February 9, 2009

COMMENTS ON REVISED STUDY PLANS
DRUM-SPAULDING PROJECT # 2310
AND YUBA-BEAR PROJECT # 2266

Via Electronic Submittal

Hon. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Dear Secretary Bose:

On January 23, 2009, Pacific Gas and Electric Company (PG&E) and Nevada Irrigation District (NID) issued their Revised Study Plans pursuant to the Integrated Licensing Process (ILP) for relicensing the Drum-Spaulding and Yuba-Bear (Projects), FERC #2310 and # 2266 respectively. These comments are being filed to meet the deadline of February 9, 2009 established by the Federal Energy Regulatory Commission (Commission).

Foothills Water Network
This response was jointly developed and signed by non-governmental organizations and by individuals participating in the Drum-Spaulding and Yuba-Bear Relicensings. The Foothills Water Network represents a broad group of non-governmental organizations and water resource stakeholders in the Yuba, Bear, and American Watersheds. The overall goal of the Foothills Water Network is to provide a forum that increases the effectiveness of non-profit conservation organizations to achieve river and watershed restoration and protection benefits for the Yuba, Bear, and American Rivers. This includes negotiations at the county, state, and federal levels, with an immediate focus on the FERC relicensing processes.

This document is organized in the following manner:

1 COLLABORATIVE STUDY DEVELOPMENT

In general, the Foothills Water Network and its members consider the licensee's Study Plan development process to be collaborative and based on consensus between stakeholders. We applaud PG&E and NID for starting well before the ILP process required in order to ensure that priority study plans could be implemented in the summer field season of 2008. In many cases, we have been able to come to consensus on Study Plans with the licensees, resource agencies, and tribes. However, certain study elements requested by the non-governmental organizations and other stakeholders have not been incorporated into the licensees' Study Plan. These will be addressed below.

2 CONSENSUS ON SELECT STUDY PLANS

The Foothills Water Network and its members have participated in the consensus-based process to collaborate on study plans in the PG&E and NID relicensing process. We have been party to consensus-based agreements on the following studies. We agree with the licensees that the following studies included in the licensees' Revised Study Plan Comments submitted on January 23, 2009 have reached a "can you live with it" threshold by Relicensing Participants.

1. Water Quality
2. Water Temperature Monitoring
3. Stream Fish Populations
4. Instream Flow
5. Special-Status Amphibians - Foothill Yellow-Legged Frog Surveys
6. Special-Status Reptiles – Western Pond Turtle
7. Special-Status Mollusks
8. Special-Status Wildlife – California Wildlife Habitat Relationships
9. Special-Status Plants
10. ESA-Listed Amphibians – California Red-Legged Frog
11. ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle
12. ESA-Listed Plants
13. CESA-Listed and Fully Protected Wildlife – California Wildlife Habitat Relationships
14. CESA-Listed and Fully Protected Wildlife – Bald Eagle
15. CESA-Listed Plants
16. Recreation Flow
17. Recreation Use and Visitor Surveys
18. Historic Properties
19. Sierra Nevada Yellow Legged Frog
20. Reservoir Fish
21. Bioaccumulation
22. Macroinvertebrates
23. Fish Passage
24. Bats
25. Wildlife

Unfortunately, the Foothills Water Network does not agree with the licensees that the following study has reached a collaborative agreement:

- Native American Traditional Cultural Properties Study

The Foothills Water Network agreed to withdraw its initial request on August 11, 2008 for the following study:

- Bioenergetics

2.1 Interpretation of Study Results

It should be noted that the consensus to move forward with the above listed Study Plans does not affirm the accuracy of any conclusions drawn or interpretations made in those studies. The Foothills Water Network assumes that the collaborative approach that has been developed during the Study Planning phase of the Relicensings will continue, and that it and its members, along with other Relicensing participants, will participate actively in reviewing study results, conclusions and interpretations.

3 DEFICIENT REVISED STUDY PLANS PROPOSED BY LICENSEES

This section summarizes the Foothills Water Network's review of the following study plans addressed in the Revised Study Plan filed by PG&E and NID on January 23, 2009. This review is based on the ILP's seven study criteria. The studies addressed are:

- Native American Traditional Cultural Properties
- Channel Morphology
- Entrainment
- Habitat Suitability Criteria
- Hydrologic Alteration
- Water Temperature Modeling
- Western Placer Creeks (filed by PG&E only)
- Wetlands
- Anadromous Ecosystem Effects Study
- Water Use and Efficiency Study
- Periphyton / Algae

We note that the joint resource agencies (U.S. Forest Service, Bureau of Land Management, National Park Service, California Department of Fish and Game; collectively, "agencies" or "resource agencies") are also submitting Comments on the licensees' Revised Study Plans, in which the agencies directly address the ILP's seven study criteria in regards to those studies. The Foothills Water Network supports the agencies and defers to their comments for a detailed explanation of how proposed modifications to study plans meet the seven criteria. Our general comments below are supplemental to our support of agency modifications. These comments are intended to bring focus to issues critical to our interests, and especially to provide additional clarity regarding disputed portions of respective study plans.

4 REQUEST FOR MODIFICATIONS OF INITIAL STUDY PLANS

There are five studies for which the Foothills Water Network is requesting additional modification since their initial submission by the resource agencies on December 19, 2008. With the exception of our request for extension of the HEC-ResSim water balance model under "4.4 Anadromous Ecosystem Effects," our modification requests coincide with the resource agencies' same requests for these study modifications.

The general concepts for the study modifications are briefly listed below.

4.1 Additional Elements for Entrainment and Water Temperature Modeling Study to Address NID's Proposed Upgrade of Rollins Powerhouse

FWN supports the resource agency request for the addition of study elements in the Entrainment and Water Temperature Modeling Study to address the impacts of NID's newly proposed upgrade at Rollins Powerhouse. The resource agencies have outlined these additional study elements in detail in their Comments on licensees' Revised Study Plan. By reference, we are making a request for the same study plan modifications to address information needs for the NID proposed upgrade.

In addition, we support PG&E's request to NID for more information on its Rollins Powerhouse Upgrade (PG&E Comment on NID Revised Study Plan February 2, 2009) to inform the Entrainment Study. However, we also add that NID should produce the requested information in a timely manner so as not to unduly delay the study, which is scheduled to start in summer field season 2009.

4.2 West Placer Creek Study Modifications

The Foothills Water Network requests to modify the West Placer Creek Study because the resource agencies made some mistakes in the earlier version.

Please see the section below on West Placer Creek Study. The fully modified study can be found in the Joint Agencies filing for February 9, 2009.

4.3 Hydrologic Alteration Study Modification

In summary, FWN requests that the Hydrologic Alteration Study include quantification of the extent of historic ramping rates downstream of Spaulding Reservoir and Milton Diversion. For more information on the rationale behind this requested modification, please see our comments below on the IHA Study. The fully modified study can be found in the Joint Agencies filing for February 9, 2009.

4.4 Anadromous Ecosystem Effects Study

FWN requests that the National Marine Fisheries Service's Anadromous Ecosystem Effects Study be replaced by an extension of the licensee-developed HEC-ResSim water balance model to include the lower reaches of the South Yuba, Middle Yuba and mainstem Yuba Rivers. For more information and specific recommendations, please see the section on Anadromous Effects Study.

5 GENERAL COMMENTS ON LICENSEES' APPROACH RESPONDING TO RELICENSING PARTICIPANTS' COMMENTS

5.1 References to the CFR

Licensees and their consultant Devine Tarbell & Associates (DTA) both in comments and in practice have sought to establish a *de facto* requirement that every step in each Study Plan must explicitly reference a corresponding criterion from the Seven Study Plan Criteria in the CFR 18, § 5.9(b). There is absolutely nothing in the CFR that requires this. We maintain that, as opposed to this formalism, it is up to Commission staff to rule based

an overall determination of whether or not a study proposal essentially fulfills the congressional intent of the CFR. FWN also reminds the Commission that the question is not, formalistically, which study proposal best conforms to the seven criteria. This formulation threatens to reduce the CFR to a filter, which excludes valid studies for lack of explicit reference to the CFR. Rather, the issue is, and must be, whether a study plan presents a study that provides the soundest and most reasonable basis from which to make resource management decisions.

5.2 Licensees Dismiss Essential Study Issues as PM&E Requests

In addition, there is a frequent pattern in licensees' comments regarding requested information or tools that might be used to develop license conditions, in which licensees and their consultant claim that participants are asking for a PM&E measure. When Participants pose a potential future scenario to illustrate the need for a particular study element, the licensees and their consultant claim that the discussion is "pre-decisional." When participants do not describe how a study might be used, licensees and their consultant reply that a proposal lacks specificity and fails to explain how it would inform license requirements. FWN opposes this circular logic, and believes that what is really taking place is a pre-emptive attempt to exclude anticipated license conditions that licensees might find disagreeable, using a formalistic application of the seven study criteria. For example, please see licensees NID and PG&E's joint response in FWN-23.

6 GENERAL COMMENT ON ILP PROCESS

FWN found that the 15 days allotted to respond to PG&E and NID's Revised Study Plans was not adequate, considering the sheer quantity of information, modifications, argument, and documents involved in the exercise. Licensees PG&E and NID's document responding to relicensing participants' comments on study plans is 60 pages, plus Attachments for PG&E and NID of 436 and 435 pages respectively. On top of that were 237 pages of red-line version of studies. This magnitude of documentation did not even address approximately 20 studies whose disposition had already been resolved through collaborative agreement. Given that the Drum-Spaulding / Yuba-Bear combined relicensings are, by most accounts, the most complex relicensings in the United States, FERC should allow more time than 15 days to review and comment on a response of this magnitude. We look forward to working with FERC on future timelines that can more appropriately encompass the activities required.

7 NATIVE AMERICAN TRADITIONAL CULTURAL PROPERTIES

FWN supports the Comments by the Cultural Team (representing numerous tribal participants) submitted for the February 9, 2009 deadline.

The Cultural Team has submitted the Alternative Native American Traditional Cultural Properties Study Plan, which is concerned with recording the places, events, and stories in the study area that help document, promote, and restore traditional cultural values and property, including salmonids that are affected by continued and previous operations and maintenance of these projects.

Should a "waterscape" be identified and found to be eligible for the National Register, studies can determine the effects of the relicensing (past and present) on this traditional cultural landscape. Effects can be obstruction to fish passage, alterations in water quality, quantity, temperature, and flow regime that affect fish, plant life, habitat, and human use of the waterways, and erosion of significant cultural sites. The reason these effects are considered is because they alter the way in which the tribes use the river and its resources.

For more information concerning salmon as a traditional cultural property, please see Appendix A: Historical Report of Salmon in the Yuba Watershed.

8 CHANNEL MORPHOLOGY

FWN requests the resource agencies' study plan as submitted for the February 9, 2009 deadline be accepted by the licensees and FERC for implementation in PG&E and NID's relicensing proceedings.

FWN stated in its Comments for the December 24, 2008 filing,

> An additional goal of the study should be to collect information regarding the history of human activity during the license period that could reasonably be thought to have permanently altered the geomorphology of stream reaches. These activities include flow alteration, cattle grazing, logging, OHV use, etc.

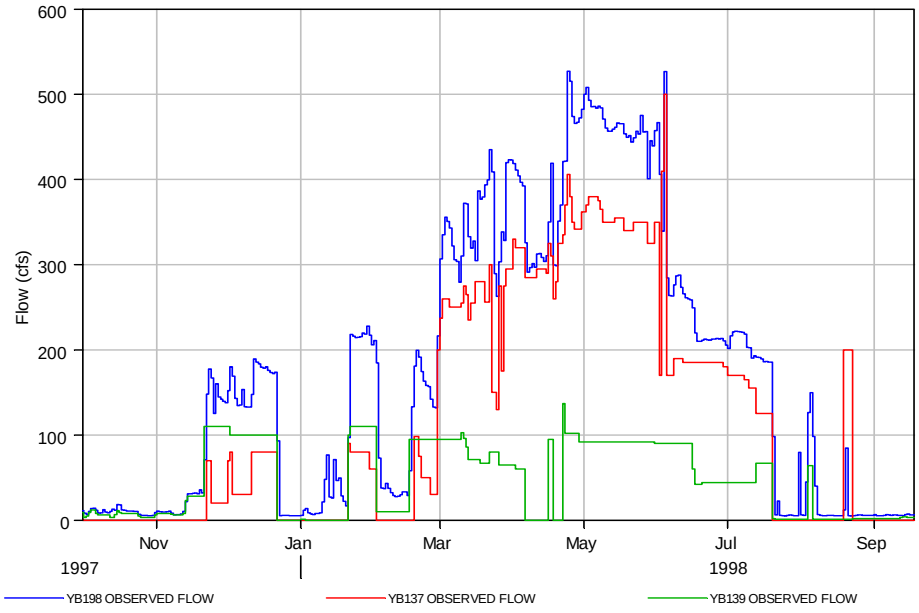
In response, the Licensee PG&E states: "…Licensee has no control over these activities." Presumably, this statement is intended to refer to the last sentence in the above quoted FWN Comments.

FWN believes that that there are cases where landowner, licensee PG&E, does have control of these activities, such as flow alteration, cattle grazing, and logging, as illustrated below.

8.1 Flow Alteration

The following graph, from the Licensees' hydrology, illustrates the Bear River through the Bear Valley in blue, and the two primary sources of water for this reach: Water from the Drum Canal in red, and water from the South Yuba Canal in green.

The natural drainage above YB198 is a few hundred acres, and produces very little runoff. The graphic below illustrates that the Projects are responsible for virtually all of the flow through the Bear Valley.



8.2 Cattle Grazing

PG&E leased the Bear Valley for cattle grazing during the first 30 years of the license period, from 1963 to 1993, and so had total "control over these activities". The first letter below, which terminates a grazing lease that PG&E had with a cattle operation in the Bear Valley, illustrates this point. Presumably the Bear Valley cattle lease was terminated as part of an agreement between PG&E and CDFG, as mentioned in the second letter partially reproduced below.

May 11, 1993

Mr. Stanley L. Van Vleck
7879 Van Vleck Road
Rancho Murieta, CA 95683

Dear Stan:

Last week I talked with you about renewing your lease at Bear Valley; since that time I have received new directions from our Management.

Management has decided to remove the Bear Valley area from leasing. At the end of your current term, May 31, 1993, the area will be closed to leasing.

I'm sorry if this decision causes you any inconvenience. It has been a pleasure working with you all these years and I hope we will be able to work together again someday.

If you have any questions regarding the lease, please phone me at (916) 889-3131.

Sincerely,

Edward E. Lehman
Division Land Supervisor

cc: Ron Battles
Curtis Fulks
Greg Johnston
Milt McLellan

Pacific Gas and Electric Company

FILED
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95 MAR -2 PM 2:45
FEDERAL ENERGY
REGULATORY
COMMISSION

March 1, 1995

Ms. Lois Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street, N.E.
Mail Code: DCPA, HL-21.3
Washington, DC 20426

Dear Ms. Cashell:

Drum-Spaulding Project - FERC No. 2310
Water Temperature Monitoring Plan

The CDF&G made two recommendations in its February 3, 1995 letter (see Attachment 2), which will probably enhance aquatic habitat, including water temperatures, in the subject river reach over time: 1) initiation of a permanent exclusion of all livestock grazing within the riparian buffer zone along the river in Bear Valley and 2) PG&E participation in an Memorandum of Understanding with CDF&G for continued cooperation regarding the ongoing Fisheries Habitat Restoration Plan for Bear Valley. PG&E has agreed to these recommendations in a letter to CDF&G, dated February 28, 1995 (see Attachment 3).

8.3 Logging

In addition to the cattle grazing, Licensee PG&E has proposed a Timber Harvest Plan (THP) for three years of logging in the area from Drum Forebay to Bear Valley, north of Interstate 80 and west of Highway 20 in Placer and Nevada Counties. The boundaries include much of the Bear watershed and, specifically, the lands adjacent to and downstream of the Bear Valley. The timing of the proposed logging coincides with the three study field seasons for the relicensing, which could affect the study results in terms of fauna and water quality. The proposed mitigation is limited to removing existing culverts from logging roads and replacing them with cobble.

Licensee PG&E should be required to provide existing information to FERC regarding the extent and impacts of the THP and to modify or abandon the THP if there is a reasonable possibility that the harvest will affect the relicensing studies.

The boundaries of the PG&E THP are illustrated in Appendix C: PG&E THP, submitted with this document.

8.4 Existing Information Should Be Produced

The existing information on PG&E's cattle grazing and logging activities have not been provided in the PAD and should be included in the existing information for the Geomorphology Study as per CFR 5.9b(3), which requires the licensee to "Describe

existing information concerning the subject of the study proposal, and the need for additional information".

Moreover, the existing information provided should include the agreement "for continued cooperation regarding the ongoing Fisheries Habitat Restoration Plan for Bear Valley," and should indicate whether the agreement is still in effect.

9 FISH ENTRAINMENT

FWN requests that the resource agencies' study plan as modified and submitted for the February 9, 2009 deadline be accepted by the licensees and FERC for implementation in PG&E and NID's relicensing proceedings. FWN also supports the resource agency request for the addition of study elements in the Entrainment and Water Temperature Modeling Study to address the impacts of NID's newly proposed upgrade at Rollins Powerhouse. The resource agencies have outlined these additional study elements in detail in their Comments on Licensees' Revised Study Plan. By reference, we are making a request for the same study plan modifications to address information needs for the NID proposed upgrade.

In addition, FWN offers the following comment on Joint Agencies-59b:
Licensee PG&E proposes to conduct electrofishing surveys in the Bear River Canal instead of physically measuring the number of fish that actually enter the canal. This type of survey can be subjected to endless interpretation and controversy. It poses questions such as: Does the relative absence of species other than trout show that entrainment from Rollins Reservoir is limited, as PG&E has speculated? Or does it mean that non-trout species are killed, and thus increase the need to mitigate? And so forth.

As has been shown in the recent relicensing of the DeSabla – Centerville Project, there is no substitute for physically quantifying the fish that enter into a project canal. In spite of the difficulty of physically measuring entrainment into the Bear River Canal, the effort needs to be made.

