



March 26, 2015

Peter Barnes, Engineering Geologist
State Water Board Resources Control Board
Division of Water Rights
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Via e-mail

Re: Comments of California Sportfishing Protection Alliance and American Whitewater on the *Draft Environmental Impact Report for the Water Quality Certification of Pacific Gas & Electric Company's Upper North Fork Feather Hydroelectric Project, Federal Energy Regulatory Commission Project No. 2105*

Dear Mr. Barnes:

The California Sportfishing Protection Alliance (CSPA) and American Whitewater (AW) respectfully submit comments on the *Draft Environmental Impact Report for the Water Quality Certification of Pacific Gas & Electric Company's Upper North Fork Feather Hydroelectric Project, Federal Energy Regulatory Commission Project No. 2105* (DEIR). Both CSPA and AW are signatories to the April 22, 2004 Project 2105 Settlement Agreement. That Settlement resolved many of the issues relating to the relicensing of the Upper North Fork Feather Project ("Project"), but left unresolved issues relating to water temperature, not only in the bypassed reaches of the Project, but also in the bypassed reaches of the Rock Creek – Cresta and Poe hydroelectric projects downstream (FERC No. 1962 and No. 2107 respectively).

CSPA and AW appreciate the fact that Board staff took on the issue of water temperature in the North Fork Feather River in 2005, following the failure of FERC to take it on in relicensing and the lack of resolution on this issue in Settlement. CSPA and AW consider water temperature to be the single greatest aquatic issue still facing the North Fork Feather River (NF Feather River or NFFR) from Lake Almanor to Oroville Reservoir. Fulfillment of the benefits achieved in the Rock Creek – Cresta Settlement (2001), to which CSPA and AW are also both signatory, has equally been significantly held in abeyance pending the Certification of the Upper North Fork Feather Project. The Rock Creek – Cresta Settlement explicitly points to the need to address water temperature issues upstream. In over ten years of license implementation on the Rock Creek – Cresta Project,¹ it has been abundantly confirmed that water temperatures on this

¹ The Rock Creek – Cresta Project is located immediately downstream of the Upper North Fork Feather Project. The head of Rock Creek Reservoir is less than a mile downstream of Belden Powerhouse, for which Rock Creek Reservoir effectively serves as an afterbay.

downstream project and its bypassed reaches are almost completely dependent on input temperatures from the Upper North Fork Feather Project immediately upstream. In short, PG&E cannot significantly reduce summer water temperatures in the Rock Creek, Cresta and Poe² reaches without reducing summer water temperatures at Belden Reservoir, in the Upper North Fork Feather Project. Releasing larger volumes of warm water from Rock Creek, Cresta and Poe dams will not make the water cooler. The Level 1 and 2 Report and the Level 3 Report that preceded this DEIR provided extensive technical data and analysis of this thermal reality.³ As stated succinctly in the Level 3 Report: “The water temperature profile of the NFFR is primarily driven by the Belden Reservoir water temperature, which in turn is controlled by the Lake Almanor and Butt Valley Reservoir outflow temperatures.”⁴

State Board staff recognized the controlling water temperature function of releases from Belden Forebay in 2005 or earlier. Since 2005, Board staff has persevered in pursuit of improving NF Feather River water temperatures, in spite of several personnel changes and until recently a general shortage of capacity. We appreciate the fact that the DEIR has finally seen light of day, and we urge the Board to recognize and do justice to the decade of staff dedication that went into it.

We are disappointed, however, that after ten years, the DEIR contains fundamental flaws that will require it to be recirculated or, at the very least, supplemented. However, we believe that the necessity of correcting the flaws in this DEIR presents Board staff with an opportunity to affirmatively address concerns that were raised at the February 11, 2015 public comment meeting in Chester, and that are raised in written comments. The Board can address key issues in a recirculated DEIR or in a supplement to the DEIR without extensive additional data gathering. At the same time, the Board will also have the opportunity to address important alternative mitigations that have the potential to meet multiple interests, including most notably those of Plumas County and its residents.

The DEIR is substantially flawed because:

The DEIR does not present evidence to demonstrate the benefit of the preliminary staff alternative. This alternative will not bring the Project into compliance with the Clean Water Act. In lieu of such compliance, the DEIR proposes “adaptive management” without definition, boundary, timelines, or triggers, improperly and indefinitely further delaying enforcement of the Clean Water Act after ten years of delay.

The DEIR does not present a reasonable range of alternatives.

² The Poe Project is located just downstream of Cresta Powerhouse. Cresta Powerhouse is located at the bottom of the Cresta reach at the head of Poe Reservoir; the Poe reach of the North Fork Feather River is immediately downstream of Poe Reservoir, and ends at Poe Powerhouse, several miles upstream of the high water pool of Oroville Reservoir. While modeling shows that it is not possible to cool the entire Poe reach, it is definitely possible to cool the upper mile of the Poe reach in the area near the settlement of Pulga, which is both accessible to anglers and the most important part of the reach for trout.

³ The Level 1 and 2 Reports and the Level 3 Report are included in the DEIR as Appendix D and Appendix E, respectively.

⁴ Level 3 Report, DEIR Appendix E, p. 2-4.

The DEIR does not present evidence to explain why it deems infeasible an alternative to release 600 cfs from Canyon Dam in July and August to cool the North Fork Feather River.

The DEIR relies on previous modeling that grouped various mitigation elements into various combinations, but did not isolate the thermal benefits of specific elements. In addition, the DEIR does not present model output for the precise alternatives described in the DEIR, including the Preliminary Staff Recommendation, relying instead on inaccurate approximations that can be gleaned from previously modeled combinations of elements.

The DEIR does not propose adequate mitigation for project effects on the cold water habitat in Lake Almanor.

Additionally, the DEIR recommends measures beyond the clear scope of the need to improve cold water habitat. The DEIR unilaterally proposes changes to the Project 2105 Settlement Agreement that would leave other project impacts unmitigated and that could affect the balancing of resources agreed upon in relicensing.

We elaborate on these issues, and make a series of recommendations, below.

