and wet weather use increases costs and effort associated with user generated, recurring, and deferred maintenance as well as increases surface replacement costs.

Desired Conditions

The desired condition of project roads and trails is the operation and maintenance of those facilities consistent with the Tahoe National Forest Land and Resource Management Plan as well as FS standards in an economical and efficient manner that provides necessary access to the project while minimizing negative environmental effects throughout the life of the license. That desired condition includes the appropriate service level of public access to project related recreation facilities and opportunities.

The desired condition for the NFS Roads used to access project facilities is for an agreement authorizing Licensee's use of those roads and Licensee's commensurate share of road maintenance and repairs.

Objectives Addressed by Transportation Management Measures

Transportation and Facilities Management

Information Used to Establish Transportation Management Measures

- Tahoe National Forest Land and Resource Management Plan
- Various agency directives

Rationale for Transportation Management Measures

Implementing the Roads and Transportation Management Conditions would achieve standards, goals, objectives, and direction for the Tahoe National Forest as provided for in its Land and Resource Management Plan (LRMP), the Sierra Nevada Forest Plan Amendment (Final, 2001 and Final Supplemental, 2004), Motorized Travel Management EIS and ROD (Final, 2010) as well as direction from the Code of Federal Regulations, Forest Service Manuals, Handbooks and Best Management Practices. These aspects include providing recreation access, protection of water resources, wetlands, soils, wildlife, and cultural resources. Additional reference material included Docket No. PL06-5-000 Policy Statements on Hydropower Licensing Settlements.

Pursuant to 36 CFR 212.7 (d), Licensee, as a principal user of NFS roads is required to share in the maintenance of the road system, commensurate with their use. Project facilities must be inventoried and maintained. Specific transportation needs were identified that are directly related to the Project or visitation and public use that is a result of the Project facilities and Project operations.

Applicable Standards and Guidelines from the Sierra Nevada Forest Plan Amendment (2004) include:

- Prohibit wheeled vehicle travel off of designated routes, trails and limited OHV use areas (SEIS pg 367).
- To provide protection for watershed resources, the following standards should be met for new road construction, reconstruction, and relocation: (1) design new stream crossings and replacement stream crossings for at least the 100 year flood, including bedload and debris; (2) design stream crossings to minimize the diversion of stream flow out of the channel and down the road in the event of crossing failure; (3) design stream crossings to minimize disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface water; (4) avoid wetlands or minimize effects to natural flow patterns in wetlands; and (5) avoid road construction in meadows (SEIS pg 349).
- During relicensing of Federal Energy Regulatory Commission (FERC) hydroelectric projects, evaluate modifications by the project to the natural hydrograph. Determine and recommend in stream flow requirements and habitat conditions that maintain, enhance, or restore all life stages of native aquatic species, and that maintain or restore riparian resources, channel integrity, and fish passage. Provide written and timely license conditions to FERC. Coordinate relicensing projects with the appropriate State and Federal agencies (SEIS 2004, Page 344).
- Streamflow Patterns and Sediment Regimes: Maintain and restore in-stream flows sufficient to sustain desired conditions of riparian, aquatic, wetland and meadow habitats and keep sediment regimes as close as possible to those with which aquatic and riparian biota evolved. (SNFPA EIS, 2001, Chapter 2, Page 41, Aquatic Management Strategy Goal #8, as incorporated into the 2004 FSEIS by reference on Page 10 of the 2004 SNFPA FSEIS ROD.).
- Stream Banks and Shorelines: Maintain and restore the physical structure and condition of stream banks and shorelines to minimize erosion and sustain desired habitat diversity. (SNFPA EIS, 2001, Chapter 2, Page 41, Aquatic Management Strategy Goal #9, as incorporated into the 2004 FSEIS by reference on Page 10 of the 2004 SNFPA FSEIS ROD.).

Forest Service Road Maintenance Level Descriptions

Maintenance levels 1-5 (operational and objective) are described in the following paragraphs. Roads assigned to maintenance levels 2-5 are either constant service roads or intermittent service roads during the time they are open to traffic.

Maintenance Level 1

Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate." Roads receiving Level 1 maintenance may be of any type, class, or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

Maintenance Level 2

Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles.

Maintenance Level 3

Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Maintenance Level 4

Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Maintenance Level 5

Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage."

Forest Service Traffic Levels:

	A	B	C	D
Flow	Free flowing with adequate parking facilities.	Congested during heavy traffic such as during peak logging or recreation activities	Interrupted by limited passing facilities, or slowed by the road condition.	Flow is slow or may be blocked by an activity. Two-way traffic is difficult and may require backing to pass.
Volumes	Uncontrolled; will accommodate the expected traffic volumes	Occasionally controlled during heavy use periods	Erratic; frequently controlled as the capacity is reached.	Intermittent and usually controlled. Volume is limited to that associated with the single purpose.
Vehicle Types	Mixed; includes the critical vehicle and all vehicles normally found on public roads.	Mixed; includes the critical vehicle and all vehicles normally found on public roads.	Controlled mix; accommodates all vehicle types including the critical vehicle. Some use may be controlled to vehicle type.	Single use; not designed for mixed traffic. Some vehicles may not be able to negotiate. Concurrent use traffic is restricted.
Critical Vehicle	Clearances are adequate to allow free travel. Overload permits are required.	Traffic controls needed where clearances are marginal. Overload permits are required.	Special provisions may be needed. Some vehicles will have difficulty negotiating some segments.	Some vehicles may not be able to negotiate. Loads may have to be off-loaded and walked in.
Safety	Safety features are a part of the design.	High priority in design. Some protection is accomplished by traffic management.	Most protection is provided by management.	The need for protection is minimized by low speeds and strict traffic controls.
Traffic Manage-ment	Normally limited to regulatory, warning, and guide signs and permits.	Employed to reduce traffic volume and conflicts.	Traffic controls are frequently needed during periods of high use by the dominant resource activity.	Used to discourage or prohibit traffic other than that associated with the single purpose.
User Costs	Minimize, transportation efficiency is important.	Generally higher than "A" because of slower speeds and increased delays	Not important; efficiency of travel may be traded for lower construction costs.	Not considered.
Align-ment	Design speed is the predominant factor within feasible topographic limitations.	Influenced more strongly by topography than by speed and efficiency.	Generally dictated by topographic features and environmental factors. Design speeds are generally low.	Dictated by topography, environmental factors, and the design and critical vehicle limitations. Speed is not important.
Road Surface	Stable and smooth with little or no dust, considering the normal season of use.	Stable for the predominant traffic for the normal use season. Periodic dust control for heavy use or environmental reasons. Smoothness is commensurate with the design speed.	Many not be stable under all traffic or weather conditions during the normal use season. Surface rutting, roughness, and dust may be present, but controlled for environmental or investment reasons.	Rough and irregular. Travel with low-clearance vehicles is difficult. Stable during dry conditions. Rutting and dusting controlled only for soil and water protection.

Drum-Spaulding Project

Road and Transportation Facility Management Plan

Through development of a Road and Transportation Facility Management Plan and a commensurate use Road Maintenance Agreement as required by the license condition, Road and Transportation Facility Management, roads that are on or that affect NFS Lands that are used to access the project will meet current Forest Service and Federal direction. It will allow for roads to meet or exceed Forest Service standards, provide for long-term monitoring, specific maintenance practices, and the protection of sensitive resources, wildlife and aquatic species, as well as the prevention of the spread of noxious weeds. It will allow for erosion control mitigations and all other aspects associated with proper road maintenance and will deliver public user safety and comfort, on top of the protection of the adjacent resources for the next license term.

Project Recreation Facility Roads

The critical data for roads needed to assess their condition in a technical way for resource protection was never properly addressed on the roads needed for Project recreational purposes within the Project Boundary. These Project Recreation Facility Roads include Project recreation access roads, Project campground loops and spurs, Project parking areas etc., information. The only information assessed on some of these roads can be found in the "Licensee's Recreation Use and Visitor Survey Technical Memorandum," which was a survey of the visiting, recreating public's opinion on the condition of the roads.

While researching FERC policy statements, it became clear that a road that is needed for Project operations or recreational purposes, in particular a road that is the only access to a project recreation facility (as is the case with the roads below) should be a project road as defined in Docket No. PL06-5-000 Policy Statements on Hydropower Licensing Settlements, Section 35 Roads, page 15 which states…

> "First, in order to decide whether a license should include a requirement that road activities be funded, the Commission must determine that the road is necessary for project purposes, as with a road that is needed in order to reach a powerhouse or a road that is the only way to reach a project recreation site."

Licensee does plan on replacing the Project Recreation Facility Roads paved surfaces as needed for those roads that are within the Project Boundary as stated in their Recreation Plan, however the criteria in the Transportation Facility Management Plan is applicable and should apply to all roads within the Project Boundary that are on or that affect NFS lands, in order to protect; health and safety, sensitive resources, wildlife and aquatic species, the prevention of the spread of noxious weeds, erosion control mitigations and all other aspects associated with proper road maintenance. For these reasons it is imperative that Project Recreation Roads are addressed in the Transportation Facility Management Plan the same way in which "Primary Project Roads" are regardless of whether or not they are they are for project recreational purposes.

Road Maintenance Agreement (Roads for General Access)

<u>Implementing the Road Maintenance Agreement will meet Federal and Forest Service direction that is pursuant to 36 CFR 212.7 (d)</u>

> “, Licensee, as a principal user of NFS roads is required to share in the maintenance of the road system, commensurate with their use. Project facilities must be inventoried and maintained. Specific transportation needs were identified that are directly related to the Project or visitation and public use that is a result of the Project facilities and Project operations. “

Licensee and FS have a commensurate share Road Maintenance Agreement in place outside of the License that was recently updated. However, it has come to the attention of FS that the shares in this agreement were based upon Project access for Licensee maintenance of power producing facilities only and did not include the Project recreation component. As the new License takes effect, FS is hopeful that this agreement will be updated to reflect shares that are proportionate to the actual use of the roads to access the Project for both Project maintenance and Project recreation.

In order to update this agreement in a fair and balanced way, it is imperative to have traffic data on Project Affected and General Access. The vast complexities of the road network accessing the Project coupled with the checkerboard ownership patterns across the Tahoe National Forest makes it extremely difficult to determine each party’s appropriate shares without a traffic use study. These complexities clearly support the need for this data.