PG&E contends that some of the fish may have been in the canal already, and that an entrainment study that looks at the Rollins Powerhouse tailrace would have difficulty distinguishing between fish living in the canal and fish entrained through Rollins Powerhouse. FWN replies that, unless PG&E can produce documentation of having planted fish in the Bear River Canal, none of those fish belong there, and there is effectively no difference between recent arrivals and canal veterans. The state's public trust fishery resources do not belong in canals. For the record, FWN explicitly cites, per Criterion 3, that it is in the public interest to keep public fishery resources out of canals. We further note that it makes no difference whether fish were entrained yesterday, or whether they are the progeny of public trust resources that were entrained five years ago. They don't belong in canals - Period. Entrainment needs to be prevented, or if not preventable, mitigated.

10 HABITAT SUITABILITY CURVES

FWN requests the resource agencies' study plan as submitted for the February 9, 2009 deadline be accepted by the licensees and FERC for implementation in PG&E and NID's relicensing proceedings.

11 HYDROLOGIC ALTERATION

FWN requests the resource agencies' study plan as modified and submitted for the February 9, 2009 deadline be accepted by the licensees and FERC for implementation in PG&E and NID's relicensing proceedings.

11.1 Environmental Flow Conditions

Licensees and other relicensing participants continue to differ on this study in regards to the Environmental Flow Component (EFC) of the Nature Conservancy's Indices of Hydrologic Alteration (IHA). Licensees do not want to report the IHA output of the EFC component; other participants want the output reported.

FWN has reviewed licensees' comments regarding the alleged failure of the EFC component of IHA to live up to Criterion 6 of the study plan criteria (see PG&E response Joint Agencies-269). FWN responds that licensees' ostensibly scientific critique of the EFC is based on a single limited interpretation of the relative value of the EFC component of IHA when compared to a USGS software package, in the context of a specific application in Texas (see Hersh and Maidment 2006). Against this single analysis made in 2006 in order to decide on the best tool for a statewide mandate relating to major Texas watersheds, licensees and their consultant argue that use of the EFC in relicensings in California, more recent than the cited document, should be considered less demonstrative of accepted scientific practice.

Licensees' argument runs that default categories can not accurately represent specific hydrology; but wait, the defaults can be changed; but wait, the setting can be "somewhat subjective;" but wait, even if adjusted, the categories can be "problematic;" but wait, flows can be incorrectly categorized. Now wait some more: It may all be too complex to help in the development of flow regimes.

In fact, the reviewer from Texas is less harsh that licensees and their consultant make him out to be:

> If the task of choosing between the two programs is framed as the question of which tool better characterizes streamflow hydrographs in general, then there is little difference between these two packages. But if the task of choosing between them is framed more narrowly as the question of which program will best support the four- level flow characterization (subsistence flow, base flow, high flow pulses, and overbank flows) of the Texas Instream Flow Program, then the HAT program is a better choice than IHA as it allows for more flexibility in the determination of flow component thresholds and greater capacity for regionalization (Hersh and Maidment, 2006, pp.74-5).

In short, the reviewers did not question the scientific validity of the EFC in the IHA program, but rather its applicability to a specific situation. Licensees, however, mention no site-specific issue and have suggested no particular parameters or thresholds that are inappropriate in the present project area.

Licensees and their consultant have simply gone on a fishing expedition to avoid confronting an output they may not like from an off-the-shelf computer program. They are free to change defaults, offer a rationale, and make their argument. They are free, as suggested in the FWN comments of December 24, 2008, to make their best argument in any case. However, their attempt to discredit software based on one review whose analysis is poorly interpreted is unconvincing, and should not be allowed by the Commission to entirely discredit the EFC software.

11.2 Ramping Rate Analysis

In their Revised Study Plan, licensees have suddenly proposed to exclude ramping rate analysis below Spaulding Reservoir, in spite of the fact that this was explicitly agreed to by relicensing participants. In addition, licensees state that gauge data to support ramping rate analysis of the Middle Yuba below Jackson Meadows Reservoir is not available, and therefore propose excluding ramping rate analysis on the Middle Yuba as well.

In PG&E and NID responses Joint Agencies-266, licensees raise an objection to the first step in section 6.3 Study Methods (Joint Agency filing December 19, 2008, p. 264), which reads as follows:

> Step 1 - Ramping Rates at Select Conveyance Reaches. Licensees will analyze 15-minute data at the following locations, downstream of Yuba-Bear Hydroelectric Project and Drum-Spaulding Project dams or facilities, where large discretionary increases or decreases in instream flow are common for downstream conveyance of water:
>
> • Middle Yuba River below Jackson Meadows Dam (NID)
> • Fordyce Creek below Fordyce Dam (PG&E)
> • South Yuba below Spaulding Dam (PG&E)
> • Bear River below Drum Canal and South Yuba Canal waste gates (PG&E)26 (see above: Bear River below Highway 20 (USGS 11421710 (YB-198))
>
> A minimum, median and maximum ramping rate in both cfs per hour and feet per hour (as measured at the stream gage cross-section) will be calculated using at least 10 discretionary up-ramps and down-ramps at each location as observed during the Period of Record.

However, in response to the mislabeling of the South Yuba as a conveyance reach, licensees have responded by inappropriately seeking to eliminate the reach from analysis:

> Joint Agencies-266: Adopted With Modification. Because South Yuba below Spaulding Dam is not used as a "conveyance reach", the joint agencies' inclusion of this reach in this section is incorrect. Licensee notes also that this location is included as an analysis location in Step 2, Spill Cataloging, which licensee believes will provide the needed additional information at this location regarding spills, and that this information will inform license requirements. Additionally, this ramping rates analysis is intended to examine discretionary increases and decreases in flows where information on ramping rates might inform license conditions. Flows in the South Yuba downstream of Spaulding Reservoir consist generally of relatively constant instream flow releases or spills that are not discretionary and where licensee cannot control ramping rates. Thus, a ramping rate analysis at this location would not provide data that would inform license conditions, and the USFS, BLM, NPS and CDFG request does not meet FERC's Study Criterion 5.9(b)(5).

In addition, licensees respond to the lack of data in the Jackson Meadows Dam Reach of the Middle Yuba by inappropriately seeking to eliminate the Middle Yuba from ramping rate analysis as well:

> **Joint Agencies-266a:** Adopted With Modification. Due to the lack of data at one of the requested locations for the Yuba-Bear Hydroelectric Project, NID believe the agencies' request for this analysis at the Middle Yuba River below Jackson Meadows Dam is inconsistent with generally accepted scientific practice and therefore does not comply with FERC's Study Criterion 5.9(b)(6). The gage downstream of Jackson Meadows Dam is primarily used for low-flow compliance purposes and does not record spills, and therefore no data on spills are available to use for the ramping-rate analysis at this location. Note that this location was included in error in Licensee's Proposed Study Plan, filed with FERC on September 25, 2008; the study proposal included in Section 2 of the Revised Study Plan corrects this error, and this location is no longer included in the ramping rate analysis. NID also advised the agencies of this error.

Though the Section 6.3, Step 1 of the Joint Agencies' proposed study December 19, 2008 stated the agencies' interest as the characterization of ramping rates in conveyance reaches, this description by the agencies was mistakenly limited. The intent of this section is also to determine the existing ramping procedures below certain major dams associated with these projects, whether or not the reaches downstream are "conveyance reaches."

FWN strongly disagrees with PG&E's assertion that it has no control over spills and ramping rates at Spaulding Reservoir.

As suggested in the PAD and in a presentation to relicensing participants by PG&E's project operator, the licensee is able to, and routinely does, control rates of spill and ramping rates to some degree through variable operation of radial arm spill gates (at Spaulding Reservoir), or by pre-releasing water that is destined to spill, thereby providing

enough freeboard to buffer unforeseeable flow events. These alternatives could lead to a combination of operational changes that would be more protective of downstream resources than current operations. However, if licensee PG&E is not able to operate within acceptable ranges of impact to downstream resources, more extensive changes, such as facility modifications, may be required.

FWN believes that pre-releasing water that is destined to spill from Jackson Meadows Dam is also a management tool that is available to NID to prevent a cascading spill into the Middle Yuba over Milton Diversion.

FWN therefore suggests that the licensees' version of the above-cited Step 1 of the Study Methods be edited as appears in the Joint Agencies modified Hydrologic Alteration Study Plan submission for the February 9, 2009 deadline below [strikethrough and red font indicate agencies' edits]:

> **6.3 Study Methods**
> The study will be completed in six steps, each of which is described below.
>
> Step 1 - Ramping Rates at Select Project ~~Conveyance~~ Reaches below major dams. Licensees will analyze 15-minute data at the following locations, downstream of Yuba-Bear Hydroelectric Project and Drum-Spaulding Project dams or facilities, where large discretionary increases or decreases in instream flow are common ~~for downstream conveyance of water~~:
>
> Middle Yuba River below ~~Jackson Meadows~~ Milton Dam (NID)
> Fordyce Creek below Fordyce Dam (PG&E)
> South Yuba below Spaulding Dam (PG&E)
> Bear River below Drum Canal and South Yuba Canal waste gates (PG&E)[1] (see above: Bear River below Highway 20 (USGS 11421710 (YB-198))
>
> A minimum, median and maximum ramping rate in both cfs per hour and feet per hour (as measured at the stream gage cross-section) will be calculated using at least 10 up-ramps and down-ramps (utilizing discretionary releases but non-discretionary releases may be included if needed to achieve 10 events) at each location as observed during the Period of Record.

12 WATER TEMPERATURE MODELING

Joint resource agencies have responded to licensees regarding this study plan, and have somewhat modified their proposal for Fordyce and Jackson Meadows Reservoir. FWN requests the resource agencies' study plan as modified and submitted for the February 9, 2009 deadline be accepted by the licensees and FERC for implementation in PG&E and NID's relicensing proceedings.

[1] 15-minute data are available for the YB-198 gage (USGS 11421710, Bear R nr Emigrant Gap CA) located near Highway 20. Although PG&E maintains gages at the waste gate facilities upstream of this location, 15-minute data are not available for those gages. Ramping Rate analysis will be performed for this location using the available YB-198 gage 15-minute data.

FWN believes that the agencies' reply to licensees is particularly well stated, and supports both the analysis and the conclusions.

In addition, FWN wishes to provide the following responses to licensees' comments:

In PG&E's response FWN-23, licensee claims that FWN's emphatic statement of its interest in its December 24, 2008 comments is a request for "a PM&E measure."

On the contrary, FWN first answers Criterion 3: it is in the public interest to maintain cold freshwater habitat, and it is in the public interest to provide the habitat to restore fisheries, and particularly anadromous fisheries, in the Middle and South Yuba Rivers, in the Bear River, and in West Placer Creeks.

It is also a response to Criterion 7: because of the critical nature of the interest that is at stake in the results of this study, and in light of licensee NID's admitted agreement that its proposed spreadsheet evaluation will not model the thermodynamics or hydrodynamics of Bowman, Jackson Meadows or Rollins reservoirs, the cost savings of the untested and unproven spreadsheet models is not worth the reduction in the quality of information that it would present in comparison with a CE-QUAL model. The difference between a CE-QUAL Model and a spreadsheet analysis is not simply an incremental matter; rather, it is a qualitative difference.

In PG&E response Joint Agencies-25, licensee makes an overarching argument that Bowman, Jackson Meadows, Fordyce and Rollins Reservoirs are simply too small to be worthy of hydrodynamic and thermodynamic modeling. This argument is contrary to a large body of temperature profile data collected over four years that indicates these reservoirs store as much as 100,000 acre feet of cold water in the early summer, and that inflows and outflows, particularly in Bowman Reservoir, alter and diminish the cold water pool in complex ways. FWN reminds the licensees and the Commission that the relative importance of temperature control within the Yuba-Bear/Drum-Spaulding projects must be considered in regards to the site-specific conditions within the combined projects that are undergoing relicensing.

The Licensees owe it to their stakeholders, stockholders and ratepayers to understand the potential economic value, in the future, of cold water. Once a working temperature model has been created and calibrated, it can be combined with the HEC-ResSim Water Balance Model to evaluate the downstream cooling effectiveness of releasing various flows at various temperatures, and to evaluate the corresponding costs of various flows. FWN strongly believes the potential value of effectively managing cold water makes the development of a sophisticated temperature modeling tool extremely cost-effective. It is likely the temperature model will find that the value of 50° F water, compared to 55° F water, is so great over the license period that the cost of building reservoir models to help manage and distribute the cold water to best effect will be insignificant by comparison.

Regarding licensee's discussion of the Upper American River Project (UARP), FWN points out that the referenced Union Valley Reservoir contains storage roughly equivalent

to all four of the contested storage reservoirs in this proceeding, that there was no problem in the UARP relicensing with lack of cold water available in reservoirs that would have affected licensee SMUD's ability to supply cold water to stream reaches (willingness to supply cold water in sufficient quantity to keep it cold in the stream reaches was a different issue), and that some of the debate in setting streamflows for that project centered around the fact that water might be too cold in some of the lower elevation stream reaches. As FWN discussed in its December 24, 2008 comments, the very lack of storage in the combined Yuba-Bear/Drum-Spaulding projects increases rather than decreases the need for careful management of available cold water resources.

Licensee NID, as cited in PG&E reply Joint Agencies-25, suggests that resource agencies have not set forth a management goal that would explain the need for understanding and managing cold water in the four reservoirs in question. This is shockingly disingenuous. FWN pointed out its interest in restored anadromy in the Middle Yuba, South Yuba, Bear and West Placer Creeks in our recent comments December 24, 2008, and licensee NID dismissed it as a PM&E measure.

> For many FWN members, a major goal of the relicensing process is to ensure the provision of habitat suitable for anadromous fish habitat (salmon and steelhead), allowing the possibility of future restoration. Others see the issue simply as a matter of providing habitat according to the California Central Valley Regional Water Quality Control Board's Basin Plan. Whether it be for resident trout or for anadromous fish, cold water is the key to restoring fisheries. (Foothills Water Network Comments on Yuba-Bear / Drum Spaulding Study Plans December 24, 2008)

FWN believes that NMFS has the same goal. This is shown by NMFS's ongoing, funded study currently underway to investigate passage options past Englebright Reservoir on the Lower Yuba River. Moreover, FWN believes that the forthcoming NMFS Biological Opinion for salmon, steelhead and green sturgeon for the Operations and Criteria Plan for the CVP and SWP will recommend as a Reasonable and Prudent Alternative immediate efforts to restore anadromy upstream of Central Valley rim dams, and that restored anadromy in the Yuba watershed upstream of Englebright Reservoir will be at or near the top of the list. (FWN will be pleased to forward to the Commission a copy of this BiOp as part of the record in this proceeding just as soon as the BiOp is available; release is expected in early March 2009).

Moreover, conformance with the Central Valley Basin Plan (of the Central Valley Regional Water Quality Control Board) is a requirement for existing conditions that, in answer to licensees' response, is hereby noted for the record. We note that we also referenced this Basin Plan explicitly in our December 24, 2008 comments (page 11). The Middle and South Yuba rivers all the way down to Englebright Reservoir are listed by the Regional Board as cold freshwater habitat. The Basin Plan is not a PM&E; it is the law. Discussing a future in which more and colder water will be released to the rivers below reservoirs in order to comply with the Basin Plan is not "pre-decisional." Rather, it is a discussion regarding how the licensees will comply with a law that has been on the books

during most of the term of the current license. (As an example of such a discussion, see the above discussion of the economics of cold water)

In Joint Agencies-25, licensee NID cites the fact that water temperature patterns in Jackson Meadows, Bowman, and Rollins Reservoirs are remarkably the same year after year and therefore, do not need the high-level modeling effort. The problem is that they are generally operated in the same way year after year; what the proposed spreadsheet analysis cannot capture, as admitted by licensees, is how temperature in these reservoirs might change under differing operating scenarios. NID also cites the fact that for water supply purposes the operation of Jackson Meadows and Bowman reservoirs is "particularly limited." In combination with the acknowledged small amount of storage in the overall YBDS system, FWN maintains that in so stating NID has just made an excellent argument for sophisticated and powerful tools to model cold water availability and options within the combined projects.

13 WEST PLACER CREEKS

Licensee PG&E has submitted a revised study proposal for West Placer Creeks that is largely the same as the study proposal it submitted in its first Proposed Study Plan in September 2008.

FWN believes that the study proposal for West Placer Creeks that was submitted by the joint resource agencies on December 19, 2008, is the better study proposal, that it gathers necessary and better evidence than that which is proposed in PG&E's study proposal, that it meets the seven study plan criteria, and that it should be adopted by the Commission, as modified by the Joint Agencies and submitted in their February 9, 2009 filing.

13.1 Auburn Ravine Flow Analysis and Lower Auburn Ravine IFIM

In its comment Joint Agencies-79, licensee PG&E states that licensees have already provided extensive gage data for Auburn Ravine in the PAD. However, licensee data provided on CD in the PAD's Appendix H ends in 2004, is not year-round for many of the gages, has numerous other gaps, is mean daily not hourly, and has as its downstream-most point a gage near Highway 65 in Lincoln. (If there is other relevant gage data for Auburn Ravine provided in the PAD, licensee should specify its location within the PAD).

Licensee PG&E continues that it does not have access to all gage data, is not responsible for many gages, and that an integrated presentation of gage data for Auburn Ravine would be more appropriate for an Integrated Regional Water Management Process.

Furthermore, licensee PG&E contends in its proposed study (page 1), that its Project is not "an essential cause of any adverse flow-related effects" in Lower Auburn Ravine and other West Placer streams. However, even the limited gage data provided by licensee, which shows no flow or almost no flow in Auburn Ravine in the autumn of some years, suggests differently. We believe that these periods of little or no flow correspond to licensee's outage period, and that at least for this period PG&E's effect is absolutely

essential and absolutely adverse in that it appears to have de-watered or very nearly de-watered Auburn Ravine during the outage periods. We believe that an integrated presentation of gage data is precisely what is needed to quantify the effects of the Project, and that is exactly what agencies proposed in the Flow Analysis portion of the study proposal for Auburn Ravine.