I. The Project substantially impairs the cold water resources of the North Fork Feather River.

Summer water temperatures in the North Fork Feather River downstream of Caribou Powerhouse and Belden Reservoir cannot in any sense be construed as protective of cold water beneficial uses. Summer water temperatures on the Rock Creek and Cresta reaches are simply too warm. Since 2006, PG&E has provided summer water temperature data on a weekly basis to members of the Rock Creek – Cresta Ecological Resources Committee (ERC), a license implementation advisory body whose monthly meetings are faithfully attended by CSPA and AW and by a representative of State Board staff. This data is summarized in Annual Reports for the Rock Creek – Cresta Project that PG&E files each year, but the Annual Reports do not provide daily data. In all but the wettest years (e.g. 2011) mean daily water temperatures on the Rock Creek and Cresta reaches routinely exceed, for multiple consecutive weeks, the FERC-established benchmark of 20°C. The following table, compiled from weekly PG&E data provided to Rock Creek – Cresta ERC members, shows mean water temperatures from the summer of 2014.

| Dates (2014) | NF-57 (Rock Creek reach below Rock Creek dam) | | NF-56 (Cresta reach below Grizzly Creek) | |
|--------------|---|--|---|--|
| | Weekly mean of mean daily water temperature | Weekly mean of maximum daily water temperature | Weekly mean of mean daily water temperature | Weekly mean of maximum daily water temperature |
| 7/6-7/12 | 21.5 | 22.4 | 21.6 | 23.1 |
| 7/13-7/19 | 21.9 | 22.7 | 22.3 | 23.8 |
| 7/20-7/26 | 21.0 | 21.8 | 21.3 | 22.9 |
| 7/27-8/2 | 22.1 | 22.9 | 22.1 | 23.7 |

| | | | | |
|-----------|------|------|------|------|
| 8/3-8-9 | 21.6 | 22.2 | 21.6 | 22.8 |
| 8/10-8/16 | 21.2 | 22.2 | 21.5 | 22.9 |
| 8/17-8/23 | 20.0 | 21.3 | 20.8 | 22.4 |
| 8/24-8/30 | 20.8 | 21.6 | 20.8 | 22.3 |

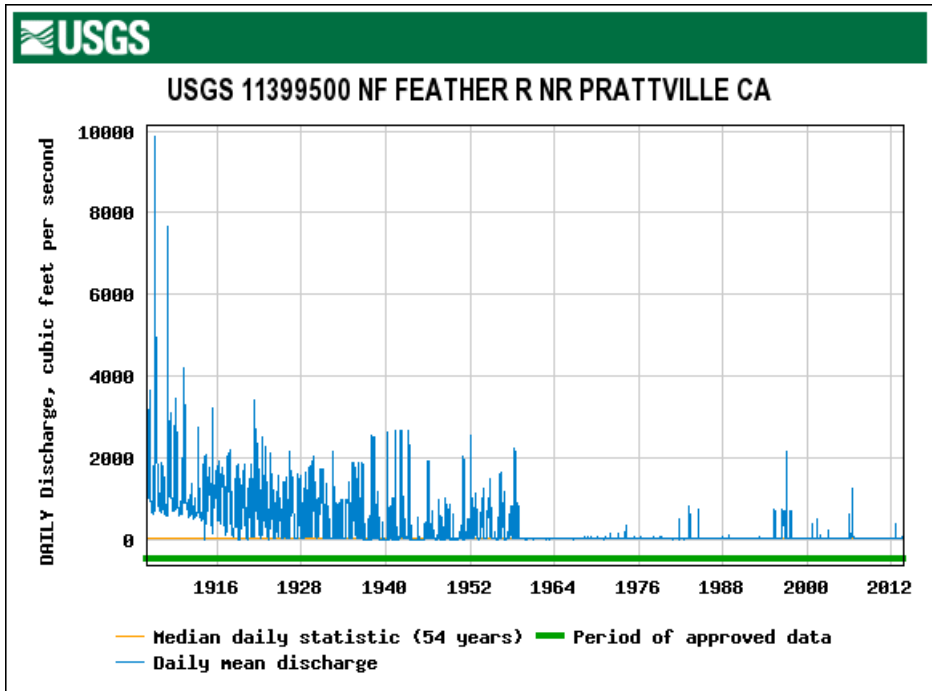
In considering this data, one must take into account that the temperature monitoring stations are located in the stream channel near the upstream end of each reach. Temperatures increase as water moves downstream. In addition, the weekly mean of the maximum daily water temperature does not highlight the highest temperatures recorded in any given week. On the Rock Creek reach, the weekly highs (°C) for the time period shown in the chart above were 22.9, 22.7, 22.4, 23.4, 22.8, 22.6, 21.8, and 22.3. On the Cresta reach, the weekly highs (°C) for the time period shown in the chart above were 23.8, 23.8, 23.5, 24.0, 23.7, 23.4, 22.8, and 22.9.

The average daily data for July and August 2014 generally show water temperature values for the Rock Creek and Cresta reaches that are lower than the 10% exceedance values shown for baseline conditions shown in DEIR Appendix F, Figures 7 and 8.⁵