Project Access Across Private Lands

18 CFR Chapter 1 2.7 (a) states that the Commission expects Licensee to acquire in fee and include within the project boundary enough land to assure optimum development of the recreational resource afforded by the project. However, without legal access to these recreation sites on NFS lands the public cannot travel there under the requirements for Motorized Travel Management. It is imperative that Licensee acquire public access easements across PG&E and other private property, filed with the County of record, that meets the requirements for Motorized Travel Management, such that it could be shown on the Forest’s Motorized Vehicle Use Map (MVUM), for all Project, recreation access and recreation roads leading to and from all Project Facilities open for public use.

<u>Yuba-Bear Project</u>

Road and Transportation Facility Management Plan

Through development of a Road and Transportation Facility Management Plan and a commensurate use Road Maintenance Agreement as required by the license condition, roads that are on or that affect NFS Lands that are used to access the project will meet current Forest Service and Federal direction. It will allow for roads to meet or exceed Forest Service standards, provide for long-term monitoring, specific maintenance practices, and the protection of sensitive resources, wildlife and aquatic species, as well as the prevention of the spread of noxious weeds.

It will allow for erosion control mitigations and all other aspects associated with proper road maintenance and will deliver public user safety and comfort, on top of the protection of the adjacent resources for the next license term.

General Information about the Roads within the Project Area

The term "Primary Project Road" which is a road needed only to access Licensee power-producing or dam facilities strictly for the purpose of power production was used in studying and defining project roads for the License. When Licensee offered their study plans, FS originally agreed with this definition with the understanding that the roads used to access and within recreation facilities would be covered under the recreation plan as stated in a footnote in Technical Memorandum 9-1 Roads and Trails[1] July 2010"

> "3. Primary Project Roads and Trials do not include roads and trails within the Project Boundary that are considered part of the recreation facility. These roads and trails are addressed in Licensee's Recreation Use and Visitor Survey technical memoranda".

Upon further review of the transportation system required to access all Project facilities, including those routes needed for Project Recreation, FS discovered some issues which are described below.

Project-Affected Roads

While researching FERC policy statements, it became clear that a road that is needed for Project operations <u>or</u> recreational purposes, in particular a road that is the only access to a project recreation facility (as is the case with the roads below) should be a project road as defined in Docket No. PL06-5-000 Policy Statements on Hydropower Licensing Settlements, Section 35 Roads, page 15 which states…

> "First, in order to decide whether a license should include a requirement that road activities be funded, the Commission must determine that the road is necessary for project purposes, as with a road that is needed in order to reach a powerhouse or a road that is the only way to reach a project recreation site."

However, the routes listed below and included in the preliminary Section 4(e) conditions were not included. Some were not included as they are Project recreation access roads and currently not in the Project Boundary, others access critical Project facilities such as dams, canals, tunnels or weirs and were somehow overlooked, and another segment of road, already within the Project Boundary, because it is a county road. No data about road conditions were ever collected or studied for these specific roads listed below.

FS would request the Commission determine if the following should be included as Project roads given the above general information, the specific information below and the enclosed maps. If not then FS will include the NFS Roads as Part of a specific roads agreement <u>unless</u> FS and Licensee reach mutual signed agreement outside of relicensing, in which Licensee will assume responsibilities commensurate to their use for the road/segments on NFS roads listed below:

<u>Gaging Station Road (NFS Road #0301-050) Access to Project Gage</u>

This road is 1.17 miles in length. This road intersects no other roads, is the only access to and dead-ends at the Project facility gauge/weir needed for project operations.

<u>Macklin Creek Road (NFSR #0041-020-10) Access to Project Canal/Tunnel</u>

This is a road segment that is 0.36 miles in length. It is the only access to the opening of a large project tunnel to which Licensee needs access.

<u>East Meadow Campground Road (NFS Road #0070-080) Access to Project Campgrounds</u>

This is a 0.31 mile long road that provides the only access from Pass Creek Loop Road to the East Meadow Project Campgrounds. This road intersects no other roads and ends at the Project campgrounds. These campgrounds are very popular and well used throughout the season of operation.

<u>Faucherie Lake Road (NFS Road #0843-037) Access to Project Lakes, Campgrounds and other Project Facilities at Sawmill Lake, Faucherie Lake and Canyon Creek Campground</u>

This road is 3.47 miles in length and provides the only access to critical Project dams, facilities and campgrounds on Sawmill Lake, Faucherie Lake and Canyon Creek Project Campground. This road is in very poor condition and needs many improvements to bring it up to the Maintenance Level 3 road that FS envisions. This road does intersect a few dead end spurs that are not open to public travel.

<u>Graniteville Road (Nevada County Road 956)</u>

This is a 2.5 mile long segment of a county road that is currently within the Project Boundary and is the only way to access the Project Campgrounds, Boat Launch, Day-Use and other Project Facilities on the west side of Jackson Meadows Reservoir. This road goes directly over the Project dam and this section of road intersects no other roads. It has a gravel surface that is quickly wash-boarded in large part by Project induced recreation and maintenance traffic accessing the Facilities on the west side of Jackson Meadows.

FS requested that Licensee to work with Nevada County to get this section of road paved to provide for a smooth, dust free driving surface as is documented in the "Draft License Application Resource Agency Comments." All of the Project campgrounds and other facilities at Jackson Meadows are paved including those that are accessed on the west side by the Graniteville Road. Paving the county access road within the Project Boundary will allow for continuity within the Project Boundary and a better experience for the recreational user.

Project Recreation Roads

The critical data for roads needed to assess their condition in a technical way for resource protection was never properly addressed on the roads needed for Project recreational purposes within the Project Boundary. These Project Recreation Facility Roads include Project recreation access roads, Project campground loops and spurs, Project parking areas etc., information. The only information assessed on some of these roads can be found in Licensee*'s Recreation Use and Visitor Survey technical memorandum* which was a survey of the visiting, recreating public's opinion on the condition of the roads.

While researching FERC policy statements, it became clear that a road that is needed for Project operations or recreational purposes, in particular a road that is the only access to a project recreation facility (as is the case with the roads below) should be a project road as defined in Docket No. PL06-5-000 Policy Statements on Hydropower Licensing Settlements, Section 35 Roads, page 15 which states…

> "First, in order to decide whether a license should include a requirement that road activities be funded, the Commission must determine that the road is necessary for project purposes, as with a road that is needed in order to reach a powerhouse or a road that is the only way to reach a project recreation site."

Licensee does plan on replacing the Project Recreation Facility Roads paved surfaces as needed for those roads that are within the Project Boundary as stated in their Recreation Plan, however the criteria in the Transportation Facility Management Plan is applicable and should apply to all roads within the Project Boundary that are on or that affect NFS lands, in order to protect; health and safety, sensitive resources, wildlife and aquatic species, the prevention of the spread of noxious weeds, erosion control mitigations and all other aspects associated with proper road maintenance. For these reasons it is imperative that Project Recreation Roads are addressed in the Transportation Facility Management Plan the same way in which "Primary Project Roads" are regardless of whether or not they are they are for project recreational purposes.

Road Maintenance Agreement (Project Affected Roads for General Access)

The following are Project-Affected general access roads that Licensee has not entered into a commensurate share Road Maintenance Agreement with FS and other affected parties as specified in the preliminary Section 4(e) conditions. Road Maintenance Agreement and as consistent with National Forest direction that requires Licensee to share in costs or maintenance of roads proportionate with their use.

Table XX Project-Affected General Access Roads

Forest Service Road ID Number	Road Name	Maintenance Level	Ownership	Total Length (mi)
0007	Fibreboard Rd	5	Forest Service	15.0
0018	Bowman Lake Rd	5,4,3	Forest Service	14.5
0018-012	Camp 19 Rd	2	Forest Service	0.5
0018-014	Clear Creek Rd	2	Forest Service	0.7
0018-018	BS Ditch Rd	2	Forest Service	1.0
0018-021	Flume Rd	2	Forest Service	0.8
0085	Rattlesnake Rd	2	Forest Service	4.3

0085-002	Lake Sterling Rd	2	Forest Service	0.7
0085-002-01	Fordyce Spur Rd	2	Forest Service	0.2
0085-002-01-01	Red Mountain Rd	2	Forest Service	1.9
0070	Pass Creek Loop Rd	3	Forest Service	0.2

Currently FS has a Road Use Permit in place with Licensee that requires them to pay nothing for the use of NFS roads. This permit expires on December 31, 2012 and will not be reissued. FS hopes to come to agreement with Licensee outside of the License to address their commensurate share of NFS roads. However, the lack of participation on the roads topic by Licensee, the vast complexities of the road network accessing the Project coupled with the checkerboard ownership patterns across the Tahoe National Forest makes it extremely difficult to determine each party's appropriate shares, particularly without a traffic use study. These complexities clearly support the need for this traffic use data on Project Affected and General Access Roads as specified in the preliminary Section 4(e) conditions.

If FS, other affected parties and Licensee cannot reach mutual, signed agreement outside of relicensing, under which Licensee will assume appropriate responsibilities for the roads and segments listed above then all NFS roads will be incorporated into Licensee Road Memorandum of Understanding described in the preliminary Section 4(e) conditions to ensure compliance with Federal and Forest Service direction that is pursuant to 36 CFR 212.7 (d)

> ", Licensee, as a principal user of NFS roads is required to share in the maintenance of the road system, commensurate with their use. Project facilities must be inventoried and maintained. Specific transportation needs were identified that are directly related to the Project or visitation and public use that is a result of the Project facilities and Project operations. "

Project Access across Private Lands

18 CFR Chapter 1 2.7 (a) states that the Commission expects Licensee to acquire in fee and include within the project boundary enough land to assure optimum development of the recreational resource afforded by the project. However, without legal access to these recreation sites on NFS lands the public cannot travel there under the requirements for Motorized Travel Management. It is imperative that Licensee acquire public access easements across PG&E and other private property, filed with the County of record, that meets the requirements for Motorized Travel Management, such that it could be shown on the Forest's Motorized Vehicle Use Map (MVUM), for all Project, recreation access and recreation roads leading to and from all Project Facilities open for public use.