Licensee should not make a statement that is not supported by substantial evidence and then say that it is too difficult to produce the evidence. Licensee should also produce best evidence, including:

- Complete gage data.
- Data that is on an hourly time-step considering the likelihood of brief unplanned outages and the potential fatality to aquatic organisms from being de-watered for periods considerably shorter that a day.
- Up-to-date data that captures recent operation, especially under two years and possibly more of dry conditions.
- Gage data that measures effects as far downstream as possible, since there is often no natural side-stream or return water inflow to Auburn Ravine in dry autumns. Just because an action does not de-water a portion of river further upstream does not mean that the action does not have serious consequences downstream. We note that a stream at very low flow can be de-watered by natural processes, by reduction of flow so that one branch of a split channel is dewatered, or by seepage of water into subterranean flow. We also note that the gage date for the downstream–most point (near Highway 65 at Lincoln) in data provided in the PAD ends in early October for each year, before the typical outage period.

On a repeated basis, both licensees, NID and PG&E, maintain that because water may be added or removed by other parties (including NID itself, but with its Consumptive Water Supply purposes rather than for hydropower), the limit of project effects and appropriate area for study should end at that river mile where another party may make a substantial discharge or diversion from the affected water body. For example, in footnote 3 at the bottom of page 1 of PG&E's West Placer County Streams study proposal (January, 2009), licensee states:

> "The City of Auburn discharges water from their Waste Water Treatment Plant into Auburn Ravine at RM 27. Because the capacity of PCWA's Auburn Tunnel discharge can be much greater than the City of Auburn's discharge, Licensee designated RM 26.4 as the downstream extent of the directly-affected section of Auburn Ravine."

FWN notes that in the hydrology for Auburn Ravine in PAD Appendix H, water from PCWA's Auburn Tunnel in Water Years 1999-2004 was discharged into Auburn Ravine beginning as early as May and as late as July, and ending in no year later than mid-September. From mid-September through the following late spring or early summer, Auburn Tunnel does not determine the flows in Auburn Ravine, and for that time period at least does nothing to limit the effects of PG&E's Project on Auburn Ravine. It is clear

that it is not merely a question of plumbing or geography that determines the extent of direct effects of the Drum-Spaulding Project on Auburn Ravine: it is also a question of timing.

How flows and related effects change over time is perhaps the single most important element that the joint agency West Placer Creeks Study, Flow Analysis for Auburn Ravine seeks to clarify and quantify.

PG&E states, in Joint Agencies-74, that "PG&E believes that integrated presentation analysis of the data for the whole watershed in many cases is unrelated to the Project." PG&E needs to state more than its belief. It needs to show evidence of what effects it has or does not have, and this is the intent of the proposed study. Based on limited evidence, we have just shown that for 8-10 months of the year PG&E may have direct effects on Auburn Ravine downstream of PCWA's Auburn Tunnel. It is not unreasonable to ask for the information that will complete the picture.

PG&E further states in the same response that this evidence "will not help inform license conditions". On the contrary, we think PG&E is responsible for maintaining the aquatic ecosystem downstream of Wise Powerhouse that its Project has, in significant part, created. We maintain that it might be eminently reasonable for a license condition to require PG&E to discharge a certain amount of water into Auburn Ravine, in order to keep it watered during outage periods. The amount of water that would be needed in this time period is addressed by the proposed instream flow study for lower Auburn Ravine; it provides an otherwise non-existent metric to evaluate how much water needs to be provided during outages. We also note that, relative to Study Plan Criterion number 5, a measure that required a discharge of a certain amount of water at or near Wise Powerhouse would be enforceable by FERC and clearly under FERC's jurisdiction.

We have frequently heard the suggestion from both licensees that a requirement to provide a certain amount of flow at the top of Auburn Ravine (or other streams) is no guarantee that all or even part of that flow will remain in the Auburn Ravine downstream. In the case of Auburn Ravine, this presumably would extend to its confluence with East Side Canal. We must admit to detecting a note of disingenuousness to the plea that someone else might pull the water out downstream. First, because the principal diverter downstream is NID itself, and we find it difficult to believe that the NID's consumptive water supply folks don't talk to their hydropower brethren in both NID and PG&E. Moreover, the outage period for Auburn Ravine is timed precisely to take place after the irrigation season has ended. This is important because many of NID's water delivery contracts end on October 15 of each year. Any of a number of the conservation groups involved in this proceeding has the ability to chase down a downstream diverter who removes critical water from Auburn Ravine during PG&E's outage period, and if necessary haul such a party into state court under the Public Trust Doctrine and Fish and Game Code Section 5937. But regardless of what might happen downstream, FERC can and should stipulate how much water a licensee should deliver as far downstream as FERC's jurisdiction over public trust resources extends; anything less would be a dereliction of its responsibility.

PG&E, on page 5 of its January 23, 2009 West Placer County Streams study proposal, outlines its study goals and objectives for lower Auburn Ravine, and, on page 12, outlines its proposed study methods. We have several objections to PG&E's stated goals and objectives, and believe that its proposed study methods are inferior to those proposed by the joint agencies.

PG&E proposes to: "Determine if the hydroelectric Project is a primary or essential cause of adverse effects on critical habitat for anadromous fish" (p.5). This goal is vague and is not addressed adequately by the proposed study methods. Moreover, it is qualitative in its nature, implying an ultimate value judgment based on information collected, whereas in other studies the goal has been limited to collecting information, and has left the evaluation to a later stage in the process. A more appropriate goal is: characterize and quantify the hydrologic and habitat effects of the project on West Placer creeks, especially during outages and periods of spill.

Looking specifically at PG&E's goals and objectives for lower Auburn Ravine on page 5 of its proposed study, we do not see why the effects of the project on Auburn Ravine should be limited to "adverse effects on critical habitat for anadromous fish". Much of the study as proposed by resource agencies would take place upstream of the area designated as critical habitat, and properly focuses on juvenile O. mykiss. We believe it is inappropriate to seek to define within the study whether the project is a primary or essential cause of anything. Finally, it appears that licensee is disingenuously seeking to use the study to absolve itself of ESA responsibilities by incorporating the "essential cause" language recently inserted into the Endangered Species Act through the administrative fiat of a lame duck president (such language will almost certainly be challenged by the new administration).

Licensee has not shown why the unimpaired flow analysis is germane. The aquatic ecosystem for Auburn Ravine is almost entirely an artifact of the spill water from hydropower and consumptive operations, and of the use of the waterway as a water conveyance. It is the real ecosystem, not a hypothetical unimpaired system that is affected by the Drum-Spaulding Project. A thorough gauging study as proposed by the resource agencies would collect better and more relevant evidence than would an unimpaired flow analysis, whose conclusion is foregone. No one disputes that the project and other entities put more water into Auburn Ravine than would exist there in many months under an unimpaired hydrograph.

The proposed gaging element of PG&E's proposed study will collect less evidence than will the study proposed by joint agencies, and it will be of less use. The extra effort involved in collecting good evidence is merited. The "flow analysis during typical annual project outage," as proposed by licensee PG&E, is similarly less valuable than looking at as many outage periods as possible, since extremes and anomalies are a major object of investigation. Finally, there is no specificity in PG&E's study proposal as to how the need for additional studies would be determined, based on the evidence PG&E proposes to gather.

For Auburn Ravine Flow Analysis and lower Auburn Ravine IFIM, we thus maintain that we have answered licensee's objections based on the study criteria. We have shown existing gaging information on Auburn Ravine is not adequate to determine the Drum-Spaulding Project's effects on Auburn Ravine, and that more information is needed. We have also shown that the more complete gaging proposed by resource agencies will provide better and more complete evidence of project effects than the gaging proposed by the licensee (Criterion 4). We have shown the nexus, and the need to clarify the nexus; PG&E itself proposes "a flow related nexus evaluation of lower Auburn Ravine" (PG&E study proposal, page 1). We have also outlined the type of license requirement for outage periods that not only can, but should be developed for the Drum-Spaulding Project (Criterion 5). Gaging and IFIM are accepted scientific practice, and we do not believe licensee has objected on this grounds (Criterion 6). Joint resource agencies have described the level of effort and cost as required by Criterion 7, and we note that the resource agency study proposal deliberately chose existing gages where possible to reduce costs and effort.

13.2 Radio Tagging in Upper Auburn Ravine

FWN agrees in part with PG&E response Joint Agencies-73: the focus of the West Placer Creeks study proposal submitted by the joint resource agencies in December of 2008, did, in part, place too much focus on anadromous salmonids, to the exclusion of resident O mykiss, insofar as goals were stated and insofar as discussion was made of returning steelhead. This, in part, was an artifact of an earlier iteration of the study proposal that foresaw a longer radio frequency identification component. As proposed by the resource agencies, this study will not provide information about returning adult steelhead.

The radio tracking study element more properly seeks to examine project effects, particularly during spill and outage periods, on juvenile O. mykiss, which as juveniles are necessarily resident, and whose subsequent anadromous or resident life history as adults cannot be predicted. We note the fact that while the agency-proposed study area is upstream of what is generally considered the upstream limit of anadromy, this does not preclude recruitment of the progeny of resident O. mykiss from becoming anadromous, a scenario that has been documented in California's Central Valley (MacEwan 1996).

We cannot agree with PG&E's, response in Joint Agencies-73, which states:

> PG&E does not agree that Drum-Spaulding Project O&M can resolve anadromous fish issues in Auburn Ravine because of the great number of other diversions, inputs and other non-Project related effects that PG&E cannot control. Diversion of waters downstream of the Project cannot be addressed by license conditions for the Project; understanding these diversions will not inform license conditions, given that the diversion are not consistent, nor static, nor controlled by PG&E.

The resource agencies' West Placer Creeks study does not propose to resolve anadromous fish issues in Auburn Ravine, and licensee has no place knocking it down for

failing to achieve something that it never set out to do. The resource agency proposed study simply seeks to identify that part of the problem for which licensee's project is responsible, with the goal of mitigating that part of the problem. Licensee PG&E made the same type of case in the late seventies about the Centerville bypass reach of Butte Creek: that because there were passage and other problems downstream, it was fruitless to address the project-created problems of low flows in the bypass reach. Happily, the problems downstream, largely relating to passage, were resolved by other parties, and the subsequent institution of higher flows in the Centerville bypass reach became critical to a restored run of spring-run Chinook.

At the moment, nobody is even asking for a long-term flow increase in Auburn Ravine. Rather, the study plan simply seeks to investigate the times and locations where the project plays a decisive role in the aquatic ecosystem. This is necessary information to inform PM&E's to assure protection of that ecosystem to the degree possible. For instance, the licensees should not be allowed to partially or completely dewater the Auburn Ravine in periods when other entities are not discharging water into the Ravine or diverting from it. Put bluntly, we want to know, during outages and during periods of project-related spill, where the juvenile O. mykiss go and how many of them survive, so we can understand how to reasonably protect them in the future.

13.3 Coon Creek Flow Study and IFIM

As with the Auburn Ravine watershed, there are numerous inputs into and diversions from the Coon Creek watershed. Licensee PG&E, on page 2 of its proposed study proposal, states:

> "Because NID can divert the entire flow in Coon Creek at the Camp Far West Diversion and NID has no minimum streamflow requirements at this facility, Licensee believes that the effects of the hydroelectric operations of the Drum-Spaulding Project effectively terminate at NID's Camp Far West Diversion."

FWN does not believe that this is true when NID is not diverting at Camp Far West Canal, at which point in time that Canal has nothing to do with the matter. It is almost certainly not true some of the time that NID is diverting, and it is precisely gage data that is needed to determine, first of all, when there are effects, and second, to describe and quantify them both temporally, geographically and in terms of effects on biota. IFIM downstream is a part of the quantification of the effects on biota.

The gage data in Appendix H of the PAD provided for Rock Creek below Rock Creek Reservoir shows several cases that could demonstrate possible direct effects of releases from Rock Creek Reservoir on Dry and Coon Creeks.

Water spilled into Rock Creek for over three weeks in November 1995 at 300-400 cfs. This was likely a major storm event that almost surely had effects downstream of Camp Far West Canal. On December 1, the licensees reduced flow from 409 cfs to .14 cfs. A simple gage comparison as proposed in the resource agency's West Placer Study would help to determine the effect of this flow relative to other inputs including the effects at the

bottom of the system. It would also allow analysis of the relative importance of this release in comparison with other releases and accretion.

In 1996, water was released into Rock Creek during the last three weeks of November at a lower volume than was released in 1995. It appears that water was spilled into Rock Creek consistently, perhaps because of lack of capacity, perhaps because of temporary facility issues. These could have the function of providing attraction flows for salmon, which might later be stranded if flow were precipitously dropped.

Flow from Rock Creek Reservoir is conveyed to the North Auburn Wastewater Treatment Plant (apparently outside of Rock Creek), and the combined outflow from the Treatment Plant contributes significantly to the flow in lower Rock Creek and then to Dry Creek. This contribution needs to be quantified through implementation of the study plan proposed by the resource agencies.

Though the extent of possible project effects on Coon Creek appears to be less frequent and extensive than project effects on Auburn Ravine, a gaging effort should be made to understand the effects on the system, and an IFIM study should be made so that flow needs can be analyzed during project-affected time periods.

13.4 Conclusion on Western Placer Creek Study Comments

FWN is baffled as to why the licensees would want to address regulatory requirements for the West Placer Creeks in a piecemeal fashion, unlike the management of West Placer Creeks, which is highly coordinated among numerous entities, including both PG&E and NID's hydropower division. Placer County Water Agency (PCWA), in its scoping comments in August, 2008, emphasized its need for sufficient water deliveries from PG&E; otherwise, PCWA might not be able to protect public trust aquatic resources, which are watered by return flow from PCWA's consumptive delivery system. Among these resources are Secret Ravine and Miners Ravine, as well as to some extent Auburn Ravine.

While FWN may not necessarily agree with PCWA's figures on flows, the concept of requiring a minimum delivery to a certain point instream or in a canal seems to be a condition that FERC could mandate and enforce (which speaks to Criterion 5). Even more compelling is PCWA's advocacy of a watershed-wide solution to management of instream resources, which considers how both consumptive water needs and best use of the hydropower system can be accommodated. If the licensees wish to speak only of the hydropower system, let them not then protest that instream measures to mitigate the impacts of the hydropower system impinge too greatly on water delivery.

We believe that PCWA has spoken in part to PG&E's contention, on page 2 of its proposed study, that "Drum-Spaulding Project has no essential effect downstream in Miners Ravine or Secret Ravine." The simple answer is: it surely can if PG&E turns off the water, and possibly even if PG&E turns it down.

14 WETLANDS STUDY

The stated goal for the Wetlands Study is to "characterize herbaceous and shrub dominated wetland habitats in the study area that may be affected by continued O&M of the projects." The objective is stated as "providing a description and Proper Functioning Condition (PFC) assessment of wetlands in the vicinity of the projects." This goal and objective statement describes a study that is descriptive in nature. Our concern is that, as written, the study plan would not develop adequate information to be useful in developing license requirements because it makes no connection between project operations and effects, as required by FERC Study Criterion 5.

In order to meet the study criteria, additional study steps should be added. Specifically, we request that Step 4 (Prepare Report) of the Methods section be modified to include a discussion of possible reasons why any wetland areas do not exhibit the conditions or processes necessary to meet proper functioning condition.

> Step 4 – Prepare Report. Licensees will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods and Analysis; 3) Results; 4) Discussion; and 5) Description of Variances from the FERC-approved study proposal, if any. Section 4 of the Report, "Discussion", will provide a discussion of the possible reasons, particularly Project effects, why any wetland areas do not exhibit the conditions or processes necessary to meet Proper Functioning Condition. Licensees plan to make the report available to Relicensing Participants when completed, and ideally in time to be included in the Initial Study Report. The report will be included in each Licensee's License Application, as appropriate. The report will include GIS maps, site data, and photo documentation.

In FWN-32-b, the licensee responded that the Wetlands Study will not reference links to other studies. In our December 23, 2008 Comments, the Foothills Water Network had suggested that in order to meet the study needs of the Wetlands Study, "Alternately, this study could be explicitly linked to other studies, such as channel morphology, that could provide this information." We suggested this as an alternative to meeting the information needs in the Wetlands Study alone.

However, we agree the licensee could include the geomorphic and channel morphology issues and study elements required to meet study criteria in the Wetlands Study itself. In fact, if the licensees use the correct protocol in wetland surveys, certain channel morphology characteristics will be recorded as a matter of course (see next comment regarding correct methodology). For example, in lotic wetland areas, that is, wetlands associated with a flowing stream, the correct methodology requires collection of data related to the following attributes and processes, among others: "Accessible Floodplain, Floodplain Storage and Release, Bankfull Width, Width/Depth Ratio, Sinuosity, Stream Power, and Bed Elevation."

In response to FWN-33 comment, the licensees replied that the wetlands identified for study, "…are either lentic wetlands, on the periphery of Project reservoirs, or large

wetlands that extend a significant distance away from any nearby stream channel, and are likely primarily lentic wetlands. If licensee believes the lotic PFC protocol is appropriate for any of these wetlands upon examination of the study site in the field, licensee will consult with relicensing participants as specified in Section 6.4 of the Wetlands Study Proposal, regarding modification to the study proposal." Suggesting that the use of the lentic PFC protocol could be appropriate for wetlands associated with stream corridors suggests a lack of understanding of the differences between the lentic and lotic protocols, or a lack of understanding of the importance of relationship between lotic wetland health and proper hydrogeomorphic processes and attributes. For example, the hydrogeomorphic attributes and processes to be considered using the lentic wetland protocol include: Ground-Water Discharge, Permafrost, Continuous, Discontinuous, Flood Modification, Inundation, Depth, Duration, Frequency, Semipermanently Flooded, and Shoreline Shape.

The hydrogeomorphic attributes and processes to be considered in using the lotic protocol include: Ground-Water Discharge, Accessible Floodplain, Ground-Water Recharge, Floodplain, Storage and Release, Flood Modification, Bankfull Width, Width/Depth Ratio, Sinuosity Gradient, Stream Power, Hydraulic Controls, and Bed Elevation.

If Licensees use the lentic protocol in lotic situations, many significant attributes and features will not be included in the study. As a result, the study will not adequately describe lotic wetlands, nor provide information necessary to understand whether wetlands meet Proper Functioning Condition. In cases where wetlands fail to meet Proper Functioning Condition, information will not be available to determine what has caused their degraded state and how to restore them.