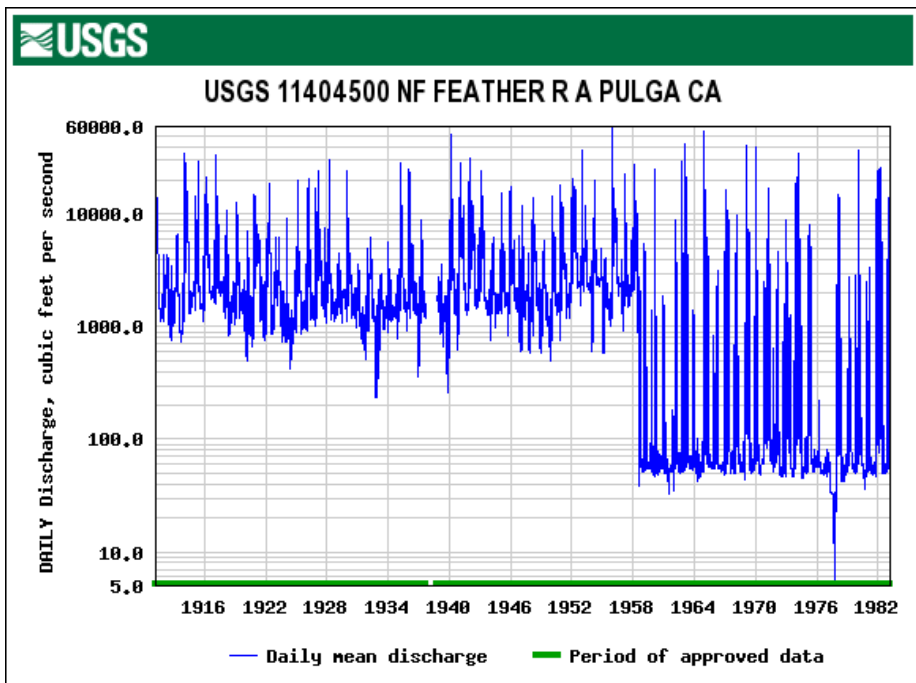
Some commenters at public meetings related to this Certification have suggested that the North Fork Feather River was not reliably a cold water resource prior to PG&E’s construction of its hydroelectric system. Springs now submerged under Lake Almanor produce summer flow of 700-1000 cfs; the claim that the system was not cold in a state of nature is simply untrue. On the contrary, the North Fork Feather River is one of two major spring-fed river systems in the Sacramento – San Joaquin watershed (the other being the upper Sacramento River complex). As such it is likely the most aquatically impaired river system of any system in California.

The record for the USGS gauge on the North Fork Feather River near Prattville, located just below Canyon Dam, clearly shows the impact of hydroelectric development on the North Fork Feather River. This record includes the period from 1906 to 1914, before the first incarnation of Canyon Dam was constructed. The record shows that pre-project flows rarely dropped below 1000 CFS. After the dam’s construction, flow still remained relatively high until the middle part of the last century. After the final raise of Canyon Dam was completed in 1962, over 95% of the flows were being diverted from the upper reaches of the North Fork Feather River.

⁵ DEIR Appendix F, pp. A-23 and A-24.



The USGS Pulga gauge, located near the bottom North Fork feather system, tells a similar story. This gauge just below the Poe Dam shows that typical summer base flows were often above 2000 cfs. After the Poe project was completed in 1958, high flows in the springtime continued to occur sporadically in the lower river, but summer base flows were reduced to less than 100 cfs.



The weekly DWR Bulletin 120 for March 9, 2015 forecast of unimpaired runoff shows that even in September of what is now tracking as the worst water year since 1950, the Feather River system is forecasted to have an estimated monthly unimpaired flow of 60,000 acre-feet, or average daily inflow to Oroville Reservoir of about 1010 cfs.⁶ The vast majority of that flow would come from the springs feeding the North Fork; those springs are now submerged in Lake Almanor.⁷ While many rivers below dams in California actually see enhanced late summer base flows with cold water releases from the bottom of reservoirs to provide managed cold water habitat, this is simply not the case on the North Fork Feather River. Far from providing a summer benefit, the removal of over 95% of the summer base flow on the Seneca reach and the rerouting of water from a warmer water source in Lake Almanor through the thermal sink of Butt Valley Reservoir has had a devastating impact on the cold water habitat of the North Fork Feather River, from Lake Almanor downstream to Oroville Reservoir.

II. The DEIR does not describe the economic impacts to Plumas County of the loss of the NF Feather River fishery due to the construction of the Rock Creek – Cresta Project, and does not describe the potential economic benefit of a restored NF Feather fishery.

It was not always so. A report published in 1952 estimated the number of angler days on the NF Feather River to 36,000 per year, or about 180 per day over the fishing season.⁸ Clients at two resorts at Belden and across the river near the mouth of Yellow Creek were estimated to account for 6000 of these angler days. Almost half the anglers were estimated to have travelled from the Bay Area. The report suggested: “Due to the highly accessible location of the North Fork it would be inevitable that without power development it would eventually become one of the most heavily fished trout streams in California. The recreational value of this canyon would rank well up among similar areas in the State.”⁹

In its 1996 Environmental Assessment for the issuance of a new license for the Rock Creek – Cresta Project, FERC and the Forest Service jointly recognized the well-documented decline of the sport fishery since the construction of the Rock Creek – Cresta Project:

Before the construction of the Rock Creek – Cresta Project in 1950, an excellent sport fishery for rainbow trout and brown trout existed in the NFFR reach now bounded by the Rock Creek development. The NFFR reach now bounded by the Cresta development was limited, however, to early season use because of warm, midsummer temperatures (FS, 1938; Wales and Hansen, 1947; FWS, 1948). A pre-project study in 1946 estimated annual angler effort within the project area at 31,500 days (FWS, 1948). From 1981-1985, annual angler effort was estimated at 21,316 angler hours (9,560 angler days) (CDFG, 1988). The creation of the reservoirs, along with flow reduction in the bypass

⁶ <http://www.cdec.water.ca.gov/cgi-progs/ioidir/B120>

⁷ The USGS gauge on the unregulated Middle Fork Feather at Merrimac recorded a September, 2014 low flow of 160 cfs. The 2014 water year was comparably grim to the 2015 water year. The South Fork Feather provides far less flow than the Middle Fork. One can very reasonably assume that even in these very driest of water years, unimpaired flow on the North Fork Feather would be about 800 cfs.

⁸ Wales and Hansen (1952), *The Effect on the Fishery of the North Fork of the Feather River, California, of Proposed Hydro-electric Developments, with Special Reference to the Cresta and Rock Creek Projects*. Attached to these comments as Appendix 2.