RATIONALE FOR PRELIMINARY CONDITIONS AND RECOMMENDATIONS – LAND MANAGEMENT

Existing Conditions

- Continued emphasis on hydroelectric generation can be expected.
- Licensee studies show that recreational use of the Project is increasing and is projected to continue to increase.
- Fire risk near Project reservoirs and dispersed areas is increasing.

Desired Conditions

- Promote fire prevention commensurate with resource values at risk.
- Treat natural fuels in the following order of priority: (1) public safety, (2) high-investment situations (structural improvements, powerlines, etc.), (3) known high fire occurrence areas, and (4) coordinated resource benefits, i.e., ecosystem maintenance for natural fire regimes.
- Manage, construct, and maintain buildings and administrative sites to meet applicable codes and to provide necessary facilities to support resource management.
- Inspect dams and bridges at prescribed intervals and provide maintenance necessary to keep them safe.
- Provide for continued use of hydroelectric facilities.
- Consider volcanic, seismic, flood, and slope stability hazards in the location and design of administrative and recreation facilities.

Objectives Addressed by Land Management Measures

The objectives addressed are to outline the responsibility of Licensee and its contractor(s) for fire prevention and suppression activieis, set up reporting and attach procedures in the event of a fire in the vicinity of the project, and ensure that fire prevention and suppression techniques are carried out in accordance with Federal, State, and local laws and regulations and to provide consistency with other plans.

Information Used to Establish Land Management Measures

- California Public Resource Code (PRC)
- FS manual direction, which includes a determination of potential probability of fire occurrence during any given weather scenario (currently referred to as Project Activity Level, PAL). PAL institutes a series of prevention techniques as well as restrictions for some activities during the driest conditions and applies to all operations and maintenance activies including those conducted by FS contractors, permittees, and personnel as well as Licensee for operation and maintenance of power generation facilities. Additionally, upon the determination of the Forest Supervisor, the FS can implement fire restrictions that limit many activities, usually excluding activities within developed recreation sites. Fire restrictions could limit Licensee's O&M activities at project facilities; it is necessary to establish procedures so that Licensee is informed.
- Tahoe National Forest Land and Resource Management Plan (USDA 1990)
- Sierra Management Framework Plan Amendment (USDA 2004)

Rationale for Land Management Measures - Fire Management and Response Plan

The Fire Management and Response Plans outline a series of procedures that protects resources and facilities, and provides for public (as well as Licensee personnel) safety through prevention of fires, and if needed, response to a fire. These procedures range from education about, and implementation of, PAL and fire restrictions; emergency contact information in the event of a fire in the vicinity of project facilities including recreation facilities, and outlines suppression efforts in the event of a Licensee Project caused fire as well as a fire in the vicinity of a project facility. It is important to note that contacting emergency services (e.g. 911) and taking action only within the limits of training and personal skill/knowledge in fire fighting, is extremely important. It is expected that periodic updates to the plan will be necessary.

Rationale for Land Management Measures - Erosion and Sediment Control and Management Plan

The Tahoe National Forest Land and Resource Management Plan (USDA 1990) and BLM Sierra contain various requirements addressing erosion control and water quality. In particular, applicable riparian conservation objectives described on pp. 62 through 66 in the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision (USDA 2004) apply.

Rationale for Land Management Measures - Review of Improvements on NFS land

All improvements on NFS land must be authorized by some instrument: special use permit, license, agreement, or authorized as a pre-forest use (authorized prior to the land becoming NFS). Anything not authorized is considered a trespass. Assuring that all improvements are authorized will protect the USA from liability associated with Licensee's improvements and assure the licencee the legal right to occupy the land.

RATIONALE FOR ADMINISTRATIVE FS AND BLM CONDITIONS

Objectives Addressed by Other FS and BLM Conditions

Consistency with Plans

Information Used for to Establish Other FS and BLM Conditions

The following information was used to establish these conditions:

- Tahoe National Forest Land and Resource Management Plan (USDA 1990)
- BLM Sierra Resource Management Plan (USDI 2008)
- Sierra Management Framework Plan Amendment (USDA 2004)
- Forest Service manuals
- BLM manuals
- Various laws and regulations

Consultation, Approval of Changes

The Tahoe National Forest Land and Resource Management Plan and their amendments as well as the BLM Sierra Resource Management Plan contain numerous requirements that must be met before construction or if changes in Project implementation are proposed. In addition, new information may become available that demonstrates that revision of the Section 4(e) conditions is necessary to accomplish protection and use of NFS and BLM resources. The standard conditions address these items and ensure that the Project does and will continue to meet the requirements in the Tahoe National Forest Land and Resource Management Plan and BLM Sierra Resource Management Plan.

Please see the General Discussion at the end of the list of other conditions.

Access

The rationale for access and road use by the government is from FS Manual 7700 (7730.1 – Authority) – Transportation System, as follows:

Authority: Authorizes FS to require users of NFS roads to maintain roads commensurate with their use and to reconstruct roads when necessary to accommodate their use. If this maintenance or reconstruction cannot be provided or would not be practical, FS may require the users to deposit sufficient funds to cover the users' share of the maintenance or reconstruction.

Operation: FS may restrict use of administrative NFS roads and public NFS roads consistent with the foregoing requirements to meet RMOs and to comply with applicable regulations (36 CFR 212.5). Commercial haulers are subject to cost recovery and are also subject to investment sharing if they are hauling non-federal forest products from land tributary to roads authorized under a road use permit.

Traffic Control on Roads Subject to a Written Authorization: Road use may be authorized by an easement, a cooperative agreement, an investment sharing agreement or easement, a special use authorization, a contract, or another written authorization. Include necessary traffic rules in these documents. Roads Covered by a License Agreement or Memorandum of Understanding. Include traffic control requirements in these documents, and designate the party responsible for implementation

Surveys, Land Corners

The Tahoe National Forest Land and Resource Management Plan require that the FS provides for maintenance of property lines (Guideline 60 of the Tahoe National Forest Land and Resource Management Plan (USDA 1989 and USDA 1990).

Pesticide Use Restrictions on NFS Lands/BLM administered lands

This condition is necessary to ensure compliance will all regulations related to pesticide and herbicide use.

Modification of 4(e) Conditions After Biological Opinion or Water Quality Certification

This condition is necessary to ensure compliance with the Endangered Species Act and the Clean Water Act. In addition, the Tahoe National Forest Land and Resource Management Plan, as amended by the 2004 Sierra Nevada Forest Plan Amendment, provide for moving ecosystem conditions toward goals that will restore and maintain the physical, chemical and biological integrity of the region's waters as mandated by the Clean Water Act, and will support FS's mission to provide habitat for riparian and aquatic-dependent species under the National Forest Management Act, Organic Act, Safe Drinking Water Act, and Endangered Species Act. In addition, p. 4-295 of the Eldorado National Forest Land and Resource Management Plan requires the FS to coordinate with the California State Water Quality Control Board regarding streamflows related to fisheries, disturbance of riparian vegetation, water quality maintenance, and recreation needs (USDA 1989).

Signs

The rationale for signs is from FS Manual 7160, Engineering Operations, Signs and Posters, as follows: The Washington Office Director of Engineering shall approve the acquisition, installation, and use of nonstandard symbols or traffic control devices (TCDs) for use at field locations. The Regional Sign Coordinator shall approve all other deviations from standards applicable to the acquisition, design, and installation of nonstandard signs and posters.

Further rationale is found in the US Department of Transportation, Federal Highway Administration's *Manual on Uniform Traffic Control Devices* (MUTCD), which is the national standard for signs, markings, pavement markings, and other devices used to control traffic

(traffic control devices) on all roads open to public travel. FS is required by 23 CFR 655.603 to adopt each addition of the MUTCD within 2 years of that edition becoming final through publication in the *Federal Register*. Traffic control devices shall be constructed, located, installed, and maintained according to the standards contained in the MUTCD. Refer to it for guidance and specific information for all standard signs and devices. Some devices in the MUTCD have been changed, deleted, and/or added. Refer to the current edition of the MUTCD for specific guidance and target dates for compliance for these devices.

Specific MUTCD direction includes:

- Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, bikeway, or private road open to public travel (see definition in Section 1A.13) by authority of a public agency or official having jurisdiction, or, in the case of a private road, by authority of the private owner or private official having jurisdiction.
- The Manual on Uniform Traffic Control Devices (MUTCD) is incorporated by reference in 23 Code of Federal Regulations (CFR), Part 655, Subpart F and shall be recognized as the national standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel (see definition in Section 1A.13) in accordance with 23 U.S.C. 109(d) and 402(a). The policies and procedures of the Federal Highway Administration (FHA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F. 03 In accordance with 23 CFR 655.603(a), for the purposes of applicability of the MUTCD:
  - Toll roads under the jurisdiction of public agencies or authorities or public−private partnerships shall be considered to be public highways;
  - Private roads open to public travel shall be as defined in Section 1A.13; and
  - Parking areas, including the driving aisles within those parking areas, that are either publicly or privately owned shall not be considered to be “open to public travel” for purposes of MUTCD applicability.

Use of NFS and BLM Roads for Project Access

Pursuant to 36 CFR 212.7 (d), Licensee, as a principal user of NFS roads is required to share in the maintenance of the road system, commensurate with their use. Project facilities must be inventoried and maintained.

Specific transportation needs of NFS Roads were identified that are directly related to the Project or visitation and public use that is a result of the Project facilities and Project operations.

Crossings, Access by the United States, Road Use

The Tahoe National Forest Land and Resource Management Plan as amended by its Travel Management Plan and BLM Sierra Resource Management Plan prohibit cross county motorized traffic and restrict traffic to designated routes. Such routes are designated in the TSMP.

The US Code of Federal Regulations at 36 CFR 261.54 NFS roads,
allows for a Prohibition in Areas Designated by Order . When provided by an order, the following are prohibited: using any type of vehicle prohibited by the order and being on the road.