The study, as written, clearly does not meet section 5.9(b)(6) of FERC's Study Criteria because it is not consistent with generally accepted practice in the scientific community. We request that the licensees modify the study plan to include the correct protocol for each wetland area studied.

15 ANADROMOUS ECOSYSTEM EFFECTS AND WATER USE AND EFFICIENCY STUDIES

The legal issue presented by the two study proposals requested by NMFS is whether licensees PG&E and NID must study the hydrology of stream reaches where project control is partial, and where third parties (both licensees and the Army Corps) also have partial control. The plain answer is yes. These projects, in combination with such third parties, cause indirect and cumulative impacts on the hydrology of the lower Yuba and other reaches. FERC and the SWRCB must analyze such indirect and cumulative impacts and associated ecological consequences, then evaluate each project's proportionate contribution to such impacts, as the record they will respectively use to decide whether and how that project will be required to mitigate its contribution. The requested study is essential for this record. A geographic extension of the licensees' existing HEC-ResSim Model, as requested by FWN below in 15.3, is essential for this record.

15.1 Yuba-Bear/Drum Spaulding Hydrologic Effects on the Middle Yuba Below Our House Dam, the Upper Main Yuba (North Yuba - Middle Yuba confluence to Englebright Reservoir), and the Lower Yuba

In PG&E response NMFS-9, licensee PG&E states:

> Although there are out-of-basin water transfers in the Yuba River above the Englebright Reservoir, the Drum Spaulding Project is not the essential cause of any potential adverse effects on critical habitat in the Lower Yuba (below the Englebright Reservoir) because PG&E does not control the flow below Englebright. The ACE and YCWA each have projects that intervene and control flow.

In NID response NMFS-17, licensee NID states:

> NMFS has not established a reasonable project nexus to the Middle Yuba River below Our House and to the Yuba River below Englebright. The flows in these sections of river are controlled by non-project water facilities in the Middle Yuba River below Our House Dam (Yuba River Development Project) and in the Yuba River below Englebright Reservoir (Yuba River Development Project, COE, and various water projects). Most importantly, NMFS has not addressed how the information from its requested Water Usage and Efficiency Study would inform license conditions in a new Yuba-Bear Hydroelectric Project license or new Drum-Spaulding Project license since FERC would be unable as part of those new license to direct how the non-project facilities control flow in those sections of stream. Licensee is not even sure how NMFS would condition the new licenses to control flows in the Yuba River below Englebright. Last, Licensee believes that NMFS has failed to consider that if FERC did not issue new licenses for the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project it is very likely that flows in the river would not change since these projects are operated primarily for water supply, which would continue even if the projects did not include power facilities.

PG&E does not provide any evidence in support of the statement: "…the Drum Spaulding Project is not the essential cause of any potential adverse effects on critical habitat in the Lower Yuba."

NID offers a misleading statement that: "The flows in these sections of river are controlled by non-project water facilities in the Middle Yuba River below Our House Dam (Yuba River Development Project) and in the Yuba River below Englebright Reservoir (Yuba River Development Project, COE, and various water projects)."

When we look at the basin hydrology for evidence supporting licensee's assertion, we find evidence that puts into question the assertions of the licensees:

Water Course	Average Acre Feet *

Colgate Powerhouse	1,139,000	
Outflow	0	
Middle Yuba below Our House Dam	104,900	
Oregon Creek below Log Cabin Dam	22,870	
Sub total North and Middle Yuba		1,266,770
South Yuba at Jones Bar	343,900	
Drum Canal	375,300	
South Yuba Canal	60,050	
Sub Total Diversions		435,350
Total Basin Production	2,046,020	
Total Actual Runoff below Englebright	1,610,670	
Water used solely for power generation	124,350	Yearly ave, YB90

[This water balance is rough because, for convenience, it uses data from the 1999 California Hydrological Data Report, http://ca.water.usgs.gov/archive/waterdata/99/index.html, which forms averages over different time periods for different gauges. The balance also misses some accretion between NBB and OHD and Englebright. Any error due to these factors is thought to be less that 5% for any quantity.]

Return to the Middle and South Yuba of all of the water presently diverted out of basin would result on average in a 27% increase in flow in the Lower Yuba compared to today's flows. Return of water to the river that is diverted out of basin and used solely for electric power generation (not delivered for consumptive purposes) would result in about an 8% increase in flow in the lower Yuba compared to today's flows.

Licensees state: "The ACE and YCWA each have projects that intervene and control flow".

The Army Corps' Englebright Reservoir has a capacity of 70 taf—a small reservoir in comparison with the total basin runoff of 1,618 taf. Relative to total basin runoff,

Englebright is little more than a large eddy. Total yearly basin runoff would fill Englebright more than 20 times. Because of this small size, Englebright has only short-term control of flows in the Lower Yuba. Its primary function is as an afterbay that re-regulates peaking flows discharged from Colgate Powerhouse.

Yuba Country Water Agency's New Bullards Bar Reservoir is a large reservoir, with 727 taf of usable capacity, and has significant control over the yearly TIMING of flows in the Lower Yuba. However, the reservoir does not diminish the yearly VOLUME of water in the Lower Yuba. On the other hand, the out-of-basin diversions from the Middle and South Yuba diminish the average annual volume of runoff below Englebright by 21%, and, similar to New Bullard's Bar Reservoir, also affect timing of runoff.

Because of the large size of each, both New Bullards Bar Project (YCWA) and the combined Yuba Bear / Drum Spaulding projects have "potential adverse effects on critical habitat in the Lower Yuba." Given that each very likely has a large impact, of a somewhat different nature (flow timing vs. flow reduction), there is no scientific or other basis for determining, a priori, which projects are "the essential cause of any potential adverse effects on critical habitat in the Lower Yuba."

Equally, the notion that entities downstream "control flow" is widely open to interpretation. Entities downstream can only dispatch the water that is available to them. Entities upstream control to a substantial degree the amount of water that is available to those downstream entities.

PG&E does not argue that there are not "potential adverse effects downstream." It merely argues that the "essential cause" is the New Bullards Bar Project and/or the ACE Dam at Englebright, and therefore argues that it should not have to analyze its impacts on downstream stream reaches. NID takes a slightly different approach: It maintains that "since FERC would be unable as part of those new license [sic] to direct how the non-project facilities control flow in those sections of stream," it shouldn't have to study the effects of its projects on stream reaches downstream either. The Yuba County Water Agency is apparently left to study all the effects of all of the FERC projects upstream of Englebright Reservoir, and presumably to mitigate all of the "adverse effects." This also allows NID and PG&E to conveniently avoid describing and quantifying the effects of their projects on the three stream reaches in question.

When speaking of mitigation, there is an added problem. Without the help of water diverted and/or stored by NID upstream, YCWA may not be able to mitigate impacts of either project on the reach of the Middle Yuba downstream of Our House Diversion. At times, accretion alone may not sufficiently augment the minimum instream flow release from Milton Diversion to meet the required instream flow to meet aquatic needs downstream of Our House Diversion.

Ideally, FERC would require the simultaneous study of the effects that all three of the hydropower projects have on the Middle Yuba below Our House Dam, the Upper Main Yuba (between North Yuba - Middle Yuba confluence and Englebright Reservoir), and

the Lower Yuba, as a logical whole. In lieu of a logically unified view of the infrastructure and its effects, a minimal alternative approach is to study, during the present Yuba-Bear/Drum-Spaulding relicensing, the effects of the YB DS system on the Middle Yuba below Our House Diversion, on the Upper Main Yuba, and on the Lower (Main) Yuba, and then to study the effects on these stream reaches of New Bullards Bar Project during the New Bullards Bar Project relicensing, which is on a timeline three years behind YB DS.

The new FERC licenses for the Yuba-Bear and Drum Spaulding Projects cannot direct how YCWA operates its hydro project or how the Army Corp operates Englebright Reservoir. However, FERC licenses for both projects can direct how much water the Yuba-Bear and Drum-Spaulding projects release, to, conceivably, one or more compliance points downstream of their respective project facilities.

The fact that the information needed is divided into two relicensing processes for three FERC projects does not absolve FERC of the public trust responsibility to analyze the effects of all of the projects under its jurisdiction, and to require license conditions for all projects that individually and in combination mitigate those effects. Further, FERC should set forth a clear procedural path by which it will avoid a jurisdictional vacuum, and must recognize the potential for procedural delay for both the Section 7 process under the Endangered Species Act and the 401 Certification process, including the need to avoid a piecemeal approach under the California Environmental Quality Act. FERC must also address, if it chooses to issue the licenses for the Yuba-Bear and Drum-Spaulding projects prior to completion of the New Bullards Bar relicensing, the likely need for a triggered reopener of the Yuba-Bear and Drum-Spaulding licenses to synchronize overlapping requirements occasioned by conditions of the new license for the New Bullards Bar Project.

Finally, FWN absolutely disagrees with the statement in NID response NMFS-17 that “if FERC did not issue new licenses for the Yuba-Bear Hydroelectric Project or Drum-Spaulding Project it is very likely that flows in the river would not change since these projects are operated primarily for water supply… .”

We note that this misperception is also reflected in FERC’s Scoping 2 document: “Although we note that reduction in streamflow is in most cases a function of consumptive water deliveries, relicensing studies may identify instances where project diversions may directly or cumulatively affect downstream anadromous fishes.” (p. 6, Section 2.3.1)

We address this issue as follows:

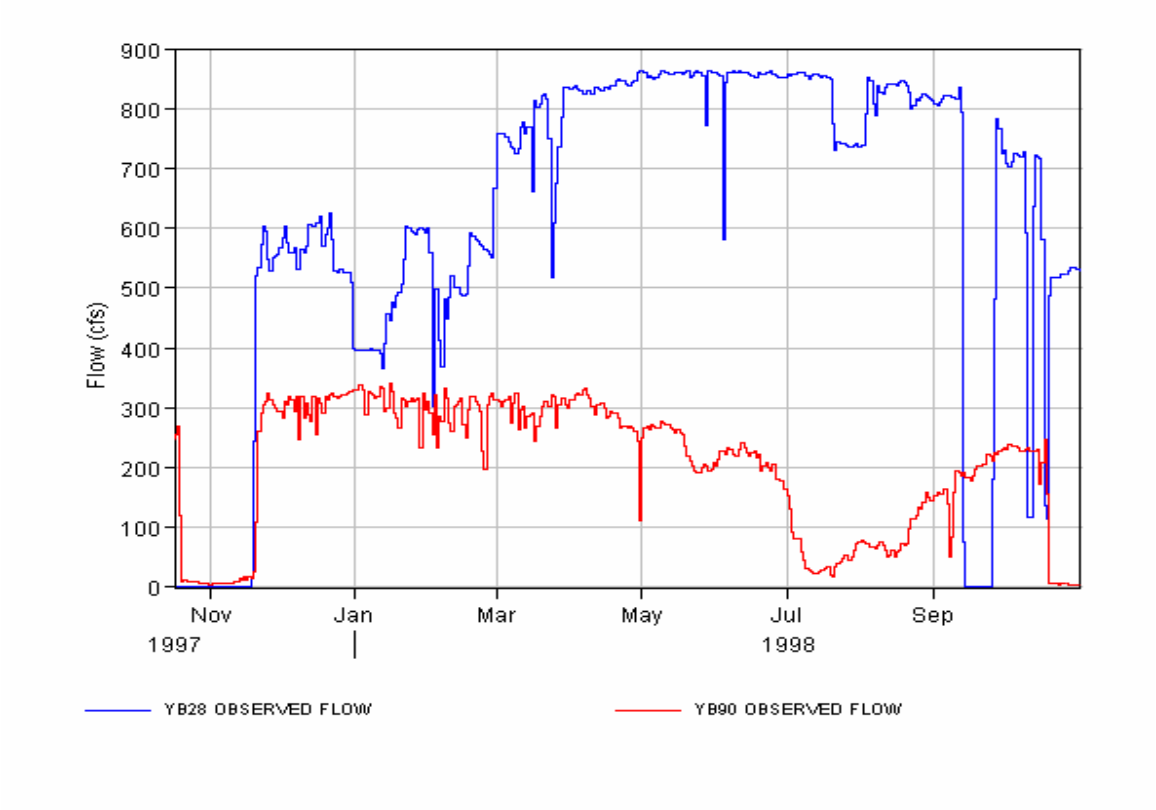
Water that is diverted out of the Yuba basin by the Yuba-Bear and Drum-Spaulding projects can be divided into three basic categories:

1. Water that is delivered by the licensees for consumptive purposes, but which does not generate hydropower

2. Water that generates hydropower, but is not delivered by the licensees for consumptive purposes
3. Water that is used to generate hydropower, and that is subsequently delivered for consumptive purposes.

There is little if any water in the first category.

The next two categories are best illustrated by looking at hydrographs for Drum Canal near its source, Spaulding Reservoir, YB28, and the gage that measures the flow that reaches Folsom Lake below Newcastle Power House, YB90. Note that this figure (pasted below) came from the hydrology information provided by the licensees.



The red line represents water that entered the Drum Canal below Spaulding No. 1 powerhouse, and traveled through a succession of canals including the Bear River Canal, the Wise Canal, and the South Canal. Finally, the water flowed into Folsom Reservoir, effectively "abandoned" by the licensees, not having been delivered for any industrial, agricultural, domestic or other consumptive purpose. The red line represents water from Category 2 above: Water that generates hydropower, but is not delivered by the licensees for consumptive purposes.

The blue line represents all of the water that was diverted into the Drum Canal. The difference between the flow in blue and the flow in red (the area between the red line and the blue line) is water that generated power in one or more generators, and was then delivered for consumptive purposes: Category 3 above.

Very clearly, for 5 months out of Water Year 1998 (roughly December through April), water diverted solely for hydropower decreased the flow in the Yuba watershed rivers by about 300 cfs. In three more months (May through July), the streamflow reduction was about 200 cfs. FWN suggests that interested parties review the hydrology records to assure themselves that the graph above is representative of the entire period of record, and that a large fraction of the water diverted into the Drum Canal is diverted solely for power generation.

Ceasing hydropower operations would free a very substantial amount of water for other beneficial uses, with no impact whatsoever on consumptive water supply.

FWN suggests that the lack of understanding portrayed in NID's NMFS-17 comment is, in and of itself, one of the most critical issues that NMFS sought to address in its "Water Use and Efficiency" study proposal. While FWN believes that the information needed to address the aim of that proposed study is largely already available to relicensing participants, in the hydrology data and in the HEC-ResSim water balance model provided by the licensees, FWN completely supports NMFS's interest in analyzing that data and parsing out the various uses of water that is made of the water that is affected by the combined projects. (This also includes water that is lost in various ways, through leakage, evaporation, or other causes). FWN looks forward to working with NMFS and other relicensing participants in analyzing current water use and in evaluating reasonable alternatives for future operations of the combined system.

15.2 Information Request: Extend Yuba- Bear/Drum-Spaulding HEC-ResSim Water Balance Model

FWN has reviewed NMFS' study proposal entitled "Anadromous Ecosystem Effects," as presented in NMFS' initial study plan comments filed on December 23, 2008. FWN has also reviewed the comments of licensees in regards to these study proposals.

FWN agrees in some measure with licensees that the NMFS study proposal is difficult to follow. However, FWN, particularly in light of licensees' comments as responded to above, finds great importance in understanding the relative hydrologic effects of different management actions taken by the operators of major water developments in the watershed. A good water balance model encompassing the entire Yuba watershed would be the foundational and most important potential tool for making a science-based, professionally competent assessment of the respective impacts of the operations of PG&E, NID, YCWA and ACE projects in the Yuba watershed.

Licensees have built a HEC-ResSim water balance model ("Model") for the Yuba-Bear/Drum Spaulding system that extends downstream only as far as just downstream of Canyon Creek confluence on the South Yuba and just downstream of Milton Diversion on the Middle Yuba. FWN proposes that licensees extend the HEC-ResSim model to encompass, possibly in successive phases as described below, infrastructure and reaches that are downstream in the Yuba Watershed but are not yet included in the Model.

NID and PG&E developed the existing Model as an up-front tool to be used by relicensing participants. This development took place prior to the development of study plans for the relicensing. While it is unclear to FWN whether a study plan is required in order to propose extension of the Model to downstream areas of the Yuba watershed, FWN nonetheless provides a rudimentary study proposal here. FWN also provides the caveat that much of the rationale for such a proposal, which more or less directly addresses the CFR for study criteria, is contained in our comments above.

15.3 Study Element Request: Extension of the HEC-ResSim model downstream in the Yuba Watershed

FWN requests a study element that would extend the HEC-ResSim model to encompass, possibly in successive phases, infrastructure and reaches that are downstream in the Yuba Watershed but are not yet included in the Model. A technically feasible step-by-step approach to extending the model would:

1. Develop the hydrology time-series for the Middle Yuba down to Our House Diversion (as needed) and downstream of Our House to confluence with the North Yuba. Develop the hydrology time-series downstream of confluence of North and Middle Yubas (Upper Main Yuba) to Englebright Reservoir. Develop the time-series downstream of Englebright Reservoir, capturing Narrows 1 and 2 Powerhouses and spill.

2. Extend the model through Englebright Dam and Narrows 1 and 2 Powerhouses. Represent the North Yuba above Englebright as a time-series input to the model, rather than actually modeling the YCWA infrastructure in this step. The primary time series would be the flow of the Yuba just below New Colgate Power House.

3. Extend the model through Our House Dam to the confluence with the North Yuba, and include Lohman Tunnel, Oregon Creek, Comptonville Tunnel.

4. Extend the model on the South Yuba downstream as far hydrology has already been developed to Jones Bar. Represent the South Yuba between Jones Bar and Englebright by backing out the accretion on a mass balance basis from outflow from Englebright Reservoir.

5. Extend the model to New Bullard's Bar Reservoir. This step could be deferred until the YCWA Licensing.

Response to the seven Study Plan Criteria:

1. The goal of extending the existing YBDS HEC-ResSim water balance model downstream to below Englebright Reservoir is to determine the hydrologic effects of the Yuba-Bear and Drum-Spaulding projects on reaches of the Yuba River downstream of the projects, since they cannot be determined with existing information [as discussed in more detail above]. There is a need to understand the hydrologic effects in order to fully understand the effects on existing resident and anadromous fisheries downstream on the Lower Yuba River, and to understand the projects' hydrologic effects, especially on the potential for restoration of anadromous fisheries, on the South Yuba and Middle Yuba rivers.