⁹ *Id.* p. 17.

reaches and increased water temperatures, changed the NFFR's aquatic habitat to favor non-game species rather than trout (FWS, 1962; Moyle et al, 1983; PG&E, 1979).¹⁰

The Rock Creek – Cresta Settlement Agreement explicitly sought to restore the NF Feather fishery to its historic greatness. The parties to this agreement, including PG&E and Plumas County, as well as CSPA and AW, set forward fishery goals for the Rock Creek and Cresta reaches based on historic conditions. The Rationale Report for the Rock Creek – Cresta Settlement explicitly recognizes this in the description of the “Fishery Objective”:

Achieve a desired goal of an excellent trout fishery and functioning ecosystem to all naturally occurring species. According to the best available information on conditions prior to the Project (Rowley 1955a, 1955b, Gerstung 1973, Snider and Linden 1980, California Trout, 1998) fishery performance criteria will include:

- a. Wild rainbow trout population with 4 age classes.
- b. Fish catch 80% wild trout/ 20% non-game fish.
- c. Average wild trout caught > 9.7 inches fork length.
- d. Adult rainbow trout available for catch > 17 inches.
- e. Harvestable component of 595 lbs/mile wild trout.
- f. Wild trout biomass 62 lbs/acre (catch).
- g. Angler catch rate of one fish per angling hour including catch and release.¹¹

To date, some, but not all of the Rock Creek – Cresta fishery objectives have been achieved. All four age classes are present in the two project reaches, and the average trout exceeds 9.7 inches in length. Fish over 17 inches in length are caught. However, the catch ratio of wild trout to non-game fish is often not met, the catch rate is generally not met, and the biomass and harvestable component objectives have not been met.

While the NF Feather River fishery has partly recovered since the relicensing of the Rock Creek – Cresta Project, it has in no sense recovered the stature it enjoyed pre-project. The 2011 Creel Census prepared for the Rock Creek – Cresta ERC reported a projected number of anglers between 997 and 2,573 for the years between 2002 and 2011.¹² The NF Feather River receives occasional notice in fishing reports, but is not guided regularly and does not receive a lot of fishing pressure.

The partial recovery of the NF Feather River fishery in the last fifteen years encouraging, but it is only a small step towards recapturing the historic value and present potential of the NF Feather River's recreational fishery. According to a report prepared by ECONorthwest for CSPA and AW, “Those 36,000 angling days that occurred on the NFFR in the 1940s would be

¹⁰ Federal Energy Regulatory Commission and U.S. Forest Service, *Draft Environmental Assessment for New License, Rock Creek – Cresta Hydroelectric Project*, November 1996, p. 47. See FERC eLibrary 19961108-0259.

¹¹ *Rationale Report for the Rock Creek – Cresta Relicensing Settlement Agreement*, November 21, 2000, p. 5.

¹² Meadowbrook Conservation Services and Garcia & Associates, *2011 Angler Creel Survey*, April 2012. Submitted to Rock Creek – Cresta ERC, p. 3.

worth approximately \$4 million annually in today's dollars."¹³ Please see Appendix 1 to these comments for additional analysis of the economic consequences of the decline of the recreational fishery on the NF Feather River and of the opportunities that a restored fishery could provide.

III. The DEIR does not include the Preliminary Staff Recommendation as an alternative and does not provide technical analysis of its potential benefits and effects. The Preliminary Staff Recommendation will not improve the temperatures in the NF Feather River downstream of Rock Creek Reservoir sufficiently to protect cold water beneficial uses.

The DEIR does not contain a preferred alternative. Instead, the Notice of Availability for the DEIR contains a "Preliminary Staff Recommendation" that would limit required actions to reduce summer water temperatures in the North Fork Feather River to a release of "up to 250 cfs" from the low level outlet at Canyon Dam from June 15 to September 15 each year, combined with some summer flow augmentations in the Seneca and Belden reaches over and above the flows agreed to in Settlement and included in the Forest Service's 4(e) conditions.¹⁴

Staff's preliminary recommendation to release "up to 250 cfs" down the Seneca reach from June 15 to September 15 for temperature improvement would not be additive to the required minimum flow for the Seneca reach; part of the required flow would be provided by the minimum flow required specifically for aquatic resources in the Seneca reach. Thus, the maximum amount of water actually being required for temperature improvement to maintain cold freshwater habitat in entire NF Feather River is the differential between 250 cfs and required minimum flows. Under the Settlement Agreement and Forest Service 4(e) conditions, September flows for the Seneca reach in all year types are 60 cfs; Wet year flows in June for the Seneca reach are 150 cfs. Otherwise stated, the maximum flow augmentation specifically for temperature improvement for *all reaches* of the NF Feather River downstream of Lake Almanor would be limited to increases of between 190 cfs and 100 cfs over three months, in the Seneca Reach alone.

As noted above, it is actually unclear what the Preliminary Staff Recommendation is. Is the recommendation to release 250 cfs from Canyon Dam each June 15 – September 15, or is it to release some amount less than that? What does "up to 250 cfs" actually mean? If it means less, how is that amount to be determined and how is it to be written as an enforceable condition?

Assuming for the moment that the requirement would be to release 250 cfs from the low level outlet at Canyon Dam continually from June 15 through September 15, the DEIR makes no showing that this (in combination with the "alternative minimum flows") would sufficiently cool the NF Feather River to bring it into conformance with the 20°C benchmark in any of the reaches

¹³ Sarah Reich and Ed MacMullan, ECONorthwest, *Comments on the DEIR for the Upper North Fork Feather River Hydroelectric Project: Economic Issues Related to Coldwater Angling and Whitewater Boating*. March 25, 2015. Attached to these comments as Appendix 1.