General Discussion for all Other FS and BLM Conditions

- Maintenance of Improvements on or Affecting NFS Lands
- Existing Claims
- Compliance with Regulations
- Surrender of License or Transfer of Ownership
- Protection of United States Property
- Indemnification
- Damage to Land, Property, or Interests of the United States
- Risks and Hazards on NFS Lands
- Protection of FS Special Status Species
- Ground Disturbing Activities

The “other” conditions include requirements that serve to address the statutory and administrative responsibilities of the FS. These conditions address the FS concerns related to maintenance of the Project improvements; existing valid claims and rights to the land occupied by the Project; compliance with Federal, State, county and municipal laws and regulations; protection of Federal property; indemnification; water pollution; risks and hazards; signs, pesticide use restrictions; access; road use; and hazardous materials. The Commission is not the agency responsible for administering NFS lands and cannot be expected to condition the Project license relative to the Eldorado and Tahoe National Forest Land and Resource Management Plansand the numerous laws, regulations, and agency policies that pertain to this NFS land. Including these conditions would ensure that project operations are consistent with management direction for the Forests.

During annual consultation meetings, useful information such as the timing of moving large equipment over Forest roads, spill events, and physical changes to Project features will be addressed. The FS could use the information to minimize user conflicts, particularly in the area of recreation, and schedule Forest personnel time for administration of the ongoing project.

There is a potential concern that Project features could be responsible for damage, injury, or death if the public accesses these features. Since these features are the property of Licensee, and not the FS, a license condition to require Licensee to indemnify the FS against damage, injury, or death associated with the use and/or occupation of NFS lands authorized by the Project license will protect the public interest.

Project facilities and activities may pose a threat of fires or other possible destruction of habitat with resultant losses of other resource values, injury, and human life. It is appropriate that Licensee take measures to minimize the risk to federal land and human life. Including license conditions that address these hazards provides an incentive to Licensee to eliminate or minimize risks associated with Project facilities and operations and to provide protection of Forest resources by preparing a plan for responding to wildland fires.

The Surrender of License condition would require Licensee to restore NFS lands in the event the license is surrendered. This condition would minimize the risk of Project improvements being abandoned on the Forests.

The remaining license conditions would provide protection for public health and/or safety and Forest resources on NFS lands by requiring compliance with laws, regulations, and statutory requirements that guide the FS in managing the Federal land occupied by the Project.

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ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ABA	Architectural Barriers Act
ABAAS	Architectural Barriers Act Accessibility Standards
ac-ft	acre-feet
ADA	American with Disabilities Act
ADAAG	American with Disabilities Act Accessibility Guidelines
AIR	Additional Information Request
AN	Above Normal Water Year
APE	Area of Potential Effect
ASRA	Auburn State Recreation Area
ATV	All Terrain Vehicle
BL	Boat Launch
BLM	Bureau of Land Management
BMPs	Best Management Practices
BN	Below Normal Water Year
BOR	Bureau of Reclamation
BRCMP	Bowman Recreation Corridor Management Plan
CD	Critical Dry Water Year
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDPH	California Department of Public Health
CDPR	California Department of Parks and Recreation
CDUA	Concentrated Dispersed Use Area
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLM	California Land Management (Jackson Meadows concessionaire)
CG	Campground
CPI	Consumer Price Index
CSI	Construction Specifications Institute
CVRWQCB	Central Valley Regional Water Quality Control Board (aka State Water Board)
D	Dry Water Year
DBAW	Department of Boating and Waterways (California State)
DLA	Draft License Application
DS	Drum Spaulding
DSOD	Division of Safety of Dams
DSYB	Drum-Spaulding/Yuba-Bear

EC	Extreme Critically Dry Water Year
EAR	Environmental Assessment Report
EM	Engineering Manual
FERC	Federal Energy Regulatory Commission
FGC	Fish and Game Code
FHA	Federal Highway Administration
FLA	Final License Application
FPO	Forest Protection Officer
FR	Forest Route
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FSORAG	Forest Service Outdoor Recreation Accessibility Guidelines
FSTAG	Forest Service Accessibility Guidelines
FYLF	Foothill yellow-legged frog
GIS	Geographic Information System
HPMP	Historic Properties Management Plan
I-80	Interstate 80
ILP	Integrated Licensing Process
INFRA	Internal Forest System Database (not an acronym)
LEO	Law Enforcement Officer
LEIMARS	Law Enforcement and Investigations Management Attainment Reporting System
LRMP	Land And Resource Management Plan
MOU	Memorandum of Understanding
MPH	Miles per Hour
msl	mean sea level
MUTCD	Manual on Uniform Traffic Control Devices
NEPA	National Environmental Policy Act
NFS	NFS
NFSR	NFS Road
NFST	NFS Trail
NGO	Non-governmental Organization
NID	Nevada Irrigation District
NNIP	Non-Native Invasive Plants
NVUM	National Visitor Use Monitoring
O&M	Operation and Maintenance
OHV	Off Highway Vehicle

ORAR	Outdoor Recreation Accessible Route
PAD	Pre-Application Document
PAOT	Persons-at-one-time
PAL	Project Activity Level
PCT	Pacific Crest Trail
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric
PG&E	Pacific Gas and Electric Company
PM	Particulate Matter
PM&E	Protection, Mitigation, and Enhancement
PRC	Public Resource Code (California State)
PM&E	Protection, Mitigation, and Enhancement
R5	Region 5 (Pacific Southwest Region of the US Forest Service)
RD	Recreation Days
Reclamation	Bureau of Reclamation
RCO	Riparian Conservation Objective
RP	Recreation Plan
RM	River Mile
ROS	Recreation Opportunity Spectrum
RV	Recreational Vehicle
RVD	Recreation Visitor Day
RV	Recreational Vehicle
RVD	Recreation Visitor Day
SD	Supporting Document
SDWA	Safe Drinking Water Act
SMP	Semi-Primitive Motorized
SPI	Sierra Pacific Industries
SRMP	Sierra Resource Management Plan
SMP	Sediment Management Plan
SRA	State Recreation Area
TDC	Traffic Control Device
TES	Threatened, Endangered, and Sensitive
TDLT	Truckee Donner Land Trust
TNF	Tahoe National Forest
TR1	Trigger 1
TR2	Trigger 2
TSMP	Transportation System Management Plan
TSP	Technical Study Plan

TSR	Technical Study Report
TWG	Technical Working Group
UFAS	Uniform Federal Accessibility Standards
USA	United States of America
USC	United States Code
USDA-FS	United States Department of Agriculture-Forest Service
USDI	United States Department of Interior
USDOL	United States Department of Labor
USGS	United States Geological Survey
VAOT	Vehicle At One Time
VQO	Visual Quality Objective
VRM	Visual Resource Management
Wet	Wet Water Year
WSE	water surface elevation
WST	Western States Trail
WUA	Weighted Usable Area
YB	Yuba Bear
YOY	Young of the Year
2WD	Two Wheel Drive
4WD	Four Wheel Drive

Attachment A

Forest Service Recreation Facility Development Scale Definitions

Development Scale displays the level of amenities and site modification.

Development Scale 0: (No site modification)

- No constructed features evident at the site.

Development Scale 1: (Almost no site modification).

- Rustic or rudimentary improvements designed for protection of the site rather than comfort of the users.
- Use of synthetic materials excluded.
- Minimum controls are subtle.
- No obvious regimentation.
- Primary access usually over primitive roads
- Spacing informal and extended to minimize contacts between users.

Development Scale 2: (Minimal site modification).

- Rustic or rudimentary improvements designed primarily for protection of the site rather than the comfort of the users.
- Use of synthetic materials avoided.
- Minimum controls are subtle.
- Little obvious regimentation.
- Spacing informal and extended to minimize contacts between users.
- Primary access usually over primitive roads.
- Interpretive services informal, almost subliminal.

Development Scale 3: (Moderate site modification)

- Facilities about equal for protection of natural site and comfort of users.
- Contemporary/rustic design of improvements is usually based on use of native materials. Inconspicuous vehicular traffic controls usually provided.
- Roads may be hard surfaced and trails formalized.
- Development density about 3 family units per acre.
- Primary access may be over high standard roads.
- Interpretive services informal if offered, but generally direct.

Development Scale 4: (Heavy site modification)

- Some facilities designed strictly for comfort and convenience of users.
- Luxury facilities not provided.
- Facility design may incorporate synthetic materials.
- Extensive use of artificial surfacing of roads and trails.
- Vehicular traffic control usually obvious.
- Primary access usually over paved roads.
- Development density 3-5 family units per acre.
- Plant materials usually native.
- Interpretive services, if offered, often formal or structured.

Development Scale 5: (Extensive site modification)

- Facilities mostly designed for comfort and convenience of users and usually include flush toilets; may include showers, bathhouses, laundry facilities, and electrical hookups.
- Synthetic materials commonly used.
- Formal walks or surfaced trails.
- Regimentation of users is obvious.
- Access usually by high-speed highways.
- Development density 5 or more family units per acre.
- Plant materials may be non-native.
- Formal interpretive services usually available.
- Designs formalized and architecture may be contemporary.
- Mowed lawns and clipped shrubs not unusual.

Attachment B. Yuba Bear Monitoring Methods for Facilities by Type of Occupancy Data Collection Method.

Facility Type	Parameter	Trigger Measures
HOSTED AND RESERVATION CGs **(Where Daily Occupancy Records are Kept)**	Indicator	• The non-Holiday weekend (Fri (night)/Sat (night)) combined annual peak season (June 15 to August 15) average occupancy for similar campground types within the geographic groupings shown in Table 2. Campground host sites are exempt from this annual average peak season combined occupancy calculation. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 14 days (Fri/Saturday nights) for the annual peak season combined occupancy calculation. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 10 days to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	*Hosted Campgrounds:* Caretaker records daily occupancy information. Note. Unoccupied reserved sites will be counted as occupied sites for monitoring purposes.
	Trigger 1	• 90% Average Annual Occupancy of campsites within geographic grouping in 1-year out of 6-year rolling period.
	Required Action if Trigger 1 is met	• Implement recreation use management process[1] starting in calendar year after trigger is met • Continue annual monitoring • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• Continue annual monitoring
	Trigger 2	• 90% Average Annual Occupancy of indicator reached <u>two additional times</u> during the 6-year rolling period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for new campground (NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA).
	Required Action if Trigger 2 is not met	• Revert back to 6-year rolling annual monitoring (Method 1).