2. Requester is not a resource agency. Local Native American tribes, some of which are represented in the Foothills Water Network Coalition, have expressed an interest in the restoration of anadromous salmonids to the South Yuba and Middle Yuba in that salmon represent a Traditional Cultural Property.

3. Salmonid populations in the state of California have diminished to a point where Central Valley spring-run Chinook and Central Valley steelhead, which inhabit the Lower Yuba River today and which once inhabited as much as 500 miles of the Yuba River watershed (Lindley, 2007) are listed as threatened under the Endangered Species Act. Over ten million dollars was spent on the Upper Yuba River Studies Project to determine the feasibility of reintroduction of anadromous fish into the upper Yuba River watershed; both licensees were parties to that project. Populations of salmon in California, of all species and life histories, are so low that commercial and sport fishing was closed in 2008, and is virtually certain to be closed in 2009. Restoring anadromous fish upstream of Central Valley rim dams is widely held to be essential in preventing extirpation. The Yuba River is widely seen to offer one of the most feasible opportunities for restoration. The National Marine Fisheries Service has commissioned a $100,000 engineering study that is currently underway to evaluate fish passage options for Englebright Reservoir.

4. Hydrology for the immediate area of the Yuba-Bear and Drum-Spaulding projects has already been provided to relicensing participants. A HEC-ResSim model for the projects has been constructed, but does not extend far enough downstream to determine the nature and extent of downstream hydrologic impacts.

5. Licensees, as referenced above, have made unsubstantiated claims about their projects in reference to downstream effects. Licensee PG&E has claimed that the Drum-Spaudling Project is not “essential cause” of negative effects in the Lower Yuba. Licensee NID has claimed that “non-project facilities control flow” downstream of its Yuba-Bear Project. The information requested will characterize and quantify the downstream hydrologic effects of both projects. Potential license conditions include instream flow requirements at various potential compliance points to meet the needs of instream resources, either on a stand-alone basis or in coordination with the facilities of other water developments (including a FERC-licensed development) downstream.

6. The methods proposed in developing the hydrology time-series and extending the HEC-ResSim water balance model are the same as those applied in the hydrology and water balance model developed for areas upstream. The methods are the same; it is a question of applying these methods over the remainder of the project-affected area.

7. The cost of extending the HEC-ResSim model downstream, including developing the necessary hydrology time-series, is estimated to be $15,000. This is calculated based on 30 days at $500.00 per day. The time required was estimated for FWN by agency personnel with relevant experience. The reason that the current extent of the water balance model is not adequate is discussed extensively above.

16 PERIPHYTON

FWN disagrees with the Licensees comment FWN-38 that the requested Periphyton Study Plan as submitted by FWN for the December 24, 2008 "has not met many of FERC's Study Criteria, most notably Study Criteria 5.9(b)(5) and (6)". FWN is resubmitting this plan in Appendix B: Periphyton Study.

Furthermore, the licensee states that "FWN additionally has not satisfied Study Criterion 5.9(b)(3), by identifying the relevant public interest relating to periphyton." And that FWN "has not addressed Study Criteria 5.9(b)(4) or (7) to establish the need for the information." On the contrary, the study plan clearly identifies the relevant public interest involving periphyton, which is quality of water contact recreation and aquatic community health. High biomass of benthic algae such as depicted in the following picture have generated significant concern among recreationists, many of whom suspend use of the river due to excess algae.

Typical periphyton mass in the South Yuba River approximately one-half mile below Spaulding dam during early summer. The brown material is dead algae and diatoms which builds over summer as green algae dies.

The interest statement corresponds to the need for information to understand the projects' effects on public safety, quality of recreation experience, water contact recreation opportunities, and aquatic health.

Licensee states, "Specifically, the FWN has not established the nexus between the project and the resource to be studied, or described how the study results would be used to inform license requirements." We disagree. The study plan details existing information and the nexus of the project with periphyton conditions as affected by flow and temperature, which is governed by the Yuba-Bear and Drum-Spaulding hydropower facilities. Existing information is described in the Periphyton Study Plan to show that periphyton biomass below Spaulding Dam is higher than at locations either further downstream or above the Projects. Additional information to be gathered is essential to determining the extent of project effects on periphyton and on the relative roles of temperature, flow and other factors, which may vary according to type and quantity of periphyton present. Altering temperature and flow can have an effect on periphyton biomass and community. This study will allow for understanding of those effects. Furthermore, the study clearly identifies potential license conditions that will be informed by the Periphyton Study. Since ecosystem health and more specifically water quality are

affected by and dependent on the growth or limitation of growth of Periphyton, this study will inform the license conditions for instream flow releases and water quality measures.

The State Water Resources Control Board filed comments in support of this type of study on 12/22/08. Unfortunately, the time constraints to the collaborative process have not allowed resolution of study details.

“Licensee believes FWN has underestimated the cost of this large data-gathering effort (approximately 360 periphyton samples with extensive analysis - including statistical analysis - of the results)…” In response, the study’s cost estimate has been calculated by experts in this field based on a total of 72 samples. The Licensees' response falsely claims that much greater effort would be required but does not provide supporting rationale.

We request that FERC require this particular study, or essential components therein, and thereby ensure that critical information on the effects of the projects on periphyton be collected in time for consideration of license terms and conditions.

17 CONCLUDING COMMENTS

We appreciate this opportunity to provide comments on the Licensees’ Revised Study Plans for Drum-Spaulding and Yuba-Bear Projects. We look forward to continued participation in the process to develop protection, mitigation, and enhancement measures once adequate information has been provided. If you have questions, please contact Julie Leimbach, Foothills Water Network Coordinator (530)-622-8497.

Sincerely,

Foothills Water Network Yuba-Bear Working Group

Julie Leimbach, Foothills Water Network
Allan Eberhart, Sierra Club - Mother Lode Chapter
Bill Jacobson, Social Alliance Network
Bob Center, American Whitewater
Brian Johnson, Trout Unlimited
Chris Shutes, California Sportfishing Protecting Alliance
Dave Steindorf, American Whitewater
Jason Rainey, South Yuba River Citizen’s League
Gary Reedy, South Yuba River Citizen’s League
Steve Rothert, American Rivers
Ron Otto, Auburn Ravine Preservation Committee and Ophir Property Owners Association
Ty Gorre, Property Owner
Brad Cavallo, Fisheries Scientist
Gregg Bates, Dry Creek Conservancy

Cc:
Ron Nelson, Nevada Irrigation District
Steve Peirano, PG&E
Beth Paulson, USFS

APPENDIX A: HISTORICAL REPORT ON SALMON IN THE YUBA RIVER

The Lower Yuba River supports some of California's last remaining runs of wild Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*Oncorhynchus mykiss*). The Yuba's salmon run is still an impressive annual event in the main stem of the river, but the population has declined drastically since the early 1800s as a result of gold-mining, logging, road-building, and habitat loss due to dams and diversions. These endangered fish once had access to many miles of prime spawning habitat in the upper watershed, in the South, Middle, and North forks of the Yuba. Access to the upper watershed is now blocked by Englebright Dam on the Yuba's main stem.

Currently citizens are considering ways to restore the Yuba's salmon and steelhead runs, and potentially to reintroduce them into the upper part of the watershed. Understanding the Yuba's salmon population from a historical perspective is an important component of working to preserve and restore the remaining population of today. This report is a compilation of historical information about salmon and steelhead in the Yuba, from the time when they shared the free-flowing river with the Nisenan people, through the years of European settlement, the Gold Rush, and dam construction, and on into the present.

In attempting to reconstruct the historical extent of salmon populations in the Yuba, this report draws on information from scientific studies as well as from the historical literature. Regarding the latter (diaries, memoirs, county histories), a key scientific paper makes the following comments: "Those sources have been used infrequently by fisheries biologists, but if viewed judiciously they may convey highly useful information…historic records can be used by citizen groups to justify efforts to restore anadromous fishes to streams from which they are now absent…Because comprehensive fish survey data were not regularly collected in California until the 1940s, our knowledge of salmon and other anadromous fish distributions within the Central Valley during earlier times must rely largely on non-scientific historical writings." (Yoshiyama et al, 2000).

TIMELINE OF IMPORTANT EVENTS FOR YUBA RIVER SALMON

1848 Gold discovered at Sutter's Mill on the American River. The Gold Rush begins.
1850-85 Intensive hydraulic mining on the Yuba.
1884 Sawyer Decision ends release of hydraulic mining debris in the Yuba.
1892 Earliest version of Spaulding Dam completed on the South Fork of the Yuba.
1893 Caminetti Act creates the California Debris Commission to impound hydraulic mining debris with dams.
1904 Barrier No. 1 constructed 4.5 miles upstream of the present site of Daguerre Point Dam.
1907 Barrier No. 1 destroyed by floods.
1910 Daguerre Point Dam completed.
1913 Current version of Spaulding Dam completed.
1921-24 Construction of Bullard's Bar Dam on the North Fork.

1924 Fish ladders installed at Daguerre Point Dam.
1927-28 Daguerre fish ladders washed out in winter storms.
1938 Surveys of salmon and steelhead populations conducted by CDFG.
1941 Englebright Dam completed, blocking all salmon passage into the South, Middle, and North forks.
1950-52 New fish ladders installed at Daguerre Point Dam.
1961 Earliest comprehensive report of chinook abundance in Central Valley streams, covering period from 1940-1959 (Fry). Since then, CDFG has carried out regular surveys of spawning runs.
1994 Sacramento winter chinook run listed as endangered under the U.S. Endangered Species Act.
1998 Central Valley steelhead listed as threatened.
1999 California Central Valley spring chinook run listed as threatened.
1999 Upper Yuba River Studies Program formed under CalFed's Bay-Delta Program to investigate the feasibility of re-introducing salmon and steelhead into the upper watershed above Englebright Dam.

Native Americans and Salmon

"The Bear, Yuba and Feather rivers were full of salmon, and the Indians speared them by the hundred in the clear water…The streams were as clear as crystal, at all seasons of the year, and thousands of salmon and other fishes sported in the rippling waters…" (Chamberlain and Wells, 1879).

Although information is scarce about salmon in the Yuba River before the arrival of Europeans, the accounts of a few early-arriving settlers suggest that salmon were an abundant and important resource for native people throughout the Sacramento drainage. Colonel J. J. Warner, a fur trapper in the Sacramento Valley, noted in 1832 that "the banks of the Sacramento river, in its whole course through its valley, were studded with Indian villages, the houses of which, in the spring…were red with the salmon the aborigines were curing" (Yoshiyama, 1999). A pioneer missionary's wife, writing of the Marysville area in 1851, noted, "The rivers abound in excellent salmon, which the Indians spear in great numbers, and dispose of in the towns. They are the finest I ever tasted. Some of them are three and four feet long, and weigh fifty pounds or more. It is amusing to see the Indians spearing them…Their aim is unerring" (Bates, 1857).

The Yuba watershed was inhabited by the Hill Nisenan, a group of Southern Maidu who lived along both the Yuba and American Rivers. The Nisenan spent the fall harvesting acorns in the foothills and stayed on in those camps for the winter. In spring, they moved up to higher elevations, following the migration of deer and other game, as well as salmon and steelhead (Meals, 2001). Ralph Beals, in his 1933 study *Ethnology of the Nisenan*, reports that salmon were a part of the Nisenan diet and "at one time came far up the Yuba River."

The spring run of salmon was the most important for native Californians. "When the

Pleiades were on the western horizon at dusk it was time to watch for the first salmon" (Swezey and Heizer, 1993). At this time of year, the fish were abundant and in good condition while winter provisions were running low. The anadromous runs were large and dependable, whereas populations of nonanadromous fish in the region (other than trout) tended to be small and of poor quality. The seasonal arrival of large quantities of salmon made salmon fishing "perhaps the most efficient subsistence undertaking in Native California" (Swezey and Heizer, 1993). In the Sacramento drainage system, salmon was a food source that equaled plants and game in importance for the Maidu and other native groups (Swezey and Heizer, 1993). "Salmon and other fishery resources on the Central Valley floor were part of a resource base that enabled resident Native American groups to attain some of the highest population densities to occur among the non-agricultural native societies of North America" (Yoshiyama, 1999).

Although salmon were a valuable food source, they were only one of a wide variety of foods used by native people in this area. Sinnott, in his history of Downieville, wrote that "the area that was to become Sierra County in 1852 abounded in deer and bear, the streams were full of trout, and the mountains provided wild berries and acorns in abundance" (Sinnott, 1983). Yoshiyama et al (1998) note that because of the variety of available foods and correspondingly diverse diet of native groups in the area, it is unlikely that the salmon runs were overfished.

Another factor that may have contributed to maintaining a large and healthy salmon population was the yearly celebration of 'first-salmon' rites, which established specific rules about when salmon could be caught. There were many variations of the ritual among salmon-dependent tribes stretching the length of the Pacific coast, reflecting the cultural importance of salmon. In the Nisenan first-salmon rites, held when the spring run arrived, a "dreamer or singing shaman" conducted the ceremony, thus opening the season on the Yuba (Beals, 1933). Dixon (1905) describes the ritual among the Maidu:

> In the region of the foot-hills there was always some little ceremony at the time when the first salmon of the season was caught. The first salmon had to be caught by one of the shamans, and no one else might fish until he was successful. The fish caught was cooked over a fire built on the spot, and was then divided into many small pieces, one of which, with a morsel of acorn-bread, was given by the shaman to each person. After that, any one might go fishing.

Those who disregarded the restrictions faced "supernaturally induced illness, death, or loss of fishing luck" (Swezey and Heizer, 1993). The purpose of the rites for the Maidu was to "'induce a heavy run and bountiful catch' by urging the salmon to ascend the river" (Yoshiyama, 1999).

Some sources suggest that the observances of California Central Valley native groups were "more cursory and celebratory in nature" than those of tribes that lived further north where healthy salmon runs were even more crucial to their survival. "There is no indication that they were used to actively manage the salmon resource or to ensure its equitable distribution among the various fishing groups", according to Yoshiyama

(1999). Other sources, however, maintain that the ritual may indeed have helped to conserve the salmon resource. Swezey and Heizer (1993) state that the fish were allowed to run freely before the ceremony took place – several days to two weeks – and therefore many were able to spawn successfully, ensuring their return the following year. At the same time, fishing was put off until the run reached its peak, allowing the community to harvest salmon with greater efficiency and avoiding intense competition between fishermen for a scarce supply.

Regardless of the role that Native American groups played in managing the salmon population, it is clear that European settlers arriving to the area in greater and greater numbers in the early to mid-1800s were struck by the size, abundance, and quality of the salmon in the Yuba River, as well as in the Sacramento into which it flows.

European Settlement

"[The Sacramento River] abounds in fish, the most valuable of which is the salmon. These salmon are the largest and fattest I have ever seen. I have seen salmon taken from the Sacramento five feet in length. All of its tributaries are equally rich in the finny tribe." (Bryant, 1849)

Early-arriving settlers' observations of the Yuba confirm that they found a pristine river well suited to salmon. The miner William Kelly described the 'Juba' in 1849 as "a fine stream, deep enough for navigable purposes for a considerable distance up its course to where it widens out at the ford, passing over a broad, level, gravell bed. Its waters in the stream appear of a greenish hue, but when taken into a glass are perfectly colourless, clear, and well-tasted." He went on to note that the Yuba, along with the other "principal affluents" of the Sacramento, was a river "…abounding in salmon, and rich in golden deposits" (Kelly, 1950). Both salmon and salmon trout (another term for steelhead) were included in Bean's Directory in 1866 among the list of fish species native to Nevada County (along with brook trout, lake trout, perch, whitefish, sucker, chub, and two varieties of eels) (Wells, 1880). In 1850 the California Fish Commission reported that "the salmon resorted in vast numbers to the Feather, Yuba, American, Mokolumne, and Tuolumne Rivers" (Yoshiyama et al, 2001).

Throughout the Sacramento drainage, settlers began to take note of the potential profits to be made from the abundant salmon runs. A Swedish scholar visiting Fort Sutter on the American River in 1843 observed: "The raising of wheat, corn, horses, and cattle constitutes the principal business of Captain Sutter; but he has realized considerable income from the salmon fisheries of the rivers, the fish being unequalled in flavor, and found in the greatest abundance" (Wells, 1880). This was only the beginning of what was to become a large and successful fishery. According to Duflot du Mofras of France, "The Sacramento and its branches yield enormous salmon of superior type that come in from the sea to spawn… The fish, after being salted, is consumed to a large extent in the Sandwich [Hawaiian] islands, where it is exported in great quantities…Ships also come out from New York expressly to load on salmon. M. Sutter confidently believes that the exportation of this product should return good profits" (Yoshiyama, 1999). As thousands

of pounds of salmon were removed from the rivers and shipped off to faraway locations, populations began, not surprisingly, to decline. But another historical event had much greater consequences for salmon.

The discovery of gold at Sutter's Mill on the American River in 1848 quickly overshadowed salmon, as abundant and valuable a resource as they were. Miners, despite their one-track minds, did make occasional mention of salmon during their explorations, presumably because gold was not edible. Major William Downie, founder of the town of Downieville on the North Fork of the Yuba, relates the following tale from the year 1849. "In speaking of our start at the Forks, I am reminded of what my reader will no doubt call a fish story. It is; but it is nevertheless a true one, and let this be said with all due deference to any narrator of piscatorial adventure. While we were camped on Jersey Flat, Jim Crow caught a monster salmon, weighing nearly 14 pounds. We boiled the fish in the camp kettle, and afterwards, when we examined the water, we found gold at the bottom of it" (Downie, 1893). According to Yoshiyama et al (2001), Downie could either be referring to a salmon or a steelhead. Steelhead typically weigh 3-8 pounds, rarely exceeding 13 pounds; this suggests that the fish was more likely a late spring-run salmon. However, it could also have been an exceptionally large steelhead (which were called salmon-trout at that time) from a now-extinct summer run. Whether or not salmon traveled as far as Downieville, the California Fish Commission reports quantities of salmon on the Yuba River as late as 1853. "The miners obtained a large supply of food from [salmon]…It is the testimony of all the pioneer miners that every tributary of the Sacramento, at the commencement of mining, was, in its season, filled with this fish, hurrying and struggling as if to reach the very sources of these streams" (CFC, 1880).