¹⁴ The flow augmentations recommended by Board staff in the DEIR for the Seneca and Belden (called "the alternative minimum flows" in the DEIR) reaches are described in Chapter 4 of the DEIR (Alternatives) on pp. 4-9 and 4-10, and are shown side-by-side with the Project 2105 Settlement flows on page 3 of Appendix E1. We discuss the "alternative minimum flows" and our belief that they inappropriately conflict with the Project 2105 Settlement in a separate section of these comments below.

downstream of Belden Reservoir with any consistency. In fact, the DEIR inexplicably presents no modeling results for the Preliminary Staff Recommendation at all. On a very crude basis, comparison of alternatives 3 and 4a in the Level 3 Report suggest that the maximum temperature benefit in the Rock Creek and Cresta reaches of the 250 cfs augmentation in the Seneca reach would be at most 1°C.¹⁵

CSPA and AW did not wait ten years for a summer water temperature improvement in the Rock Creek and Cresta reaches of less than 1°C. Even less did we wait ten years for staff to further kick the can down the road by recommending “adaptive management based on monitoring.” Staff can perform temperature modeling of its Preliminary Recommendation on a stand-alone basis and tell the Board in a matter of weeks what its proposed measures will do. The cooling benefit of a release of 250 cfs into the Seneca reach on a stand-alone basis must be separately modeled to be accurately understood. Staff should perform that modeling and report the results forthwith.

If indeed an adaptive management program were to go forward as an outcome of Certification, it would need to start from and be based on these modeling results and on additional modeling described below that staff has yet to perform. The absence of a clearly defined expected or desired outcome to test is a central defect of the Preliminary Staff Recommendation that the Certification should require “adaptive management.” In contrast, the Rock Creek – Cresta Settlement defined clear thresholds to measure success, both for fisheries (as quoted above) and for water temperature (20°C average daily temperature).

The “adaptive management” that is the final element of the proposed Preliminary Staff Recommendation has additional foundational shortcomings.¹⁶ The Recommendation does not say what adaptive management would monitor, what the timelines for monitoring would be, what metrics for success or failure it would apply, or who would evaluate monitoring results and decide on additional measures. Its sole definitive aspect is the prospective remedy: install a thermal curtain or curtains that Plumas County and users of Lake Almanor are 100% dead against.

The State Board has a readily available model of adaptive management, should the Board decide that adaptive management is an appropriate component of Certification. The Rationale Report for the Rock Creek – Cresta Settlement provides a clear description of necessary elements of its adaptive management program:

The Adaptive Management program established in the Settlement provides resource managers with the opportunity to set resource management goals and objectives; establish and implement initial resource PM&E measures designed to meet those

¹⁵ See Appendix E, Level 3 Report, Figures 2-2a, 2-2b, 2-3a, 2-3b, 2-4a, 2-4b, pp. 2-14 to 2-19. Both alternatives 3 and 4a assume the presence of a thermal curtain at Lake Almanor; Alternative 3 also includes a low-level release of 250 cfs from Canyon Dam. A thermal curtain would further reduce the temperature at Belden Reservoir and thus make the additional 250 cfs from Canyon Dam relatively more effective in its cooling effect. We thus believe that 1°C maximum differential between alternatives 3 and 4a provides a bookend benefit for 250 cfs release on a stand-alone basis; the actual benefit would likely be much less.

¹⁶ There is so little definition of adaptive management in the Preliminary Staff Recommendation that we question whether it is anything more than a vehicle for delaying difficult decisions.

management goals and objectives; monitor the response of target organisms and resources to the PM&E measures and determine if the management goals and objectives are being met; implement modifications to the PM&E measures within pre-established limits in an attempt to meet management goals and objectives that are not being met by the current PM&E measures; and then continue a defined program of monitoring and readjustment of PM&E measures within pre-established limits over time to meet the established goals and objectives.¹⁷

As CSPA, AW, Plumas County, Board staff, and other ERC participants and Forest Service advisors have learned over the thirteen years, adaptive management does not defer defining a desired outcome until “we see it.” The Certification must start with actions that the Board determines, based on substantial evidence, will protect cold water beneficial uses. Any consideration of adaptive management must start from these actions.

IV. The DEIR does not present a reasonable range of alternatives.

A. The alternatives are inadequately defined and are not sufficiently distinct.

Chapter 4 of the DEIR presents the alternatives that the document analyzes. Chapter 4 starts by describing “the Proposed UNFFR Project” as shown below:

The Proposed UNFFR Project, as outlined in Section 3.5 of this EIR, consists of the elements of PG&E’s application to FERC and the Project 2105 Relicensing Settlement Agreement (2004 Settlement Agreement), Section 18 Conditions, Section 4(e) Conditions, and FERC’s Staff Alternative.¹⁸

We believe this description is misleading and inaccurate. The Proposed Project under CEQA is the issuance of a Water Quality Certification for the relicensing of the Upper North Fork Feather Project. As such, the Proposed Project must demonstrate that it conforms to the requirements of the Clean Water Act under whose authority Certification is issued. Part of what allows the DEIR as written to avoid description of how the Preliminary Staff Recommendation would (or would not) comply with the Clean Water Act is this misidentification of the Proposed Project. The whole reason for the DEIR and the overriding objective of the Proposed Project is to incorporate substantive addition to the proposed federal action. FERC punted water quality (temperature) to the State Board; the Board can’t analyze only the proposed federal action as the Proposed Project because the proposed federal action does not address temperature, and thus does not conform to the Basin Plan because it does not protect cold water beneficial uses. Not only is there no *preferred project* in the DEIR, there is no Proposed Project. The PG&E Proposed Project, as modified by FERC and by the Settlement Agreement, is more appropriately considered a No Project Alternative (whereby the Board would waive its Certification authority) under CEQA.

¹⁷ *Rationale Report for the Rock Creek – Cresta Relicensing Settlement Agreement*, p. 29. [“PM&E” measures means “protection, mitigation and enhancement” measures.]

¹⁸ DEIR, p. 4-4.

The DEIR per se (as opposed to the Notice of Availability) analyzes two additional alternatives. These “State Water Board Proposed Project Alternatives” are described in Chapter 4 as: “Alternative 1: Thermal Curtains at Prattville Intake and Caribou Intakes with Modifications to Canyon Dam Outlet Structure and Associated Flows to the Seneca and Belden Reaches”¹⁹ and “Alternative 2: Thermal Curtains at Prattville Intake and Caribou Intakes and Associated Flows to the Seneca and Belden Reaches.”²⁰ Functionally, Alternative 1 would require up to 250 cfs release into the Seneca reach, while Alternative 2 would require release only of “alternative minimum flows” into the Seneca reach.