Facility Type	Parameter	Trigger Measures
SELF-PAY CGs **(No on-site host present)**	Indicator	• The non-Holiday weekend (Sat) combined annual peak season (June 15 to August 15) average occupancy for similar campground types within the geographic groupings shown in Table 2. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 6 Saturdays for the annual peak season combined occupancy calculation. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 4 days to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	• On-site observations every 3rd and 6th years within the 6 year Form 80 Cycle: Record non-holiday weekend facility occupancy rates on all Saturdays from June 15 to August 15. Counts will be conducted after noon.
	Trigger 1	• 90% average annual occupancy or above of indicator reached during <u>one</u> of the monitoring years (Year 3 or Year 6).
	Required Action if Trigger 1 is met	• Start Method 2 monitoring • Implement recreation use management process[1] starting in calendar year after trigger is met • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• None
	Method 2	• On-site observations annually for next 5 years: Record non-holiday weekend facility occupancy rates on all Saturdays from June 15 to August 15. Counts will be conducted after noon.
	Trigger 2	• 90% average annual occupancy of indicator reached <u>2 more times</u> during the next 5 year monitoring period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for additional facility capacity (expand existing or construct new facility). NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA.
	Required Action if Trigger 2 is not met	• Revert back to monitoring every 3rd and 6th years during the Form 80 monitoring cycle (Method 1).

Facility Type	Parameter	Trigger Measures
DAY USE AREAS AND PRIMITIVE CAMPSITES	Indicator	• The non-Holiday weekend (Sat for primitive campgrounds; Sat/Sun for day use areas) combined annual peak season (June 15 to August 15) average occupancy for similar campground/day use sites types within the geographic groupings shown in Table 2. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 6 Saturdays for the annual peak season combined occupancy calculation for primitive CGs and 14 Saturdays/Sundays for Day Use Areas. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 4 days (CGs) or 10 days (Day Use Areas) to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	• On-site observations every 3rd and 6th years within the 6 year Form 80 Cycle: Record non-holiday weekend facility occupancy rates on all: Primitive CGs – Saturdays (counts conducted afternoon), or; Day Use Areas - Saturdays (Between 9:00 a.m. and 6:00 p.m.) & Sundays (Between 9:00 a.m. and noon).
	Trigger 1	• 90% average annual occupancy or above of indicator reached during <u>one</u> of the monitoring years (Year 3 or Year 6).
	Required Action if Trigger 1 is met	• Start Method 2 monitoring • Implement recreation use management process[1] starting in calendar year after trigger is met • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• None
	Method 2	• On-site observations annually for next 5 years: Record non-holiday weekend facility occupancy rates on all: Primitive CGs - Saturdays (counts conducted after noon), or; Day Use Areas - Saturdays (Between 9:00 a.m. and 6:00 p.m.) & Sundays (Between 9:00 a.m. and noon).
	Trigger 2	• 90% average annual occupancy of indicator reached <u>2 more times</u> during the next 5 year monitoring period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for expansion of existing or development of new site. NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA.
	Required Action if Trigger 2 is not met	• Revert back to monitoring every 3rd and 6th years during the Form 80 monitoring cycle (Method 1).

[1] **<u>Examples of Recreation Use Management Processes</u>**

- Educate visitors about other regional day-use areas and campgrounds.
- Implement more on-site management (provide camp host, bring in amenities).
- Implement a fee for use (if applicable).

[2] **Feasibility/Suitability:**
Suitable - A proposed development will be considered suitable for NFS lands if the Forest Service considers the proposal suitable and appropriate. A proposed development will be considered suitable for licensee lands if the licensee and/or FERC considers the proposal suitable and appropriate.

Feasible - A proposed Project related development on NFS lands will be considered feasible if the Forest Service and licensee qualified engineers consider the proposal practical and reasonable based on the site conditions. If, on NFS land, Licensee and the Forest Service engineers do not mutually agree to the feasibility, then the engineers will request a combined on site review with the decision makers of each respective agency for further guidance.

[3]**Overflow:**
For all infrastructure items, especially campgrounds, the Licensee will also address overflow facilities at this time. Specifically, the Licensee must address any potential overflow impacts, especially in regard to impacts to natural resources. In particular, the Licensee must address controlling motor vehicles (signing, barriers) and human waste (CXT or portable toilets). Typically these overflow areas will not include additional amenities (picnic tables, fire rings, tent pads), but could do so if the Licensee and the resource agency(s) agree to provide such. Address during annual O & M meeting between licensee and FS.

Table 2. Yuba-Bear Hydroelectric Project: Monitoring Trigger Groupings.

	Facility Type	Grouping	Reservoir	Facility	Indicator Capacity*
FAMILY AND GROUP CGs	Family Campground	Jackson Meadows **	Jackson Meadows	East Meadow Campground	45 units
				Pass Creek Campground	29 units
				Findley Campground	14 units
				Fir Top Campground	12 units
				Woodcamp Campground	19 units
		Jackson Meadows	Jackson Meadows	Pass Creek RV Overflow	TBD**
		Rollins	Rollins	Orchard Springs Campground	101 units
				Greenhorn Campground	79 units
				Peninsula Campground	67 units
				Long Ravine Campground	85 units
		Bowman Recreation Corridor	Bowman	Bowman Lake Campground	10 units
			Canyon Creek	Canyon Creek Campground	16 units
			Sawmill	Sawmill Lake Campground (proposed)	15-20 units
				Jackson Creek Campground	12-units
	Group Campground	Jackson Meadows	Jackson Meadows	Aspen Group Campground	3 units (100 PAOT)
				Silvertip Group Campground	2 units (50 PAOT)
		Bowman Area	Sawmill	Sawmill Lake Group Campground (proposed)	1 unit (25 PAOT)
			Faucherie	Faucherie Lake Group Campground	2 units (50 PAOT)
				Bowman Lake Group Campground (proposed)	1 unit (25 PAOT) 1 unit (25 PAOT)
				Canyon Creek	

	Facility Type	Grouping	Reservoir	Facility	Indicator Capacity*
FAMILY AND GROUP CGs continued	Group Campground continued	Bowman Area continued		Group Campground (proposed)	

Table 2. (continued)

	Facility Type	Grouping	Reservoir	Facility	Indicator Capacity*
DAY USE AREAS AND PRIMITIVE CAMPSITES	Primitive/ Hike-In Campground	Jackson Meadows	Milton	Primitive campsites (proposed) Fire ring and parking spur	6 units
		Bowman Recreation Corridor	Bowman, Sawmill, Canyon Creek. Faucherie	Within ¼ mile each side of road - All dispersed campsites to be either converted and included in a developed CG or eliminated	NA
			Bowman, Sawmill, Faucherie	Outside of ½ mile camping restriction corridor.	None primitive campsites designated
	Boat-In Campground	Jackson Meadows	Jackson Meadows	Jackson Point Boat-In Campground	8 units
	Boat Launch Facility	Jackson Meadows	Jackson Meadows	Pass Creek Boat Launch	43 spaces
				Woodcamp Boat Launch	36 spaces
		Rollins	Rollins Reservoir	Orchard Springs Boat Launch	150 spaces
				Greenhorn BL	108 spaces
				Peninsula Boat Launch	50 spaces
				Long Ravine Boat Launch	72 spaces

	Facility Type	Grouping	Reservoir	Facility	Indicator Capacity*
DAY USE AREAS AND PRIMITIVE		Milton	Milton	Milton Informal Boat Launch	FS and Licensees will meet on the ground to determine capacity numbers.

CAMPSITES (continued)	Informal Launch Facility	Bowman Corridor	Bowman	Bowman Lake Informal	FS and Licensees will meet on the ground to determine capacity numbers.
			Sawmill	Sawmill Informal	FS and Licensees will meet on the ground to determine capacity numbers.
			Faucherie	Faucherie Informal	14 spaces (shared with Day Use)
	Picnic Facility	Jackson Meadows	Jackson Meadows	Aspen Picnic Area	11 units, 30 spaces
				Woodcamp Picnic Area	6 units, 35 spaces
	Parking Facility	Jackson Meadows	Jackson Meadows	Jackson Meadows Vista	8 spaces
	Day Use Facility	Faucherie	Faucherie	Faucherie Day Use and Parking	14 spaces (shared with boat launch)

* Site capacities will change as Project development plans are implemented. Use current available capacity at time of survey.
** Jackson Meadows RV overflow sites to be tracked separately from family campgrounds to determine demand for oversized vehicle “parking lot” style campsites. Capacity for these sites will vary during the season since lower water levels will increase availability sites when Pass Creek Overflow is not needed for boat ramp parking. Additional 20 family and 50 PAOT group sites constructed at Jackson Meadows will also be included in capacity, when constructed.

Table 3. YB facilities - New facilities to be constructed when implementation triggers are met.

Licensee	Recreation Area	Reservoir	Facility Group Hitting Trigger	Facility to be constructed when trigger is reached:
NID	Jackson Meadows	Jackson Meadows	East Meadow CG Pass Creek CG Findley CG Fir Top CG Woodcamp CG 20 additional sites	Additional campsites at Jackson Meadows Reservoir (either NFS or NID lands)
NID	Jackson meadows	Jackson Meadows	Aspen Group CG Silvertip Group CG 50 Additional PAOT	Additional at Jackson Meadows Reservoir (either NFS or NID lands) 50 PAOT
	Canyon Creek	Sawmill Faucherie	Sawmill Group CG (proposed) Faucherie Group CG	FS Recommends Bowman Group CG[1] on NID lands.

[1] TNF recommends developing Bowman Group Campground concurrently with the conversion of the Bowman area from dispersed to developed (and the Bowman Family campground rehabilitation) in lieu of converting the dispersed sites in this same area into a small single family campground.

Attachment B. Drum-Spaulding Monitoring Methods for Facilities by Type of Occupancy Data Collection Method.

Facility Type	Parameter	Trigger Measures
HOSTED AND RESERVATION CGs **(Where Daily Occupancy Records are Kept)**	Indicator	• The non-Holiday weekend (Fri (night)/Sat (night)) combined annual peak season (June 15 to August 15) average occupancy for similar campground types within the geographic groupings shown in Table 2. Campground host sites are exempt from this annual average peak season combined occupancy calculation. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 14 days (Fri/Saturday nights) for the annual peak season combined occupancy calculation. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 10 days to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	*Hosted Campgrounds:* Caretaker records daily occupancy information. Note. Unoccupied reserved sites will be counted as occupied sites for monitoring purposes.
	Trigger 1	• 90% Average Annual Occupancy of campsites within geographic grouping in 1-year out of 6-year rolling period.
	Required Action if Trigger 1 is met	• Implement recreation use management process[1] starting in calendar year after trigger is met • Continue annual monitoring • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• Continue annual monitoring
	Trigger 2	• 90% Average Annual Occupancy of indicator reached <u>two additional times</u> during the 6-year rolling period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for new campground (NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA).
	Required Action if Trigger 2 is not met	• Revert back to 6-year rolling annual monitoring (Method 1).