Life changed drastically for the Nisenan on the Yuba with the discovery of gold. "When we began to find gold on the Yuber (Yuba) river we could git'em [the native people] to work for us day in and day out, fur next to nothin'. We told 'em the gold was stuff to whitewash houses with, and give 'em a handkerchief for a tin-cup full," a white woman recalled. One miner reported that a trader exchanged a handkerchief and a string of beads for $500 in gold (Chatterjee, 1997). According to Stevenson (1853), "The Indians in this portion of the State are wretchedly poor, having no horses, cattle, or other property. They formerly subsisted on game, fish, acorns, etc., but it is now impossible for them to make a living by hunting or fishing, for nearly all the game has been driven from the mining region." Mining had a drastic effect not only on the lifestyle of the native people, but on the salmon as well. "On the head of the Sacramento, before that beautiful river was changed from a silver sheet to a dirty yellow stream, I have seen the stream so filled with salmon that it was impossible to force a horse across the current. [Last summer the Native Americans were devastated by] the utter failure of the annual salmon run on account of the muddy water" (Chatterjee, 1997).

Decline of the Salmon

"The rivers or tributaries of the Sacramento formerly were clear as crystal and abounded with the finest salmon and other fish. But the miners have turned the streams

from their beds and conveyed the water to the dry diggings, and after being used until it is so thick with mud that it will scarcely run it returns to its natural channel." (Stevenson, 1853)

Gold mining took an enormous toll on the clarity of the water and the quality of salmon habitat in the rivers where it was carried out. Hydraulic mining operated by literally washing entire hillsides into the river in order to remove the gold contained in them. The Yuba River experienced some of the most intensive hydraulic mining undertaken anywhere during the California Gold Rush. Although once the Yuba was described as "perfectly clear and well-tasted", in March of 1860 the Marysville Appeal remarked that "the yellow Yuba…that turgid vehicle of sediment takes a vulgar pride in spreading out its dirty face" (Kelley, 1989).

The sediment washed into the river by hydraulic mining was carried downstream and accumulated in quantity in the main channel. According to the Department of Fish and Game, "By 1876, the channel of the Yuba River reportedly had become completely filled and the adjoining agricultural lands covered with sand and gravel" (CDFG, 1993). Chamberlain and Wells' 1879 *History of Sutter County* reported that "At Timbuctoo ravine it is claimed that the Yuba river has been filled with a deposit eighty feet in depth…At Marysville, the depth of the deposit is about twenty-two feet…The bottom-lands along the Yuba and Bear rivers have been covered to a depth of five to ten feet, extending, in some places, one and one-half miles back from the streams." Gilbert (1917) estimated that from 1849-1909, 684 million cubic yards of gravel and debris from hydraulic mining washed into the Yuba River basin; "more than triple the volume of earth excavated during construction of the Panama Canal" (Yoshiyama et al, 2001).

Salmon eggs require clear, well-oxygenated water to survive, and this is why salmon seek out gravel-bottomed stretches of river to build their nests. As early as 1870, a report by the Commissioners of Fisheries of California recognized the problem caused by mining for salmon: "Formerly salmon were plenty and largely caught by the Indians in the Feather River, in the Yuba, and in the American; but of late years they have ceased to visit these rivers. It is not because the waters of these rivers are muddy...they will pass through muddy water, if beyond they find clear water and clean gravelly bottoms. The gravel beds that formerly existed in these streams are now covered with a deposit of mud, washed down from the mines; and on this the eggs of the salmon will not hatch." (Sumner and Smith, 1940).

Others, too, were aware and distressed by the declining populations of salmon on the tributaries of the Sacramento. An article published in Hutchings California Magazine in 1860 lamented, "Many of the pioneers of California, if they are not already aware of the fact, will be sorry to learn that the Salmon fish are fast disappearing from our waters — that is, upon all the streams upon which mining is carried on to any extent, and, in fact, we may say from all the streams of importance. This may be attributed to...the mining operations, by which the water is carried by ditches and flumes for miles out of its channel, and, when it again finds its natural course, it would scarcely be true to call such a muddy mass, *water*. This being the case on all the tributaries, the fountain being

impure the whole stream is polluted, and our beautiful and highly palatable fish, scorning to 'live, love, and have their being' in such an impure element, are seeking other realms, where their native element is not made so unpleasant by man's search for gold." (Olmsted, 1962)

Hydraulic mining was detrimental not only to fish populations, but also to people living downstream when the sediment load caused the river to spill over its banks and flood agricultural land and cities. In 1884 most mines were forced to close when Judge Lorenzo Sawyer, in 'Woodruff versus North Bloomfield Gravel and Mining Company', ruled "to restrain the defendants, being several mining companies, engaged in hydraulic mining on the western slope of the Sierra Nevada mountains, from discharging their mining debris into the effluents of the Yuba River, and into the river itself, whence it is carried down by the current into the Feather and Sacramento Rivers, filling up their channels and injuring their navigation, and sometimes overflowing and covering the neighboring lands with debris." This meant that mining was allowed to continue only if miners prevented silt and gravel from washing downstream. The Caminetti Act in 1893 created the California Debris Commission, the role of which was to build dams to impound hydraulic mining debris (Sumner and Smith, 1940).

Mining continued to affect salmon populations, however. Hard rock mining succeeded hydraulic mining, and this method made use of dissolved cyanide to remove gold from ground ore. In their 1940 survey of the Yuba, Sumner and Smith noted that, "Though the State Fish and Game Code prohibits pollution of streams by chemicals or other materials harmful to aquatic life, poisonous mine tailings have been washed directly into streams where they have killed fish and fish food. This pollution was often observed during the present survey, particularly from Poorman creek on the South Yuba. Here the stream bottom was devoid of aquatic insects two miles below the Spanish Mine." (Sumner and Smith, 1940) And the dams built to contain the debris from hydraulic mining, as well as for other purposes, were at least as detrimental to the fish as mining itself.

Dams

"I was at the [Daguerre Point] dam a couple of weeks ago and the last run of salmon were lying dead by the dozen..." From a letter to the Fish and Game Commission from Smartsville resident Asa Fippin, February, 1920.

"It must be kept in mind that while the production of gold will ultimately end, salmon can go on reproducing their kind indefinitely; and the debris dams will continue indefinitely to restrict present and potential salmon runs and the permanent economic values to be derived therefrom" (Sumner and Smith, 1940).

The rivers of California's Central Valley provide water for one of the world's most productive agricultural regions as well as for two major urban areas, San Francisco and Los Angeles. For this reason, they are "among the most disrupted rivers in the world, with hundreds of dams and diversions emplaced on the mainstems and tributaries."

(Yoshiyama et al, 2000). This is especially true of the Yuba. Dams and diversions have altered the flow of the Yuba River and affected salmon populations since 1892, with the construction of Spaulding Dam. Here is the chronology of dams on the Yuba:

Spaulding Dam: South Fork. Earliest version built in 1892, current version in 1913, by Pacific Gas & Electric Company. The dam is 275 feet tall and diverts 66% of the South Yuba's flow.

Barrier No. 1: Preceded Daguerre Point Dam on the main stem, 4.5 miles upstream. Constructed in 1904-05 by the California Debris Commission. 1200 feet long, 15 feet high, with a spillway around one end. Plans to enlarge the spillway and add 8 feet to the total height of the barrier were made in February 1907; in March 1907, floods carried away a significant amount of the dam, and restoration was "deemed inadvisable."

Daguerre Point Dam: Yuba main stem. 15 feet high, completed in 1910 by the California Debris Commission to contain debris from hydraulic gold mining. When hydraulic mining was not resumed, the dam was retrofitted as a diversion point to provide water for consumptive water users. Fish ladders constructed in 1924, destroyed by floods in 1927-28. Improved fish ladder (pictured at left) installed around 1950-52 (Yoshiyama et al, 2001).

Bullards Bar Dam: North Yuba. Constructed 1921-24 for mining debris storage. New Bullards Bar Dam was built by the Yuba County Water Agency, 1969.

Englebright Dam: Yuba main stem, 12 miles above Daguerre. Originally called Upper Narrows Dam. Construction begun in 1938, completed in 1941, at a cost of $4 million. Originally built to catch hydraulic mining debris, retrofitted for hydroelectric generation (provides power for 50,000 homes annually). Also used recreationally by houseboaters and anglers. The dam is 260 feet high and 1142 feet long; Englebright Reservoir is 227 feet deep at the dam, covers 815 acres, and is 9 miles long with 24 miles of shoreline.

Sumner and Smith, in their 1940 survey of salmon populations, point out two problems with debris dams for the fishery. First, the height of the dams blocks all potential salmon and steelhead runs upstream of the barriers. Second, debris dams are built "for the sole purpose of allowing gravel and silt to be washed into the streams above them, and this silt will affect both resident and migrant fish" (Sumner and Smith, 1940). The fish ladder at Daguerre was constructed almost 15 years after the dam was completed in order to allow fish access to the spawning grounds above the dam. However, Sumner and Smith describe it as "a rather ineffectual fishway... That few fish have been able to use it...is testified to by the almost universal belief among local residents that at present no fish ever come above the dam. It was also reported that heavy runs of salmon occurred in Dry Creek and Deer Creek above Daguerre Point Dam before its construction, but there are few, if any, there now." Large numbers of salmon must have gotten over Daguerre during certain high-water years, however. Reports from the construction of Bullards Bar Dam on the North Fork in 1921 to 1924 state that "so many salmon congregated and died below it that they had to be burned" (Sumner and Smith, 1940).

The matter of the Daguerre Point Dam fish ladders is discussed at length in the correspondence of the Army Corps of Engineers from 1920 to 1924 and provides some interesting reading. Asa Fippin of Smartsville wrote to W.H. Shebley at the Fish and Game Commission, February 4, 1920: "I was at the dam a couple of weeks ago and the last run of salmon were lying dead by the dozen such conditions being witnessed by others of the party accompanying me... If the conditions at the dam could not easily be remedied, such conditions might be excused, but I cannot see why the U.S. Government or Colonel Rand or whoever may be at fault should be allowed to maintain a dam across any stream that is the natural home of the game fish that live therein it being an act of injustice to the people of this locality and shows absolute disregard for the laws of the State of California." Shebley then wrote to the San Francisco District Engineers Office of the War Department, February 18, 1920: "There is a run of food fish, Chinook salmon, in the Yuba River and they should be saved from extermination. Kindly let us know whether you cannot construct a fishway over this dam, according to the plan that we made two years ago."

A letter dated April 21, 1924, from the Chief of Engineers of the War Department to the President of the California Debris Commission makes reference to another letter from Shebley. Presumably the quoted correspondence was addressed to Fippin. "A communication from W.H. Shebley…[has] been brought to the attention of this office: 'Referring again to the fishway, kindly get up a petition stating the facts regarding the efforts made to have this fishway built and forward the petition to Congressman Lea requesting his assistance…It is the only way we see out of it. If the people of your district demand the fishway, which we know they will, and make their wants known in the form of a petition to Congressman Lea stating firmly that we have exhausted our best efforts to get the War Department to construct this fishway and for him to use his influence in Washington to get this work done.' " The letter continues, quoting the petition as reading: " 'We, the undersigned residents of California, urgently ask you to use your influence with the War Department to erect a fishway at Daguerre Point Dam, in Yuba County, California, in order to permit the fish of the Yuba River to seek spawning beds and freely circulate. As present conditions prevail it is a serious reflection on the United States Government in its efforts for conservation of game fish to permit the condition to exist. The California Fish an Game Commission is willing to co-operate with the United States Government but cannot do so without authority from the War Department.' "

The initial response from the Engineers at the War Department did indeed seem to be somewhat uncooperative. A May 5, 1924, letter to the U.S. Army Chief of Engineers from the California Debris Commission explains that the Engineers previously chose not to acknowledge the necessity of the ladders: "In March, 1920, the State Fish and Game Commission requested that a fish ladder be built over the Daguerre Point sill in the Yuba River. The then District Engineer replied to their request as follows: 'The dam in question forms a reservoir behind it which causes the depositing of a large amount of the material carried in the river waters, above the dam, thereby clarifying the water to a large extent…Such being the case, it must therefore be considered that the Daguerre Point Sill,

even without a fish ladder, is really a benefit to the fish of the Yuba River below the sill rather than a detriment."

The persistent Mr. Fippin was so passionate about the fish ladder project that he was willing to try to raise the necessary funding himself. The Fish and Game Commission wrote to U.S. Grant, Army Chief of Engineers, on May 20, 1924: "We took the matter up regarding Daguerre Point Fishway with Mr. Asa Fippin of Smartsville, California, who is the person that seems to be most interested in the petitions for having the fishway built over Daguerre Point Dam. He informs us that there are 50 miles of spawning grounds above the dam as well as in a number of tributary streams in which there are 20 or more miles of spawning ground in which the Chinook salmon can spawn…Judging from his letter…if there is no money available…the citizens in the vicinity of Smartsville will raise the necessary funds to pay for the material and labor to construct the fishway according to the plans we have made…he claims there is a very large run of salmon that is locked in the passage up the river by Daguerre Point Dam and they are very anxious to have this obstruction removed by constructing a proper fishway."

Fippin wrote to Major U.S. Grant himself on June 3, 1924: "Am in receipt of your letter requesting information concerning the necessity of a fishway over Daugerre Point Dam, in the Yuba River. The people of this and other districts along the water shed of the Yuba river have made complaint to the Fish and Game Com. of the dam in question every since the dam was built having been deprived of a valuable source of getting fresh fish, principally salmon.

"Every year, generally during the low water season fish in great numbers of different varieties come up the river to spawn and not being able to get over the dam their efforts are useless as they cannot get to the natural spawning beds above.

"If it is in your power to have a fishway built over Daugerre Point dam, I think you could not perform a more earnest duty, than to construct same. There are about 100 miles of river or creek above the dam that can be traversed and is suitable for spawning beds…If there are no funds available to build fish way over dam I think I can raise the amount necessary to build a fish way of moderate cost as the people of this district most earnestly desire the fish way over Daugerre Point Dam.

"I am sending sketch of southern section of dam where fish try to get over and system of pools that would help them to get over without difficulty." (See drawing below.)

Evidently Fippin's persistence paid off in the end. A headline in the Sacramento Bee on July 12, 1924, reads: "Fishway To Be Installed In Yuba River: Agitation of Ten Years Standing is Ended With Order For Piscatorial Aid At Daguerre Dam." The article goes on to state that, though "heretofore all attempts to secure a fishway have been fruitless," the California Debris Commission had just approved the installation of the fishway, in response to pressure from sportsmen's clubs and individuals maintaining that salmon were unable to pass Daguerre Point and the upper branches of the Yuba were being depleted of fish.

Unfortunately, other information from the Army Corps files calls into question the effectiveness of the ladders Fippin and other citizens worked so hard to bring about. An inspector for the Army Corps, one J.H. Wygant, concludes in his Daily Report on salmon at Daguerre Point for November 11, 1937, that "Present fish ladder is entirely useless." His report also includes the following observations and suggestions: "...looked at the salmon below dam. 8 or 10 are spawning in a 10' wide x 35 foot long diagonal in the clean water from Dry Creek canal. Main stream was a little cloudy. I started up streambed where possible and on dredge piles the balance to the washed out old concrete-faced dam at the power line crossing. There was 4 salmon working near the concrete intake box. There was 2 more and except those below the dam was all I saw today. Below the suspension bridge there are 4 and 2 working two beds - all salmon were from 32 to 36" long. Several looked like humpbacks a very poor grade... The distance from Daguerre Point to near Timbucto is all good spawn grounds at any stage of water on river, and the suggestion I gather from this two days is that at least 2 fish chutes be cut thru so there is plenty of White Water and with 2 or 3 second feet flowing and 2 or 3 landing pools in chute. Water would have to be 1.0' to 1.3' deeper than spill is now. And if there is a confined flow of White Water to a point 25' to 35' ahead of Dam it will stop the useless jumping I saw to-day on way home when I again stopped at Dam. There is more Salmon there to-day and if Rain raises River .1" to .3" there will be hundreds where there is now 1. Rained off and on all day. I saw 34 jumps in 10 minutes ..."

Another 1937 Army Corps report on salmon contains several references to the imminent construction of the Upper Narrows Dam, which was later named Englebright. The report states that it is "Problematical that fish ways would be warranted as dam heights excessive... Dams would probably be very deleterious to fish life." Indeed, the construction of Englebright Dam marked the end of all fish passage into the South, Middle, and North Forks of the Yuba, preventing salmon from reaching any of the spawning grounds above the dam. The report goes on to conclude "The Narrows Dam too high for way – hatchery the answer." Evidently a hatchery was not their answer in the end, as the salmon runs on the Yuba have never been supplemented by hatchery-raised fish and, as such, are among the few wild runs remaining in California. However, the extent of salmon in the Yuba today – in the main stem as far as Englebright Dam – is considerably less than their historical range.

Extent of Historic Populations

"Salmon, at least in some numbers, went considerable distances up certain drainages such as the North Fork Feather and North Fork Yuba Rivers; within the territory of the Nisenan people…salmon in most streams were said to have ranged 'above the limit of permanent habitation' – i.e., 3000 to 4000 feet." (Yoshiyama, 1999)

Yoshiyama, Gerstung, Fisher, and Moyle (2001) compiled both scientific and historical evidence to come up with an estimate of the historical distribution of chinook salmon populations in Central Valley rivers. Their results for the Yuba, along with some of the evidence used to draw these conclusions, are as follows:

South Fork Yuba: Records are scarce for the South Yuba. Access to this fork was already blocked by dams when surveys were conducted by the Department of Fish and Game in the 1930s. However, DFG records indicate both salmon and steelhead occurring at least one to two miles upstream from the mouth. A photo taken at Bridgeport shows a young girl holding two salmon caught nearby (attached). A 12-foot drop 1/2 mile below Humbug Creek would have presented a significant obstacle, and was probably the upper limit for salmon in most years. It is possible that salmon got further in years of particularly high water; steelhead are known to have gotten as far as Poorman Creek near the town of Washington, and spring-run salmon may also have done so (Yoshiyama et al, 2001).