Thus, in the DEIR, we are presented with an “alternative” that does not comply with the Basin Plan and two alternatives whose central features are thermal curtains at Lake Almanor and at Butt Valley Reservoir. Thermal curtains are vehemently opposed by Plumas County and its residents, and by many other people who regularly spend time in the Lake Almanor area. Thermal curtains are opposed by AW and CSPA. They are opposed by PG&E. In fact, there is no known support at all among any stakeholders for thermal curtains as the solution to improving water temperatures in the NF Feather River downstream of Belden Reservoir, largely because thermal curtains are believed likely to negatively impact the Lake Almanor trout fishery.

In addition, a thermal curtain in Lake Almanor would likely create unmitigated and inmitigable conditions in Lake Almanor that would likely in turn violate the Basin Plan in its impacts to the cold water fishery in the lake.

To the degree that the Preliminary Staff Recommendation could be considered another alternative under CEQA once it is analyzed, it is simply the difference between the other two State Board proposed alternatives. It chooses the least controversial element, but would not comply with the Basin Plan.

In *Foothill Conservancy v. East Bay Municipal Utilities District*, Sacramento Superior Court Case No. 34-2010-80000491 (2011), the Court invalidated an EIR, finding:

... While the Court has no objection to the conceptual range of portfolios described in the EIR, the Court finds there is insufficient variation in the composition of those portfolios to permit informed decisionmaking.

An EIR is required to ensure that all reasonable alternatives to a proposed project are thoroughly assessed by the responsible official. Therefore, an EIR must describe a range of reasonable alternatives to the project or to the location of the project, which could feasibly attain the basic objectives of the project and evaluate the comparative merits of the alternatives. (*Friends of the Eel River v Sonoma County Water Agency* (2003) 108 Cal App 4th 859, 872.) The discussion must focus on alternatives capable of eliminating any significant adverse environmental effects or reducing them to a level of

¹⁹ DEIR, p. 4-5.

²⁰ DEIR, p. 4-8.

insignificance, even if these alternatives would impede to some degree the attainment of project objectives, or would be more costly.²¹

We believe the case is directly on point here. The DEIR neither achieves the “basic objectives” of the project nor eliminates significant adverse environmental impacts. Because the DEIR lacks a reasonable range of effective alternatives, it sets up the outcome for failure. It is also inadequate under CEQA.

B. The DEIR improperly eliminates the release of 600 cfs from Canyon Dam in July and August as an “infeasible” alternative.

Under CEQA,

The issue of feasibility arises at two different junctures: (1) in the assessment of alternatives in the EIR and (2) during the agency’s later consideration of whether to approve the project. (*See Mira Mar Mobile Community v. City of Oceanside (2004) 119 Cal.App.4th 477, 489, 14 Cal.Rptr.3d 308 (Mira Mar)*.) But “differing factors come into play at each stage.” (1 Kostka & Zischke, Practice Under the Cal. Environmental Quality Act (Cont.Ed.Bar 2d ed.2009) § 15.9, p. 740.) For the first phase—inclusion in the EIR—the standard is whether the alternative is *potentially* feasible. (*Mira Mar, at p. 489, 14 Cal.Rptr.3d 308; Guidelines, § 15126.6, subd. (a)*.) By contrast, at the second phase—the final decision on project approval—the decision-making body evaluates whether the alternatives are *actually* feasible. (*California Native Plant Society v. City of Santa Cruz 177 Cal.App.4th 957(2009)*).

“If the agency finds certain alternatives to be infeasible, its analysis must explain in meaningful detail the reasons and facts supporting that conclusion. The analysis must be sufficiently specific to permit informed decision-making and public participation, but the requirement should not be construed unreasonably to defeat projects easily.” (*Marin Water, supra, 235 Cal.App.3d at p. 1664, 1 Cal.Rptr.2d 767*.) The infeasibility findings must be supported by substantial evidence. (§ 21081.5; Guidelines, §15091, subd. (b).) (*Id.*).

The Level 3 Report included an alternative (4c) that proposed to require a July and August summer release of 600 cfs from Lake Almanor’s Canyon Dam into the Seneca reach, without requiring a thermal curtain. This alternative also included a requirement to preferentially use Caribou I Powerhouse instead of Caribou II Powerhouse. The Level 3 Report also included an alternative (4d) that proposed to require a July and August summer release of 600 cfs from Lake Almanor’s Canyon Dam into the Seneca reach and installation of a thermal curtain at the Caribou intakes in Butt Valley Reservoir. These alternatives as modeled performed very favorably in comparison to a thermal curtain at the Prattville intake at Lake Almanor.

The DEIR eliminated from further consideration any alternative that would have required preferential use of Caribou I Powerhouse over Caribou II, on the grounds that such preference

²¹ *Foothill Conservancy v. East Bay Municipal Utilities District*, Sacramento Superior Court Case No. 34-2010-80000491 (2011), p. 30.

“would likely eliminate the UNFFR Project’s ability to serve on-peak energy loads.”²² While we strongly suspect that this conclusion was conditioned by the precise (or imprecise) way in which the language was interpreted, our experience over many years in the Rock Creek – Cresta ERC suggests that any thermal benefit to such preferential operations lasts about one week until the small cold water pool in Butt Valley Reservoir near the Caribou I intake is exhausted. The alternative to preferentially operate Caribou I Powerhouse over Caribou II Powerhouse can more reasonably be eliminated from consideration for simple lack of thermal benefit.

In comparing alternatives 4c and 4d in the modeling output presented in the Level 3 Report, there is virtually no relative benefit of a Butt Valley Reservoir thermal curtain over preferential use of Caribou I. The reason is the same: there is no cold water in Butt Valley Reservoir near the Caribou intakes after the initial exhaustion of the tiny cold water pool at the beginning of each summer. The Butt Valley thermal curtain can thus also be eliminated from consideration for lack of thermal benefit.