Facility Type	Parameter	Trigger Measures
SELF-PAY CGs **(No on-site host present)**	Indicator	• The non-Holiday weekend (Sat) combined annual peak season (June 15 to August 15) average occupancy for similar campground types within the geographic groupings shown in Table 2. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 6 Saturdays for the annual peak season combined occupancy calculation. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 4 days to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	• On-site observations every 3rd and 6th years within the 6 year Form 80 Cycle: Record non-holiday weekend facility occupancy rates on all Saturdays from June 15 to August 15. Counts will be conducted after noon.
	Trigger 1	• 90% average annual occupancy or above of indicator reached during <u>one</u> of the monitoring years (Year 3 or Year 6).
	Required Action if Trigger 1 is met	• Start Method 2 monitoring • Implement recreation use management process[1] starting in calendar year after trigger is met • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• None
	Method 2	• On-site observations annually for next 5 years: Record non-holiday weekend facility occupancy rates on all Saturdays from June 15 to August 15. Counts will be conducted after noon.
	Trigger 2	• 90% average annual occupancy of indicator reached <u>2 more times</u> during the next 5 year monitoring period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for additional facility capacity (expand existing or construct new facility). NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA.
	Required Action if Trigger 2 is not met	• Revert back to monitoring every 3rd and 6th years during the Form 80 monitoring cycle (Method 1).

Facility Type	Parameter	Trigger Measures
DAY USE AREAS AND PRIMITIVE CAMPSITES	Indicator	• The non-Holiday weekend (Sat for primitive campgrounds; Sat/Sun for day use areas) combined annual peak season (June 15 to August 15) average occupancy for similar campground/day use sites types within the geographic groupings shown in Table 2. • The single highest and lowest occupancy during the peak season will be omitted from the average occupancy count to minimize the influence of anomalous days (i.e. bad weather, events…). For a typical year, this will result in 6 Saturdays for the annual peak season combined occupancy calculation for primitive CGs and 14 Saturdays/Sundays for Day Use Areas. • The occupancy will only be calculated for days when the campground is open during the peak season. In a particular year, if there are less than 4 days (CGs) or 10 days (Day Use Areas) to calculate the annual peak season combined occupancy, then this year will not be considered for trigger monitoring purposes.
	Method 1	• On-site observations every 3rd and 6th years within the 6 year Form 80 Cycle: Record non-holiday weekend facility occupancy rates on all: Primitive CGs – Saturdays (counts conducted afternoon), or; Day Use Areas - Saturdays (Between 9:00 a.m. and 6:00 p.m.) & Sundays (Between 9:00 a.m. and noon).
	Trigger 1	• 90% average annual occupancy or above of indicator reached during <u>one</u> of the monitoring years (Year 3 or Year 6).
	Required Action if Trigger 1 is met	• Start Method 2 monitoring • Implement recreation use management process[1] starting in calendar year after trigger is met • Plan for and address overflow use[3]
	Required Action if Trigger 1 is not met	• None
	Method 2	• On-site observations annually for next 5 years: Record non-holiday weekend facility occupancy rates on all: Primitive CGs - Saturdays (counts conducted after noon), or; Day Use Areas - Saturdays (Between 9:00 a.m. and 6:00 p.m.) & Sundays (Between 9:00 a.m. and noon).
	Trigger 2	• 90% average annual occupancy of indicator reached <u>2 more times</u> during the next 5 year monitoring period. Do not have to wait for all 6 years if Trigger 2 is met sooner.
	Required Action if Trigger 2 is met	• Start Site Development Process for expansion of existing or development of new site. NEPA analysis to include Feasibility-Suitability[2] and conceptual design, Final Plan Development and Construction to follow NEPA.
	Required Action if Trigger 2 is not met	• Revert back to monitoring every 3rd and 6th years during the Form 80 monitoring cycle (Method 1).

[1] **<u>Examples of Recreation Use Management Processes</u>**

- Educate visitors about other regional day-use areas and campgrounds.
- Implement more on-site management (provide camp host, bring in amenities).
- Implement a fee for use (if applicable).

[2] **Feasibility/Suitability:**
Suitable - A proposed development will be considered suitable for NFS lands if the Forest Service considers the proposal suitable and appropriate. A proposed development will be considered suitable for licensee lands if the licensee and/or FERC considers the proposal suitable and appropriate.
Feasible - A proposed Project related development on NFS lands will be considered feasible if the Forest Service and licensee qualified engineers consider the proposal practical and reasonable based on the site conditions. If, on NFS land, Licensee and the Forest Service engineers do not mutually agree to the feasibility, then the engineers will request a combined on site review with the decision makers of each respective agency for further guidance.
[3] **Overflow:**
For all infrastructure items, especially campgrounds, the Licensee will also address overflow facilities at this time. Specifically, the Licensee must address any potential overflow impacts, especially in regard to impacts to natural resources. In particular, the Licensee must address controlling motor vehicles (signing, barriers) and human waste (CXT or portable toilets). Typically these overflow areas will not include additional amenities (picnic tables, fire rings, tent pads), but could do so if the Licensee and the resource agency(s) agree to provide such. Address during annual O & M meeting between licensee and FS.

Table 2. Drum-Spaulding Project: Monitoring Trigger Groupings.

	Facility Type	Grouping	Reservoir	Facility	Current Indicator Capacity*
FAMILY AND GROUP CAMP-CGs	Family CG	Remote	Fordyce	Fordyce Lake Campground (proposed)	10 units
		Remote	Meadow	Meadow Lake Campground	15 units
				Meadow Lake Shoreline Campground	10 units
		Interstate 80	Spaulding	Lake Spaulding Campground	35 units
			Lake Valley	Lodgepole Campground	35 units
		Bowman Road	Lower Lindsey	Lower Lindsey Lake Campground	12 units
			Carr	Carr Lake Campground (hike-in developed campsites less than 300 feet from parking)	7 units Sites within 300 feet of parking will be considered developed, and sites further than 300 feet will be considered primitive.
			Rucker	Rucker Lake Campground (proposed)	20 units
	Boat-In Family CG	Project-wide Boat-In	Spaulding	Spaulding Boat-In Campground	12 units
	Group CG	Project-wide, Developed	Kidd	Kidd Lake Group Campground	3 units (100 PAOT)
			Lake Valley	Lake Valley Group Campground (proposed)	2 units (50-100 PAOT)
			Bear Valley	Bear Valley Group Campground	1 unit (100 PAOT)
		Project-wide, Primitive	Meadow	Meadow Knoll Group Campground	2 units (50 PAOT)

	Facility Type	Grouping	Reservoir	Facility	Indicator Capacity*
DAY USE AREAS AND PRIMITIVE CAMPSITES	Primitive /Hike-In CGs	Remote	White Rock	Primitive campsites	6 units
		Remote	Sterling	Primitive campsites (proposed)	3 units
		Interstate 80	Lower Peak	Primitive campsites (proposed)	5 units
		Bowman Road	Culbertson	Primitive hike-in campsites	3 units
			Lower Rock	Primitive hike-in campsites	3 units
			Middle Lindsey	Primitive hike-in campsites	3 units
			Upper Rock	Primitive hike-in campsites	3 units
			Blue	Primitive hike-in campsites	9 units
			Carr Primitive	Primitive hike-in campsites greater than 300 feet from parking	4 units Sites within 300 feet of parking will be considered developed, and sites further than 300 feet will be considered primitive.
	Day Use Facilities	Remote	Sterling	Lake Sterling Day Use Area (proposed)	4 or 5 (TBD) units, spaces TBD
		Remote	Kelly	Kelly Lake Picnic Area	3 units, 6 spaces
		Interstate 80	Lake Valley	Silvertip Picnic Area & Boat Launch	10 units, 25 spaces
			Spaulding	Lake Spaulding Picnic & Boat Launch	3 units, 67 spaces
		Bowman Road	Bear Valley	Sierra Discovery Trail (incl. overflow)	32 spaces
		Bowman Road	Fuller	Fuller Lake Day Use & Boat Launch, Angler Access	8 units, 45 spaces
	Trailhead Facility	Bowman Road	Carr	Carr-Feeley Trailhead	30 spaces
			Lower Lindsey	Lower Lindsey Lake Trailhead	20 spaces

* Site capacities will change as Project development plans are implemented. Use current available capacity at time of survey.

Table 3. DS facilities - New facilities to be constructed when implementation triggers are met.

Licensee	Recreation Area	Reservoir	Facility Group Hitting Trigger	Facility to be constructed when trigger is reached:
PG&E	Spaulding	Spaulding	Spaulding Lake Campground Lodgepole Campground	Lake Valley Campground (PG&E lands).
		Lake Valley		
	Grouse/Spaulding	Rucker	Rucker CG (modified) Lindsey Lake CG Carr CG (modified)	Lindsey Creek Campground* (NFS lands) * When Triggers are met or within 10 years from license issuance, whichever comes first.
		Lower Lindsey		
		Carr		

Attachment C – Implementation Schedule Summary (all work should be completed within the year specified)

Year of Implementation	1	2	3	4	5	6	7	8	9	10	15	20	Comment
Actions Common to both Licenses													
Install metal food lockers in all CG except Milton		M			M								
Replace plastic food lockers					M								
Provide as-builts					X								
Public Information and Education	X	X			X								
Action Items PG&E													
Fordyce Barriers and CG Construction	M		C										FS recommends; P
Sterling camping area-east side of lake					M								FS recommends; P
Spaulding Boat-in CG construction					C								
Spaulding CG improvements													FS recommends; P
Lindsey Creek CG construction										C			
Blue Lake Road improvement					C								FS recommends; P
Carr Feeley TH expansion										R			
Carr Lake CG Reconstruction and Expansion					R								
Lower Lindsey CG Reconstruction		M									R		
Lower Lindsey TH Construction					C								
Middle Lindsey, Culbertson, Upper & Lower Rock					M								
Fuller Lake BL Reconstruction					R								
Fuller Lake Angler Access					M								
Rucker CG Improvements and Reconstruction	M									C			
Sterling CG-convert to day use										R			
Meadow Lake Day Use & lakeshore					M								
Meadow Shoreline CG Reconstruction								R					
Meadow CG Reconstruction					M						R		
Meadow Knolls Group CG					M							R	
White Rock			M										
Trail: Lower Peak to Kidd CG construction					C								