Middle Fork Yuba: Both salmon and steelhead were seen in the lower part of the Middle Yuba in the 1938 Fish and Game survey. Salmon traveled at least as far as a ten-foot falls in the lower part of the river, about 1.5 miles above the mouth; no records indicate whether salmon got beyond this point. There are no significant obstacles beyond the falls, so if salmon were able to pass the falls they would have had access to a long stretch of river. Steelhead were found as far as the mouth of Bloody Run Creek. (Yoshiyama et al, 2001)

North Fork Yuba: ***Salmon were caught in the Bullards Bar area from 1898 to 1911, during the operation of the Yuba Powerhouse Project. Coleman's history of Pacific Gas and Electric Company (1952) relates the following story. "Life at the Yuba Powerhouse was not without its compensations. During the fishing season…the ditch tenders at the diversion dam on the North Yuba, 20 miles higher in the mountains, would share their catches of salmon with the powerhouse boys by using a novel means of fresh fish delivery. They would nail two or three salmon on boards, place them body down in the ice-cold ditch stream, and ten hours later the night's dinner would come floating down to the trash rack in the ditch above the powerhouse, where waiting hands would lift the fish out and hurry them to the camp cook." Salmon were still present in this area during the period of construction of Bullards Dam from 1921 to 1924, as Sumner and Smith (1940) report that "so many salmon congregated and died below it that they had to be burned." Salmon and steelhead both were known to reach Downieville; the California Fish Commission (1875) stated that in 1850 and 1851, "large quantities [of salmon] were taken by the miners and by Indians…as far up as Downieville on the Yuba." As there were no natural barriers between Downieville and Sierra City, spring-run salmon probably reached the mouth of Salmon Creek near Sierra City. Deep pools throughout the North Fork would have provided prime habitat for spring-run salmon. It is probable that both spring-run salmon and steelhead continued beyond Sierra City into the higher gradient reach above Salmon Creek; the absolute limit would have Loves Falls. (Yoshiyama et al, 2001)***

Tributary streams

Dry Creek: Salmon traveled at least five to six miles upstream, and continue to do so occasionally in years of especially high flows (Yoshiyama et al, 2001).

Deer Creek: An impassable falls 1/4 mile upstream from the mouth is believed to be the upper limit (Yoshiyama et al, 2001).

According to an assessment by the California Department of Fish and Game, the Yuba River "historically supported up to 15% of the annual run of fall-run chinook salmon in the Sacramento River system" (Yoshiyama et al, 2001). The present range of both salmon and steelhead is restricted to the main stem of the river below Englebright Dam. Along with this reduction in available habitat has come a dramatic decline in population size.

Current Action

It may seem that we in the Yuba watershed have only recently become aware of how our actions affect the health of the ecosystem and its other inhabitants. The historical record, however, indicates that citizens in the area have been conscious of and concerned about salmon and steelhead populations for decades. From the days of the Gold Rush, when residents lamented the decline in both the region's water quality and its salmon runs in their memoirs, to the era of dam building when citizens fought to have fish ladders installed, awareness has been growing. Today both governmental agencies and citizen groups count restoration of the Yuba's salmon and steelhead runs among the items on their agendas. The plight of the Yuba's anadromous fish population was officially recognized in 1990s, when chinook salmon and steelhead in the Sacramento River and its tributaries were listed under the federal Endangered Species Act. Winter-run chinook are listed as endangered (since January, 1994), spring-run chinook as threatened (since September, 1999) and steelhead as threatened (since March, 1998).

In an attempt to address this situation, the Upper Yuba River Studies Program was formed in 1999 as part of the CalFed Bay-Delta Program. CalFed is a working group composed of state and federal agencies and many interest groups, all of which have joined together to develop a comprehensive long-term plan to improve ecosystem health and water management in the Sacramento-San Joaquin river delta and the San Francisco Bay. In December 2000, the Bay-Delta Policy Group approved $6.7 million to fund the efforts of the Upper Yuba River Studies Program. The mission of the UYRSP is "to determine if the introduction of wild chinook salmon and steelhead trout to the Upper Yuba River watershed is biologically, environmentally, and socio-economically feasible over the long-term." Members of the group represent local, state, and federal management agencies, business and property owners, water agencies, and environmental organizations. The group is currently overseeing a series of studies to investigate issues of flood control, water supply and hydropower, habitat, sediment control, water quality, and economics. These studies will provide information need to weigh various options for allowing salmon and steelhead to get around Englebright Dam, from decommissioning or retrofitting the dam to creating alternative channels for fish passage.

The Yuba River is the focus of this ambitious restoration project because, despite its long history of alteration by mining, logging, dams and diversions, and other

disturbances, it continues to support some of the last wild runs of chinook salmon and steelhead in California. In other rivers salmon and steelhead runs are supported by hatcheries, which have served to successfully maintain populations where otherwise they may have disappeared altogether. However, hatchery-raised fish lack the genetic diversity and vigor of wild stocks. Restoring wild populations is the key to bringing back the awe-inspiring salmon runs that so many settlers marveled over when they first arrived in the area. The Yuba has provided many miles of spawning habitat throughout its length in the past, and the potential remains if habitat in the main stem is maintained and anadromous fish passage can be restored into the upper watershed.

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Report on Salmon at Daguerre Point, May 17 to June 12, 1937.
"Daily Report from U.S. Engineer Office, Sacramento District" from J.H. Wygant, Inspector. Nov. 10-11, 1937.

APPENDIX B: PERIPHYTON STUDY

Study Proposal for Yuba-Bear/Drum-Spaulding
PERIPHYTON
December 18, 2008

1.0 Project Nexus

Periphyton (or benthic algae[2]) are a very diverse group of organisms living on the substrate of any river. These organisms are not only an important energy source for aquatic organisms and regulators of stream metabolism but also highly sensitive indicators of environmental conditions because they are relatively non-motile, ubiquitous and their community composition, growth type and growth extent reflect the chemical, biological, and physical processes within a river system. Most importantly in managed rivers, increases in benthic algae growth can also negatively impact stream metabolism and chemistry and benthic macroinvertebrate abundance, species richness and functional roles in the ecosystem as consumers of organic material and prey to larger invertebrates and vertebrates (Collier, 2002; Nelson and Lieberman, 2002; Quinn et al., 1997; Robinson and Minshall, 1998; Suren et al., 2003). Management activities that exacerbate algal blooms incur downstream risks and impacts, including changes in the particulate and dissolved organic carbon budget, nutrient cycling, biological and chemical oxygen demand, pH, and methylation and accumulation of mercury in fish. Algal blooms in the South Yuba River have received attention from journalists and are reported to be a negative factor for river recreation.

Periphyton growth can be controlled by a range of chemical processes including nutrient-limitation (Cascallar et al. 2003; McCormick and Stevenson, 1998; Perrin and Richardson, 1997) and temperature (Francoeur et al., 1999; Morin et al., 1999; Robinson and Minshall, 1998). The biological processes, such as grazing disturbance from benthic macroinvertebrates (Pan and Lowe 1994), are also an important factors controlling
periphyton growth. Despite the important roles of chemical and biological processes, physical processes associated with flow are critical to understanding and controlling periphyton community composition, growth type and extent (Biggs and Close 1989, Clausen and Biggs 1997, 2000, Peterson and Stevenson 1992). Hydrologic alteration combined with the reduction in scouring sediment due to dams can change the onset, growth rate and growth period of periphyton. In addition, some evidence exists to support the hypothesis that hydrologically altered streams are more susceptible to the invasion of atypical periphyton species or assemblages (Biggs and Kilroy 2000).

[2] Periphyton is generally synonymous with benthic algae but may also include other attached plant material.

The continued operation and maintenance (O&M) of the Yuba-Bear Hydroelectric Project and Drum-Spaulding Project (projects) has the potential to dramatically affect periphyton growth directly affecting ecosystem function and recreational value in downstream reaches. This study focuses on determining project effects on periphyton in stream reaches affected by operation of the two projects. This study proposal does not apply to the Rollins Transmission Line Project (FERC Project No. 2784).

2.0 Resource Management Goals of Agencies with Jurisdiction Over the Resource to be Studied

The California Department of Fish and Game and the State Water Resources Control Board have management goals and objectives addressing benthic algae, as well as water quality and populations of aquatic invertebrates and fish which are influenced by periphyton/benthic algae. SWRCB's management goals are put forth in the Central Valley Regional Water Quality Control Board's (CVRWQCB's) Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin Rivers, the fourth edition of which was initially adopted in 1998 and most recently revised in 2007 (CVRWQCB 1998), The Basin Plan formally sets forth water quality standards that include the Middle and Yuba Rivers and Bear River, which are composed of designated existing and potential beneficial uses and water quality objectives.

3.0 Potential License Condition

The study may result in the development of protection, mitigation and enhancement (PM&E) measures relating to the effects of Licensees' facility operations on environmental resources. In particular, the information from this study proposal could be used to develop:

- Instream flow releases, quantities and timing
- Waterway-specific water quality measures

Development of PM&E measures is not part of the study.

4.0 Study Goals and Objectives

The goal of this study is to characterize periphyton in project affected reaches and to determine project effects on periphyton. The objectives will be to determine if and where there is excessive periphyton growth, which taxa (pollution tolerant vs. intolerant) are present and dominate the community, and whether the distribution of excessive growth in space and time can be managed by changes in the Project. Flow impairments from the operations in Yuba-Bear/Drum-Spaulding systems

may exert considerable control on algal biomass and community composition. This study will determine the degree of that influence among other factors.

A secondary goal is to support analysis of ecological relationships, water quality conditions, macroinvertebrate communities and fish populations as may be collectively influenced by instream flows, water temperature and other project affected parameters. Live algal mats can dramatically alter the dissolved oxygen concentration in the benthos and water column during the day (increase) and night (decrease) (Lavoie et al., 2003). Dying algae results in biological oxygen demand that will reduce benthic habitat quality and by increasing organic carbon availability and reducing oxygen concentrations create conditions for mercury methylation both in-stream and in downstream reservoirs and in aggrading systems. Live algae can also cause wide swings in pH due to the use of carbonic acid (carbon dioxide source) in the water for photosynthesis during the day. This phenomenon has been observed in Deer Creek (tributary to the Yuba River) where pH values have exceeded 10 during the day in algae-rich areas (Friends of Deer Creek, personal communication). Chlorophyll measurements during the first flush storms suggest that periphyton is easily dislodged and moved downstream (Dahlgren, personal communication). The objective will be to assess impairment (spatially and temporally) of benthic and water column habitats for benthic macroinvertebrates and fish as affected by periphyton growth and assemblages. This study is expected to contribute to the interpretation of results from other study plans including macroinvertebrates, fish populations and water quality.

Specific objectives of this study are to:

1) Quantify biomass of periphyton at project affected reaches and reference sites.

2) Characterize periphyton community structure including the determination of dominant taxa, tolerance to water pollution and hydrologic disturbance, and presence of species which represent abnormalities for natural waterways of the region.

3) Measure effects of periphyton on local water quality and habitat conditions for fish and macroinvertebrates.

4) Assess strength of relationship between algal biomass, water quality affects on aquatic habitat and project-related hydrologic characteristics.

5.0 Existing Information and Need for Additional Information

The project's Pre-Application Document (PAD) notes the *"During the summer months, heavy blooms of the green alga genus Cladophora can occur in unspecified sections of the South Yuba River and its tributary, Deer Creek (Cohen, 2001; Shilling, 2003). Additionally, the Dry Creek Conservancy has observed heavy algae growth in several areas of Coon Creek, which is probably associated with high nutrient loads during the summer (Dry Creek Conservancy, 2006) … PG&E and NID experienced problems with filamentous algae in the Bowman Spaulding Canal and Bear River Canal from*

approximately 1989 to 2003. The algae grew in water from the cold pool below Bowman, Spaulding and Rollins reservoirs (Nicholson, 2007)."

Dr. Fraser Shilling of UC Davis conducted a preliminary study of periphyton in the North, Middle, and South Yuba Rivers in 2001 and 2002. Periphyton were collected from representative riffles in the South Yuba, Middle Yuba, North Yuba, and Deer Creek. The algae sampled in the Yuba system seems to be primarily of the division *Chlorophyta* (green algae) and the genus *Cladophora*, which forms branched or unbranched filaments up to several meters long and has the common name "blanket weed". The main finding was that there was a measured increase in attached algae during the summer that corresponded to increases in water temperature (Figure 1), while nutrient concentrations did not increase. Algal biomass measured in the South Yuba was among the highest in the USGS National Water Information System database. Above 15 degrees C the algae begins visibly growing, from about the beginning of June in the South Yuba, when attached green algae is first visible as small spots on cobble. The North Yuba did not get above 20.5 degrees C. The increase in periphyton biomass may be directly attributable to water temperature, and not nutrient concentrations, which were very low. Periphyton in the Yuba system seems to be temperature limited. However, this preliminary study included no analysis of hydrologic and disturbance factors on periphyton biomass.

In response to citizen concerns about observed algae blooms, the South Yuba's River Citizens League initiated a benthic algae monitoring pilot project from July to October 2008 using protocols established in Biggs and Kilroy 2000 and Barbour et al 1999. At monthly intervals, monitors conducted surveys of benthic algae at three different sites along the South Yuba. The color, growth type, extent of growth and cover of benthic algae was documented at three to eight points along three to five transects (depending on study reach length and width) at each. Relevant physical habitat parameters were collected including canopy cover, substrate size class, and percentage substrate less then 2 cm (as index of disturbance). From this preliminary effort, an index of benthic biomass was calculated from extent of growth and cover. Changes in growth type and color were also documented to determine temporal as well as spatial trends in the South Yuba river. Preliminary results suggest that Lang's crossing, where the greatest biomass was measured (Figure 2), is atypically dominated by brownish mats beginning in early summer.

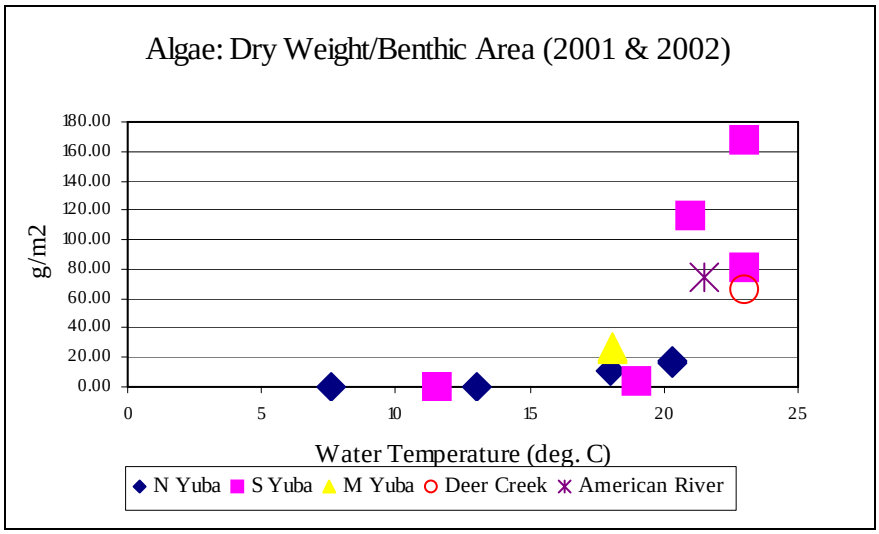

Figure 1: Results from Shilling showing relative algal biomass in the Yuba Watershed.

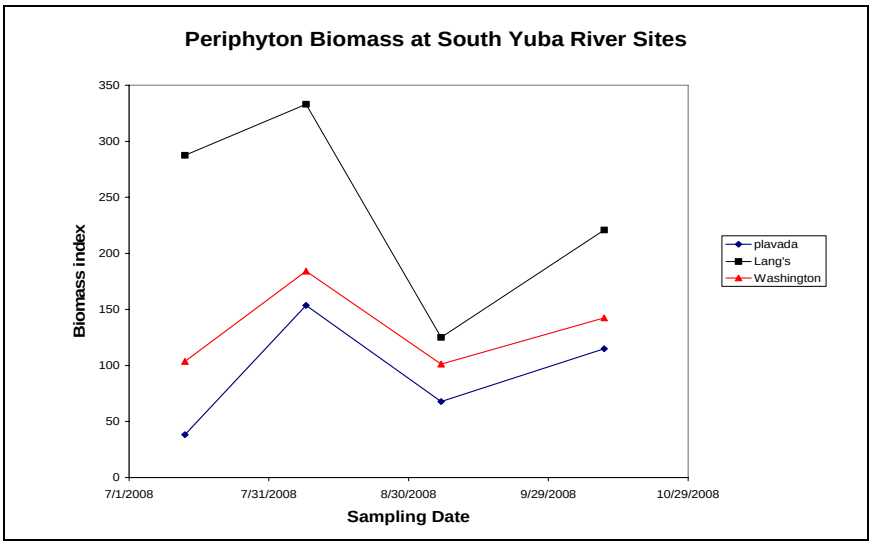

Figure 2: Preliminary results from SYRCL showing estimated biomass of periphyton at three South Yuba sites in 2008.

6.0 Study Methods and Analysis

6.1 Study Area

The study area includes projects-affected stream reaches where effects to aquatic macroinvertebrates and fish assemblages are possible and nearby reference reaches to control for other factors not-related to the projects.

6.2 General Concepts

Insert standard language for all study plans

6.3 Study Methods

The study will be completed in five steps, each of which is described below.

Step 1 – Select Sampling Sites. Table 6.3-1 provides a list of 12 reaches in which sampling will occur. These sampling sites are co-located with macroinvertebrate sampling sites which are in-turn mostly co-located with Fish Population Level II sampling sites. Prior to sampling, Licensees will invite interested Relicensing Participants into the field to comment on selected sampling sites. The North Yuba sites are intended to provide reference data for reaches of similar elevation and no project impacts.

Corresponding to each site, a reach will be selected which represents typical conditions and is approximately 250 meters in length and a minimum five times the channel width. These reaches should not be identical to reaches used for macroinvertebrate of fish population study plans, if sampling activities for those plans could disturb benthic habitat.