This leaves the element common to 4c and 4d as the effective element in reducing downstream water temperatures: release of 600 cfs from the Canyon Dam low-level outlet in July and August. While modeling of 4c and 4d provides a mostly accurate understanding of the benefit of the release of 600 cfs from the Canyon Dam low-level outlet in July and August, this measure should be modeled on a stand-alone basis.

With no supporting evidence, the DEIR eliminated from further consideration the alternative that would require release of 600 cfs in July and August. Together with its conclusion about preferential use of Caribou I Powerhouse, Chapter 4 states that a summer release from Canyon Dam of greater than 250 cfs “would likely eliminate the UNFFR Project’s ability to serve on-peak energy loads.”²³

The statement in DEIR Chapter 4 dismissing the 600 cfs release from Canyon Dam as infeasible refers the reader to Appendix J. Appendix J simply announces the conclusion that this alternative was not “feasible” because it would not allow PG&E to use the project to provide ancillary services such as load following and grid regulation. Appendix J describes:

The increased turbine bypass flows at Canyon Dam reduces the amount of energy available to produce power. So long as the remaining water can be stored and released at the most valuable time, the ability to provide ancillary services is not impacted. A/S provision requires little additional energy as it is the *option* to generate, not actual power production that is the embodied value. However, diverting 600 cfs in *Alternative 4d* does reduce the available storable or “pondage” water so as to impair the ability of the powerhouses to provide ancillary services. This means that the 247 MW of controllable project capacity would have to be replaced with alternative generation. Given the load-following and reserve characteristics of Caribou #1 and #2, this would almost certainly have to be a CT. Based on the cost of constructing CTs derived by the CEC from a survey of California power plants supplemented by estimates from other agencies, building a new replacement plants would cost \$208 to \$369 million (CEC 2010). Energy

²² DEIR, p. 4-3.

²³ *Id.*

production could be replaced with the system incremental resources available from existing resources on the power grid.²⁴

There is no discussion or series of calculations shown to support the conclusion that this alternative must be deemed infeasible. The DEIR does not show how much water that modeling assumed was required to provide reliable ancillary services. The DEIR does not disclose the frequency with which modeling assumed that the needed amount of water would run short. The DEIR not disclose how much generation at Caribou I and II modeling assumed over and above the generation pertaining to ancillary services, or how much modeling assumed that “pondage” water would be reduced by this non-ancillary-service generation. The DEIR does not distinguish, in deeming this alternative infeasible, between lost opportunity from preferential use of Caribou 1 and from releases from Canyon Dam in Alternative 4c. The DEIR does not evaluate varying the releases from Canyon Dam in order to meet temperature requirements based on real-time monitoring. The DEIR does not evaluate somewhat lesser releases from Canyon such as 500 cfs, or what benefit such releases might have. The DEIR is not even clear whether the time period for temperature control releases from Canyon Dam evaluated in the Level 3 Report (July and August) is the same time period that was evaluated for the DEIR in finding the alternative infeasible; the 250 cfs release contemplated in the preliminary staff recommendation would be for a longer time period each year, from June 15 - September 15.

Staff needs to perform the modeling and related calculations and disclose the results. If staff continues to maintain the position that 600 cfs is not feasible, staff needs to clearly, with full documentation, explain why, addressing the issues outlined immediately above. Most particularly, staff must justify this statement: “This means that the 247 MW of controllable project capacity would have to be replaced with alternative generation.” The public and decision makers deserve to see a systematic and clear delineation of all the assumptions behind this conclusion. As stated, elimination of this alternative from consideration leaves the DEIR without a meaningful range of alternatives under CEQA.

In addition, Staff should also add an alternative that evaluates intermediate flow releases from Canyon Dam, between 250 cfs and 600 cfs, and should evaluate the opportunity to adjust flows to respond in real time to water temperatures in the Rock Creek and/or Cresta reaches. One commenter at the February 11, 2015 outreach meeting held in Chester recommended a phased-in approach to temperature improvements in the NF Feather River downstream of Belden Reservoir, which would begin with a 250 cfs release and consider increased flow releases in the future. If considered by staff, this approach must address the fact that rehabilitation of the Canyon Dam outlet works will be necessary for any significant flow release from the low-level outlet. This will require major construction activities, and there would likely be significant efficiency in repairing both of the low-level outlet gates even though it is possible that the operability of only one low-level gate would be sufficient for a 250 cfs release.

²⁴ DEIR Appendix J, p. 32.

V. The DEIR makes unwarranted and unsupported assumptions about Project infrastructure.

The DEIR (Level 3 Report) inappropriately identifies repair of the Canyon Dam low-level outlet works as a capital cost associated with Certification.²⁵ This repair should rather be viewed as a long-needed correction of deferred maintenance, and should not be assigned to the cost associated with Certification per se. Two operational low-level outlet gates at Canyon Dam are needed to ensure the safe and reliable operation of the entire NF Feather hydropower system. The importance of this need was foreshadowed in the summer of 2014, when Butt Valley Powerhouse could not be operated from August 10 through August 23. Water withdrawn from Butt Valley Reservoir threatened to become increasingly warmer as water in Butt Valley could not be replenished from Lake Almanor. A potential thermal catastrophe was averted when Butt Valley Powerhouse was returned to service. Fully operational low-level outlet works at Canyon Dam are necessary to create operational redundancy not only for Butt Valley Powerhouse, but also in case the Caribou units were to go down simultaneously (in the event fire or landslide damaged the Caribou penstocks, for instance). In addition, even for a low-level release of 250 or 300 cfs from Canyon Dam, there should be redundancy of outlet works that enables release of summer flows through the second gate in the event one gate becomes inoperable. In the limiting case, PG&E should not have to decide between flooding Chester and releasing warm water into the North Fork Feather from the high level outlet in the event that operations through Butt Valley Reservoir become impossible over the course of a summer.