Action Items NID													
Facility Development Plan for Jackson Meadows	X												Required in curre
Bowman Recreation Corridor Management Plan		X											
Group CG 50 PAOT , Jackson Mdw, construction				C									
20 family campsites, Jackson Mdw, construction								C					
RV dump station		M											Decommission & dump station has failure
Aspen Group Rehabilitation		M								R			FS recommends;
Aspen Picnic Reconstruction					M					R			
Pass Creek CG Reconstruction								M			R		

Pass Creek Overflow Reconstruction					R								
Pass Creek BL Reconstruction	M				M						R		
East Meadows CG Reconstruction	M				M						R		
Replace west side water source construction			C										
Findley CG Reconstruction			M							R			
Firtop CG Reconstruction										R			
Woodcamp CG Reconstruction			M							R			
Woodcamp Picnic Reconstruction					R								
Woodcamp BL Reconstruction					R								
Jackson Mdw Vista Reconstruction					M						R		
Silvertip Group Rehabilitation					M							R	FS recommends;
Jackson point CG Reconstruction		R											Mostly required i
Jackson Mdw Admin site landlord maintenance													As needed
Milton			M								R		
French parking improvements					M								
Implement Camping Closure Bowman Corridor							X						
Potable water in Bowman Corridor					C								
Bowman CG reconstruction (add 2 sites)					R								FS recommends;
Bowman Tree Camp CG construction (~20 sites)					C								
Bowman Informal BL closure		M											FS recommends;
Bowman Peninsula Sites-convert to day use					M								
Bowman boat launch improvement					M								
East of Bowman dam: close or convert campsites					M								FS recommends;
East of Bowman Milton Canal: convert use					C								FS recommends;
Sawmill Family CG; 15-20 sites construction					C								FS recommends;
Sawmill informal BL—sign and kiosk					M								
Sawmill Group CG construction					C								
Faucherie Group rehabilitation					M					R			FS recommends;
Faucherie BL/ Day use		M			R					M			FS recommends;
Canyon Creek CG (incl. convert part to group CG)					R								
Canyon Creek Dispersed Site CG construction					C								
Jackson Creek CG reconstruction										R			
Langs Crossing construction					C								Joint NID, PG&E,
Woodcamp Interpretive trail (WI Trail)					M								
Trail from Aspen CG and Vista Point to quarry construct					C								
Trail from Woodcamp, Findley, Firtop to WI Trail const.										C			
Trail to English Dam construction											C		
Trail Xing of Sawmill spillway or reroute construction		C											If not completed
Trail to French Lake construction		C											If not completed

Notes: Additional items will be triggered in.
This chart does not include Licensee's proposals that the FS does not make comments on.

Actions in Bowman Corridor are subject to modification based on results of Bowman Recreation Corridor Management Plan.

Facilities that are constructed during the license period should be reconstructed within 20-30 years of construction.

C=Complete construction

M= relatively minor work (less than reconstruction)

R=Begin Reconstruction

X= Produce or implement

CG=Campground; BL=Boat Launch

Document Content(s)

DSYBRationale.PDF...1-529

Attachment 6

COMMENTS
Mortality of Foothill Yellow-Legged Frogs on the
Poe Project
P-2107-000 and P-2107-016

Filed by:

Chris Shutes
California Sportfishing Protection Alliance

Dave Steindorf
American Whitewater

July 29, 2011

Ms. Kimberly Bose, Secretary
Federal Energy Regulatory Commission
(via e-filing)

Dear Ms. Bose:

American Whitewater and the California Sportfishing Protection Alliance respectfully submit these comments relating to the mass mortality of foothill yellow-legged frogs (rana boylii) on the Poe reach of the North Fork Feather River on or about June 30, 2011. The Poe reach is the bypassed reach for the Poe Project (FERC #2107). AW and CSPA believe that this mortality was avoidable, and was caused by actions made by personnel for the project's licensee, Pacific Gas & Electric Co. (PG&E). AW and CSPA respectfully request that measures in the pending new license for the Poe Project affirmatively prevent recurrence of this mortality, and that in the interim licensee PG&E undertake certain management actions to reduce the likelihood of similar mortality.

June 30, 2011 mass frog mortality

On June 30, 2011, operators for PG&E dropped the instream flow below Poe Dam to 114 cfs. Up until June 27, 2011, flow below Poe Dam had been reaching a (diurnally fluctuating) daily high of about 2000 cfs. A rain event on June 29 increased the daily high to about 2800 cfs. Please see Attachment 1 at the conclusion of this comment letter for a graphic representation of the hydrograph during this time period.

Annual monitoring of foothill yellow-legged frogs (FYLF) is carried out by the licensee on the Poe reach of the NF Feather River. On July 15, 2011, PG&E biologists reported to the Ecological Resources Committee (ERC) for the Rock Creek – Cresta Project (Project No. 1962, located on the NF Feather immediately upstream of Poe) that the frog surveys on the Poe reach had determined that the June 30 flow reduction by PG&E operators had desiccated and thus destroyed 30 FYLF egg masses. According to PG&E biologists, these

30 egg masses represented virtually the entire viable annual cohort for FYLF on the Poe reach.

Previous frog mortality in the Poe Project

The Poe reach of the NF Feather River is particularly productive for FYLF. In 2010, over 100 FYLF egg masses were counted in visual encounter surveys commissioned by PG&E. While extraordinarily high water conditions have made 2011 a difficult year for FYLF throughout much of California, the actions of PG&E operators have changed 2011 from a difficult year into a disaster on the Poe reach of the NF Feather.

Since 2006, when a similar precipitous flow drop on the Poe reach desiccated 43 of 83 FYLF egg masses, PG&E has been aware of the consequences of the abrupt reduction of flows coming off of spill down to very low base flows. Following the mass stranding of FYLF in 2006, AW and CSPA began to advocate for a flow regime in the Poe Project that would recreate the descending limb of the snowmelt hydrograph. This was initially in opposition to a position taken by PG&E and by FERC in its Draft Environmental Analysis for the Poe relicensing that consistently low flows were the most protective of FYLF on the Poe reach. In comments on the Draft EA, CSPA noted:

> FYLF surveys were conducted by Garcia and Associates, as part of the Rock Creek-Cresta license implementation, in May through July of 2006 on the Poe and Cresta bypass reaches of the NF Feather River. These surveys showed that extreme fluctuations in flow had severe deleterious effects on FYLF egg masses, desiccating approximately half of the egg masses observed on both reaches. The same surveys found, however, that the frogs in many cases found alternative sites for oviposition in the place of breeding sites, observed in previous years, that were either excessively inundated, subject to excessive flow velocity, or eliminated entirely when high flows altered the streambed.
>
> The science does not support the theory that frogs simply do better at lower flows. On the contrary, habitat appears to move around in differing flows, preferred egg-laying areas change, and there may even be more options for breeding at higher flows. What is clear without doubt is that rapid and steep fluctuations in flow have unacceptable negative impacts.[1]

Similarly, in its June 26, 2007 request for hearing on the Final 4(e) conditions of the U.S. Forest Service, American Whitewater stated:

> The down-ramping rates in Conditions 24.2 and 24. 5 for controllable spills will lower stage to an extent that will expose and dewater FYLF egg masses. The permitted swing in flow stage approaches 6 feet per day and will affect many egg masses located in cobble bar or other edgewater habitat.

[1] 20060915-5028, pp. 1-2.

> The up-ramping rates in Conditions 24.2 and 24.5 for controllable spills will result in increased flow velocities that will displace FYLF egg masses and tadpoles located in cobble bar or other edgewater habitat. …
>
> Butte County and AW challenge the factual statement that Conditions 24.2 and 24 5 will protect the FYLF egg masses and tadpoles against adverse changes in velocity and stage associated with controllable spills.[2]

Proposed remedy: mimicking the descending limb of the snowmelt hydrograph

In large part as a consequence of the loss of egg masses on Poe in 2006, the Rock Creek – Cresta Ecological Resources Committee negotiated a license amendment for Project 1962 that changed the flows on the Cresta reach, immediately upstream of Poe Dam. The new Cresta flow regime maintains high base flows in May of Normal and Wet years, and remains (in Normal and Wet years) at a relatively high baseflow in June and July. [3] This reduces the stage drop coming off of spill, since the bottom of the drop (the baseflow) is elevated. In light of the 2011 event on Poe, it is evident that an actual rate of recession over a specified time period coming off of spill would be more protective, so that the stage change following spill would be slowly reduced over a period of weeks.

In several recent relicensing proceedings, American Whitewater and the California Sportfishing Protection Alliance have continued to develop and advocate flow regimes that recreate the descending limb of the snowmelt hydrograph. We have developed and further advocated re-creating the descending limb of the snowmelt hydrograph in the McCloud – Pit (FERC No. 2106) relicensing and the Middle Fork American (FERC No. 2079) relicensing. At present, we are so advocating in the coordinated relicensings of the Yuba-Bear (FERC No. 2266) and Drum-Spaulding (FERC No. 2310) projects.

There are benefits of mimicking the descending limb of the snowmelt hydrograph for macroinvertebrates; there is also the benefit of providing both angling and whitewater boating opportunities while creating biologically beneficial conditions for numerous aquatic biota. But perhaps the greatest benefit of recreating the descending limb of the snowmelt hydrograph is that it can greatly reduce mortality and thus increase viability of foothill yellow-legged frogs.