Table 6.3-1. Locations periphyton sampling.

Reach	Number of Sampling Sites	Approximate Location
MIDDLE YUBA RIVER		
Milton Diversion Dam Reach (NID)	3	• Co-located with Stream Fish Population Study Level II sampling site downstream of Milton Diversion Dam • Co-located with Stream Fish Population Study Level II sampling site downstream of Box Canyon and upstream of Wolf Creek • Co-located with Stream Fish Population Study Level II sampling site upstream of Our House Diversion Impoundment
SOUTH YUBA RIVER		
South Yuba Reach # 1 (NID/PG&E)	1	• Co-located with Stream Fish Population Study Level II

		sampling site near YB-29 (Langs Crossing downstream of Jordan Creek)
South Yuba Reach # 4 (NID/PG&E)	1	• Co-located with Stream Fish Population Study Level II sampling site below confluence with Canyon Creek
South Yuba Reach # 6 (NID/PG&E)	1	• Co-located with Stream Fish Population Study Level II sampling site below the confluence with Spring Creek
BEAR RIVER		
Bear River Reach #1 (PG&E)	1	• No co-location – Stream Fish Population Study is Level I sampling
Bear River Reach #2 (PG&E)	1	• Co-located with Stream Fish Population Study Level II sampling site
Drum Afterbay Dam Reach (NID/PG&E)	1	• Co-located with Stream Fish Population Study Level II sampling site in middle of reach
NORTH YUBA RIVER		
North Yuba River[1] (NID/PG&E)	3	• Co-Located with Stream Fish Population Study Level II sampling sites

[1] Reach is not affected by the Yuba-Bear Hydroelectric Project or the Drum-Spaulding Project but important for analysis of reference conditions.

Step 2 – Collect Data. Methods for data collections and analysis are described below.

Periphyton Field Sampling

Data collection will occur at each site monthly, May to October, and may coincide on one occasion with macroinvertebrate study plan. Sampling of periphyton within a site will be very similar to the approach used for macroinvertebrates. Each study site will be about 250 m in length. Before sampling begins, the number of riffle habitat units contained in the site will be visually estimated. A total of eight samples will be taken to form a composite. If there are fewer than eight distinct riffles, sampling points will be spread throughout the site as much as possible. If there are more than eight riffles, one or more riffle units will be skipped at random. When possible, each riffle will have a "core area" defined, avoiding edges along channel margins and the upstream or downstream edges of the riffle. The core area of each riffle will be divided into

nine equal quadrats in a 3 by 3 grid for random selection. If more than one sample must be collected from a particular riffle, a second quadrat will be randomly chosen and sampled. Samples will be taken moving upstream from the most downstream riffle unit to minimize instream disturbance.

Exact sample locations will be chosen using a random number chart to choose the distance in meters from the downstream end of the riffle (method used by Harrington et al., California Department of Fish and Game for benthic macroinvertebrate sampling). A 1/16 meter^2 quadrat will be used to delineate a collection area within which all cobble will be sampled. Rocks will be collected, scrubbed free of attached algal material, and returned to the riffle. The entire sample of collected periphtyon will be collected and stored on ice until processed. The sample will be crudely homogenized to allow accurate sub-sampling without causing cell wall disruption. Exactly 10% of the suspended algal material will be set-aside for the taxonomy step and biomass measurement. The taxonomy sample will be preserved in Lugol's Iodine Solution (KI/I in 10% Acetic Acid, 1% Lugol's in final sample). Collected physical habitat data and periphyton samples from each site will be analyzed to derive the following parameters:

Physical habitat parameters

- Reach-wide Parameters
  - Global positioning system (GPS) coordinates at each site.
  - Water temperature, specific conductance, pH, and dissolved oxygen using approved standardized procedures and instruments.
  - Total length and gradient (percent slope) and average width and depth will be measured and recorded at each site.

- Transect-specific Parameters
  - The wetted width of each riffle will be taken at a minimum of three cross-sectional transects and averaged.
  - Water velocity (using a topset rod and flowmeter) will be measured at each of the eight sample points.
  - Substrate composition will be visually estimated at each sample point (area disturbed in front of the net) using the following categories: fines (<0.25 cm), gravel (0.25 to 0.8 cm), cobble (0.8 to 25 cm), boulder (>25 cm), and bedrock. Substrate consolidation and percent embeddedness will also be characterized including reference to whether the substrate is lightly, moderately, or heavily surrounded by fine sediment.
  - Average canopy cover will be estimated at each riffle sampled using a densiometer four times from the center of habitat unit.
  - If field or analytical methods deviate from SWAMP protocols, reasons for the deviation and alternate methods will be explained and documented.

Water quality parameters

Dissolved oxygen and pH will be measured over a 24-hour cycle during peak biomass (late July or early August) at each site. Measuring devices will be positioned adjacent to the benthos and will occur at least twice per hour.

Stream Flow parameters

These data will be obtained as specified in the Hydrologic Alteration Study Plan. The nearest gaged site will be used as a proxy for flow parameters at each periphyton sampling site.

Algal Biomass parameters

Ash free dry weight:
Periphyton sample dry mass will be measured by filtering an aliquot from a periphyton sample on pre-weighed glass-fiber filters, drying and weighing the sample, ashing at 450^{o}C in a muffle furnace, then re-weighing.

Algal chlorophyll a:
An aliquout of suspended algae of known volume will be taken for chlorophyll-a measurement. The method is after that of Parsons et al. (1984) and is briefly described here. The aliquout of suspended algae will be filtered onto glass-fiber filters and pigments extracted with 90% acetone. The filter will be shaken in 90% acetone and the resulting aqueous sample centrifuged to remove particulate material. The absorption of the supernatant will be measured at 630, 647, and 664 nm, from which chlorophyll-a amounts and concentrations will be calculated. The amount of chlorophyll-a per square meter will be calculated based on the known sub-sample volumes.

Algal Taxonomy parameters

Algal samples collected in the field will be used to identify and count soft-bodied (e.g., *Cladophora* sp.) and diatom algae. All taxonomy and counting will be carried out by a qualified laboratory such as EcoAnalyst Inc. One sub-sample for each of the soft-bodied and diatom algae will be taken from the field samples. The methods used are adapted from two main protocols used for wadeable streams. The websites below describe the protocols and each has several references: a) EPA EMAP:
http://www.epa.gov/owow/monitoring/rbp/ch06main.html
b) USGS NAWQA: http://water.usgs.gov/nawqa/protocols/OFR02-150/index.html.

Soft-bodied algae:
Algae samples are sub-sampled and the relative abundance of various macroalgae determined. The remainder of the sample is agitated to dislodge epiphytic algae and to randomly distribute individual cells and colonies. Exactly 0.1mL of the

homogenized sample is placed in a Palmer-Maloney counting chamber using a micropipette. Algae in the Palmer-Maloney counting chamber will be examined at 400X magnification using a light microscope. Soft-bodied (non-diatom) algae are identified to genus. Filaments and colonies are counted as one unit.

Diatom ID/Enumeration:
The diatom ID/enumeration samples are homogenized and a 10mL subsample placed in a small glass beaker. The diatom sample is treated with a 1:1 ratio of concentrated nitric acid and 10 g of potassium dichromate (to digest all organic matter). The sample is then rinsed with de-ionized water until the pH of the sample is neutral. The clean diatoms are mounted on duplicate slides in a high-resolution resin (Naphrax®) for identification under a 1000X magnification light microscope. Relative concentration of diatom species for each sample are determined by choosing a commonly heterogeneous area of the slide and then identifying diatoms, one field of view at a time, until at least >600 diatom valves are counted and identified. A set of diatom association metrics is calculated for each of the sites:

- % sensitive individuals
- % very tolerant individuals
- % deformed or abnormal cells
- Shannon Species Diversity
- Pollution Tolerance Index
- Siltation Index (% *Navicula, Nitzschia,* and *Surirella*)
- Disturbance Index (% *Achnanthes minutissima*)

Step 3 – Analyze Data.

Multi-metric parameters (Table 6.3-2) will be calculated for each periphyton sample and metrics will be evaluated for their predicted response to impairment and evaluated for trends within and among sites. This will be followed by two multivariate analyses which will include a series of ordination techniques in an indirect and a direct gradient analysis. Indirect gradient analysis (Principal Component Analysis (PCA), Nonmetric Multidimensional Scaling (NMDS), or Correspondence Analysis (CA)) will examine the algal community composition data to determine trends and patterns within the community composition data. Following an indirect gradient analysis, a direct gradient analysis (Canonical Correspondence Analysis) will be used to determine which of the environmental variables (physical habitat, water quality, and flow parameters) exerts the greatest influence on the algal community composition and biomass.

Table 6.3-2. Biological metrics calculated to assess periphyton assemblages and local water quality conditions

Metric	Description	Predicted

		Response to Impairment
RICHNESS		
Species Richness	Total number of individual taxa	Decrease
Genus Richness	Total number of genera	Decrease
Division Richness	Total number of divisions	Decrease
COMPOSITION MEASURES		
Shannon Diversity Index	General measure of sample diversity that incorporates richness and evenness	Decrease
Siltation index	Index of tolerance to siltation	Increase in sensitive species
Pollution index	Index of tolerance to pollution	Unknown
Autotrophic index	Ratio of chl a to AFDW	Decrease
BIOMASS MEASURES		
Biomass	Chlorophyll a	Increase
	Ash Free Dry Weight	Increase
Peak biomass	Temporal indicator of ideal growing conditions	Change
Bio-volume	Cumulative volume of cell	Increase

Algal community composition and biomass can be sensitive to multiple environmental variables including nutrient enrichment and/or limitation, temperature, and disturbance (flow related and grazing by macroinvertebrates). This study will utilize proven analytical methods for determining autoecological relationships involving these variables (Porter 2008, Stevenson et al 2008) while incorporating flow alterations as an additional environmental variable that may affect algal biomass and community composition. Project effects will be determined by statistical analysis of multiple factors and comparison with reference sites in the North Yuba River.

If strong relationships are determined through the steps presented above direct univariate and multivariate regression will follow to isolate key environmental variables (independent variables) with algal community composition and biomass data (dependent variable).

Step 4 – Prepare Format and Quality Assurance/Quality Control Data. Following data collection and identification of taxa, Licensee will subject all data to quality assurance/quality control (QA/QC) procedures including, but not

limited to, spot-checks of data and review of electronic data for completeness. If any datum seems inconsistent, Licensee will investigate the problem.

Step 5 – Prepare Report. Licensees will prepare a report that includes the following sections: 1) Study Goals and Objectives; 2) Methods and Analysis; 3) Discussion; 4) Conclusions; and 5) Description of Variances from the FERC-approved study proposal, if any. In addition, the report will compare the data collected with any historic data that are available. Licensees plans to make the report available to Relicensing Participants when completed. The report will be included in the License Application.

6.4 Study Proposal Consultation

This study proposal includes the following study-specific agency consultation:

- Prior to sampling, Licensees will invite interested Relicensing Participants into the field to comment on selected sampling sites.

Licensees will file with FERC and post on its Relicensing Website periodic progress reports as may be required by FERC in its Study Plan Determination. Each report will summarize work performed since the last report was filed and key findings, and will include study data that have been organized, compiled, and subject to QA/QC procedures.

As described in Section 6.2, Licensees will consult with other Relicensing Participants if it believes a modification to the study proposal is needed.

6.5 Schedule

Licensee anticipates the schedule to complete the study proposal assuming FERC's Study Plan Determination regarding this proposal is deemed final on March 12, 2009 is as follows:

Select Sampling Sites (Step 1).....March – April 2009
Collect Data (Step 2)..... May – October 2009
Analyze Data (Step 3)..... November – December 2009
QA/QC (Step 4) .....January 2010
Prepare Report (Step 5)..... February-March 2010

7.0 Level of Effort and Cost

Several laboratories are available for completely processing algal samples at a cost of $350-500 per sample. This cost (12 samples x 6 months) would be no more than $36,000. Separate from field equipment needed for macroinvertebrate

sampling, additional costs are rental (2 weeks) of meters for continuous DO and pH, and time for field collection and data analysis. The estimated cost to complete this entire study in 2008 dollars is $100,000. This cost has been confirmed by two separate academic consultants experienced with the particular field work and analysis in the study proposal.

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Appendix C: PG&E Timber Harvest Plan Letter and Map

Pacific Gas and Electric Company
127 E. Main St
Grass Valley, CA 95945

Dear Interested Party:

Pacific Gas and Electric Company's Natural Resource's Management group is in the initial stages of preparing for a timber harvesting operation from Drum Forebay to Bear Valley, North of Interstate 80 and West of Highway 20 in Placer and Nevada Counties. We would like your input and participation in the pre-harvest planning process to ensure we have addressed local community concerns in our completed Timber Harvesting Plan. An informational meeting is scheduled for September 16th, 2008 from 6:00 to 9:00 PM in the meeting room at the Nevada County Consolidated Fire Department - Station 84, 10135 Coyote Street, Nevada City, CA.

Enclosed is a map that outlines the boundaries of the potential timber harvest. This will be a "group selection" harvest designed to increase the health and vitality of the forest, reduce wildfire hazards and fuel buildup, increase biodiversity in the forest, enhance carbon sequestration, and remove stored carbon.

PG&E manages its timber lands for the sustained yield of all resources on the land and the multiple-use of these resources, which means that all uses of the land are considered prior to implementing timber harvesting activities. When needed, protection and mitigation measures are put into place to insure no adverse affects occur to the resources of the land.

We look forward to your participation in the planning process so that feedback and comments can be incorporated into the timber harvesting plan. Due to limited space it is requested that 1 to 2 representatives from your organizations attend the meeting. Please reply with number of attendees to jmtp@pge.com or 530-477-3219.

Sincerely,
Jason Thompson Forester
Pacific Gas and Electric Company

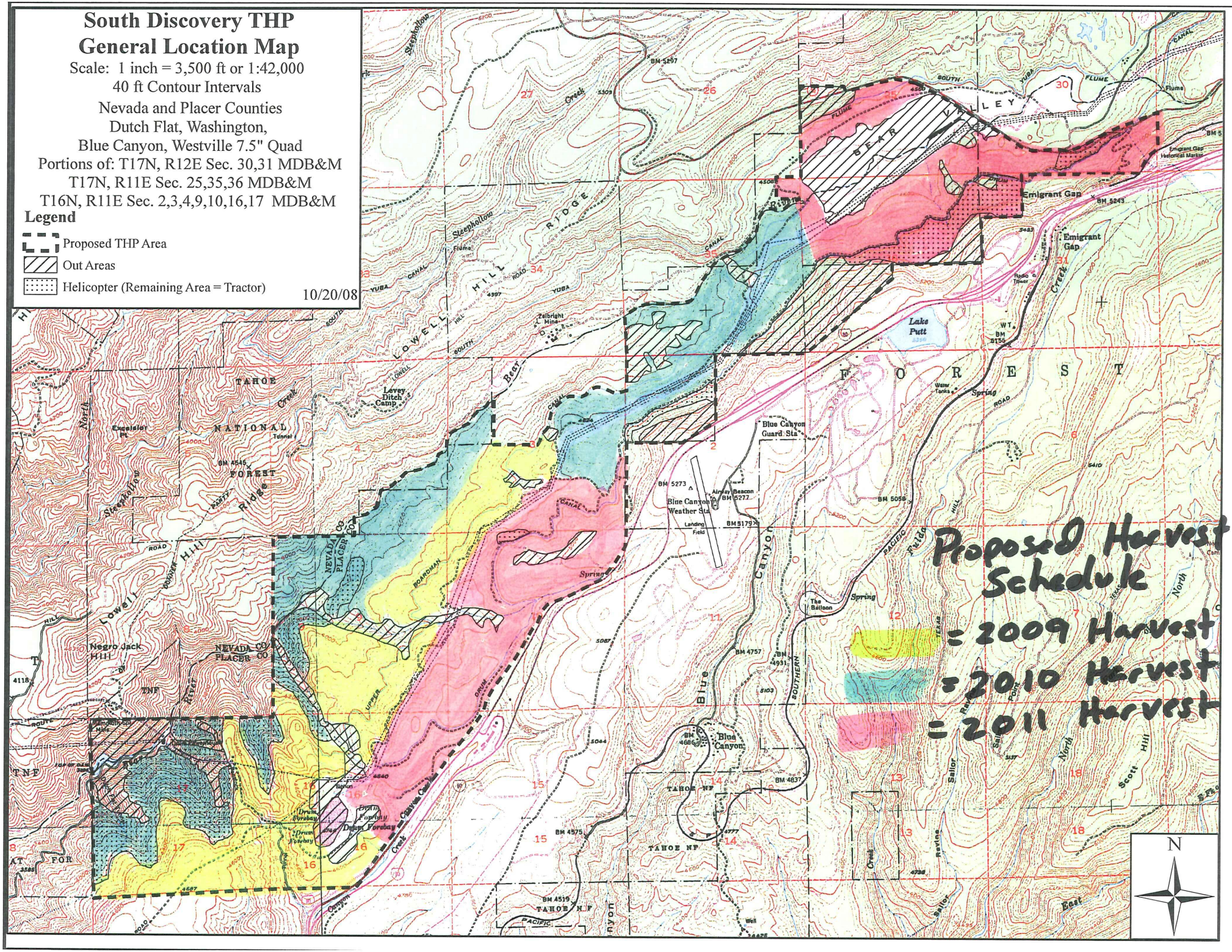
South Discovery THP
General Location Map

Scale: 1 inch = 3,500 ft or 1:42,000
40 ft Contour Intervals
Nevada and Placer Counties
Dutch Flat, Washington,
Blue Canyon, Westville 7.5" Quad
Portions of: T17N, R12E Sec. 30,31 MDB&M
T17N, R11E Sec. 25,35,36 MDB&M
T16N, R11E Sec. 2,3,4,9,10,16,17 MDB&M

Legend

- Proposed THP Area
- Out Areas
- Helicopter (Remaining Area = Tractor)

10/20/08



Cascade THP Project

Scale: 1 inch = 2,000 ft
40 ft. Contour Intervals
Washington 7.5' Quad
Portions of Sec. 33 & 34
T17N, R10E, MDB&M

Legend

PG&E Property Ownership

= 2009 Harvest