In recent comments on the Draft License Applications for the Yuba-Bear and Drum-Spaulding projects, CSPA and AW (as part of the Foothills Water Network) recommended flow regimes that would recreate the descending limb of the snowmelt hydrograph on several key project reaches.[4] Licensees Nevada Irrigation District and PG&E (respectively) declined in their Final Licenses Applications to adopt this recommendation; PG&E stated of the Foothills Water Network flow recommendations generally: "the environmental benefits, if any, are unclear (given the inconsistent positive

[2] Butte County and AW's hearing request under the Energy Policy Act of 2005 was rejected on procedural grounds by the Forest Service, and the matter was not substantively resolved. Quotes are from pp. 8 and 9.
[3] 20090414-3046.
[4] See e.g. 20110201-5027 pp. 32-40.

and negative results as applied to particular species, reaches and reservoirs) and the consequences (to power generation, water supply and reservoir levels) are severe."[5] We respectfully remind the Commission and both of these licensees that, should FYLF be listed as threatened under the Endangered Species Act, the cost of replicating the snowmelt recession on several projects will pale in comparison to the multitude of water and monetary costs that accompany and ESA listing. In addition to simply being the right thing to do, it is in the interest of everyone to take every reasonable measure to project this sensitive species.

Focus on Dynamic Flows Rather than Static Habitat

Over the last three years, increasing emphasis has been placed in California relicensings on 2-D FYLF habitat modeling. Based on ever-growing experience in managing diverse river reaches for FYLF, it is our opinion that such modeling is often of limited value, and that use of habitat models to determine optimal flows and velocities for FYLF under static conditions often misses the point. FYLF are most impacted by dynamic flow conditions. Focus on static habitat availability can lead to an over-reliance on abstract targets that can produce adverse consequences.

The timing of flows in spill years (such as 2011) will often be such that frogs will deposit eggs using available habitat, typically on the same cobble bars but higher on the bar. Under such circumstances, the question is no longer whether flows can be provided (assuming that licensee regains control of the system, ending spill) that are optimal, but whether the egg masses at locations *that were already used* remain viable. In the first instance, viability requires that these locations remain watered (in cases of flows that substantially decrease), and that the velocities at these locations do not increase to the point of scour (in the case of flows that substantially increase).

In situations where a licensee is temporarily unable to regulate the flow at locations where FYLF breed, the question is therefore far less one of optimal habitat as described *in a model* than it is of managing changes in flow (and resultant stage height) to protect egg masses and subsequently tadpoles *in the river*. The impulse to try to regain control of a regulated reach as quickly as possible in order to drop flows to modeled optimum levels becomes an ultra-high-risk strategy founded on operator optimism that, once regained, control will not again be lost. It also assumes that one knows for certain that breeding has not already occurred, and that egg masses already in the water will not be stranded and/or desiccated

An underlying assumption of the strategy of regaining control and dropping flows quickly is that habitat is a key limiting factor for FYLF. This is clearly not the case on Poe. In our experience, we have never encountered a situation where habitat has been determined to be the limiting factor for FYLF. On many other reaches, such as the Middle Yuba River, flows during the breeding season at locations used by FYLF are far greater every year, because of natural accretion, than modeled optimal flows. It is also clear that under historic unimpaired conditions, FYLF were breeding successfully during

[5] 20110412-5005 p. E6.3-345.

flows that were substantially higher than flows that are typically found below regulating dams in the Sierra under present conditions. Some of the largest populations of FYLF today are found in the few unregulated streams of California.

Moving egg masses is not a solution to post-spill conditions

The Rock Creek – Cresta ERC was informed on July 15, 2011 that PG&E had considered a plan for PG&E biologists to move FYLF egg masses on Poe once PG&E operators were about to regain control of the system and end spill. While moving egg masses may be a consideration under unavoidable emergency conditions, it is not an appropriate management strategy or substitute for responsible flow regulation.

Mortality of FYLF on Poe could easily have been avoided

It is our understanding that, prior to June 30, 2011, PG&E biologists had been discussing concerns about FYLF with PG&E operators of PG&E's NF Feather facilities for several months. This makes the actions of these operators not only negligent, but willfully negligent. Whether PG&E's operators on the NF Feather just didn't listen, operated by rote in spite of contrary advice, were wantonly indifferent, got greedy with water in one of the wettest years on record, or were instructed by management to do the wrong thing, their action is indefensible.

The Commission should order PG&E to develop a management plan to protect FYLF on Poe and on the Cresta reach of Project 1962 upstream

In its Final License Application for the Drum-Spaulding Project, PG&E recommends "Measure DS-GEN-2: Annual Employee Training." This proposed measure reads in part:

> Licensee shall, beginning in the first full calendar year after license issuance, annually perform employee awareness training and shall also perform such training when a staff member is first assigned to the Project. The goal of the training shall be to familiarize Licensee's O&M staff with special-status species, noxious weeds and sensitive areas… [6]

FERC should require, in its new license for the Poe Project, a similar condition made more explicit in training measures for operators in relation to FYLF. In part, FERC should require PG&E to develop a management plan so that incidents of spill on the Poe reach are coordinated between PG&E biologists and operators, with the explicit goal of protecting FYLF. Moreover, PG&E should be required to consult with resource agencies and interested NGO's as specific plans for each set of annual spring conditions are developed. PG&E should be required to specify a manager responsible for oversight of this coordination, and should require that a report of actions taken to protect FYLF are included in an annual report for the project.

[6] 20110412-5005, p. App. E 7-3.

AW and CSPA strongly urge PG&E to undertake immediate voluntary institution of this measure for the Poe Project, and also for the Cresta reach on Project 1962.

Flow requirements for the Poe Project that protect FYLF must be included in the new project license

The Poe Project has largely completed relicensing, and is awaiting a 401 Water Quality Certification. AW and CSPA have put the California State Water Resources Control Board (401 jurisdictional agency) on notice that a flow regime on Poe must protect FYLF egg masses and tadpoles from avoidable project-caused flow fluctuations. By this letter, we also recommend to FERC and to other responsible resource agencies that this issue be explicitly addressed in licensing. The status of Forest Service Condition 4(e) flows has been in abeyance for about four years. AW and CSPA recommend that relicensing participants on the Poe Project organize a meeting to discuss flows that will protect FYLF in the Poe Project, incorporating, with details to be determined, a flow regime that mimics the descending limb of the snowmelt hydrograph.

In the meantime, since no conditions of the present license were violated in destroying virtually the entire 2011 cohort of FYLF on Poe, AW and CSPA strongly recommend that PG&E undertake a voluntary action to create a spring recession flow on Poe, should a new license for the project not issue prior to the spring of 2012.

Thank you for the opportunity to comment on the recent mortality of foothill yellow-legged frog on the Poe reach of the North Fork Feather River. Please don't hesitate to contact us if you have any questions.

Respectfully submitted,

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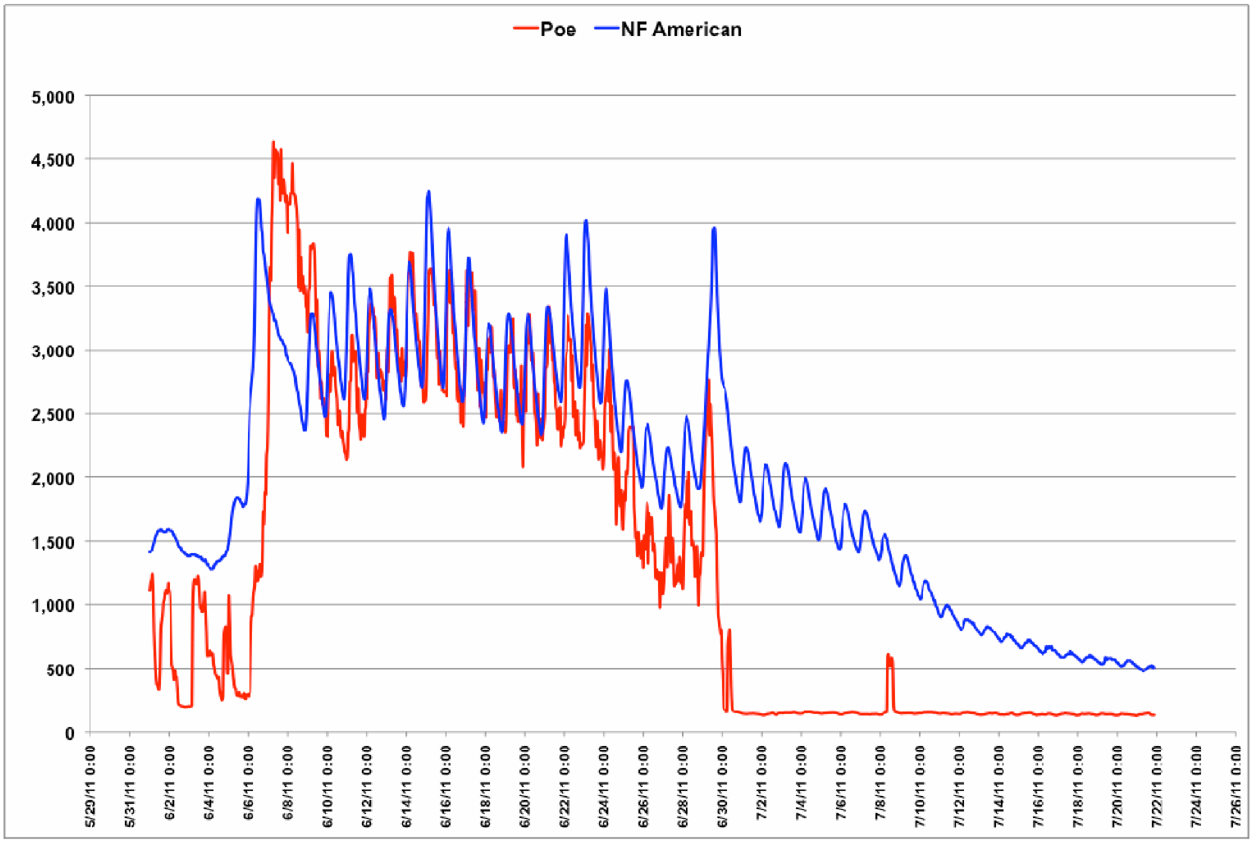
P-2107-016 Service List

Attachment 1:

Hydrograph of NF Feather Poe Reach May 29 – July 22, 2011, with Comparison Hydrograph from Nearby Unimpaired North Fork American



Certificate of Service

I hereby certify that I have served this comment letter July 29, 2011 on the mortality of foothill yellow-legged frogs on the Poe reach of the North Fork Feather River to the official service list for the relicensing proceeding of the Poe Project, FERC Docket 2107-016.

Carla Miner

Carla Miner, Stewardship Assistant
American Whitewater

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