The DEIR leaps to the conclusion the PG&E would have to construct a gas-fired power plant to backfill the reliability of the project if a 600 cfs summer release from Canyon Dam were required. However, in recent years, the generation from the Project has varied widely, due not only to hydrology but to a series of outages and repairs that the project has undergone. In 2010, annual generation for the Upper North Fork Feather Project was 696,659,700 kilowatt hours (KWH); in 2011 it was 1,188,147,000 KWH; in 2012 it was 732,109,200 KWH; in 2013 it was 1,156,598,000 KWH.²⁶ These variations in generation do not clearly follow water year types. Nonetheless, in spite of such wide swings, PG&E did not announce that it was compelled to construct a new gas-fired power plant to replace lost generation.

VI. The DEIR fails to evaluate Project cumulative effects on cold water habitat for trout in Lake Almanor, and fails to propose reasonable mitigation for these effects.

The DEIR shows that Lake Almanor has limited cold water habitat under current conditions (“baseline” conditions as described in DEIR Appendix E1, p. 1) and under the proposed action evaluated by FERC in its EIS (“present day conditions” as described in DEIR Appendix E1, p. 2).²⁷ The DEIR describes two key components of Lake Almanor’s cold water habitat: water temperature and dissolved oxygen. Several commenters during the scoping meeting in 2005, as shown in the meeting transcript which is attached to the DEIR as Appendix

²⁵ See DEIR Appendix E (Level 3 Report), pp. 4-13 to 4-19 and Table 4-9 (p. 4-33).

²⁶ Data compiled by California Hydropower Reform Coalition from annual generation reports filed by PG&E with FERC.

²⁷ See DEIR Appendix E, Level 3 Report, Table 3-10b. This table shows zero suitable cold water habitat in a Critically Dry year for the weeks of August 9 and 17 using a standard of 20°C.

B, raised the issue of inadequate dissolved oxygen in Lake Almanor.²⁸ Part of the limitation in cold water habitat stems not only from lack of cold water, but also from the fact that existing cold water has limited or no dissolved oxygen and thus is not suitable as cold water fish habitat. Most of this anoxic cold water is near Canyon Dam. Oxygenation of this cold water near Canyon Dam represents an opportunity to enhance the Lake Almanor's existing trout fishery.

The opportunity presented by oxygenation is not considered or evaluated in the DEIR. Instead, added trout planting in Lake Almanor is suggested as mitigation for when summer operations in Critically Dry years reduce available cold water habitat because water with sufficient dissolved oxygen becomes so warm that it is stressful or lethal to trout.

Oxygenation of reservoirs or of portions of reservoirs is a proven technology whose use has substantially increased in the last twenty years. The East Bay Municipal Utilities District uses two different forms of oxygenation technology: the Speece Cone in Camanche Reservoir in San Joaquin County, and the diffuse oxygenation system in Upper San Leandro Reservoir in Alameda County. The oxygenation infrastructure at Camanche Reservoir was originally installed to oxygenate water released from the reservoir into the Mokelumne River and the Mokelumne River Fish Hatchery downstream. However, an unexpected ancillary benefit has been the substantial improvement of dissolved oxygen levels in the Camanche Reservoir for several miles upstream of Camanche Dam. Initial cost of the extremely simple Camanche infrastructure was \$1.4 Million, and annual cost of oxygen and maintenance is about \$120,000.²⁹

Installation of similar infrastructure near Canyon Dam would create an entire new area of summer trout habitat. Installation near Prattville would expand existing habitat, identified in the Level 3 Report as going almost to zero in August under existing conditions in Critically Dry years, and maintain habitat viability in deeper (and thus colder) water.

Lake Almanor's trout fishery will be subject to increasing water temperatures under climate change; the status quo will not protect it. There is a need to improve reliable habitat for trout in Lake Almanor. It is not possible to improve the thermal profiling of the lake. What is possible is to oxygenate the cold water that is present and will continue to be present in the lake. In spite of attention called to this issue in scoping for the Water Quality Certification in 2005, this issue is not addressed in the EIR.

The State Board should expand the geographic application of its Clean Water Act authority for the Certification of the Upper North Fork Feather Project and protect the Lake Almanor fishery at the same time. The DEIR improperly presents protecting the river and protecting the lake as conflicting interests under Certification. The State Board has the opportunity and in fact the responsibility to protect both of these unique California resources.

²⁸ See DEIR, Appendix B, transcript of scoping meeting held in Chester in 2005, comments of Gary Story, p. 33; comments of Aaron Seandel pp. 60-62. Mr. Seandel, who monitored water quality in Lake Almanor for many years, made similar and more extensive comments relating to dissolved oxygen at the February 11, 2015 meeting held by the State Board in Chester to take comments on the DEIR.

²⁹ CSPA personal communication with EBMUD staff, December 12, 2014.

VII. The DEIR correctly considers that increased flow at the head of the regulated North Fork Feather River system is an appropriate mechanism to address water temperature in the entire system. However, the recommended “alternative minimum flows” for particular reaches in the Upper North Fork Feather Project and the recommended elimination of pulse flows overreach into resolved issues under Settlement.

The Project 2105 Settlement Agreement clearly states the issues that were resolved within that settlement, and those issues that were left unresolved. Resolved issues included:

- Flows for physical habitat for aquatic species,
- Flows for whitewater recreation
- Geomorphic and channel maintenance flows,
- Lake level agreement designed to protect recreation and aesthetics at Lake Almanor.

At the top of the list of unresolved issues is water temperature. Section 2.3 of the Project 2105 Settlement Agreement, Table 2, #2 states:

b) Water Temperature: Feasibility studies are currently underway to determine Project 2105 controllable factors associated with attainment and protection of cold freshwater habitat, a designated Beneficial Use of the North Fork Feather River. All Parties await additional information in early 2004 from on-going modeling efforts related to the potential Prattville Intake Modifications, re-operation, or other structural changes (Canyon Dam Intake structure modification, modification to Caribou 2, etc.) to inform PM&E development and agreement on appropriate water temperature conditions. CSPA has unresolved issues with temperature impacts on aquatic resources resulting from the continued operation of the Hamilton Branch and Project 2105 features including the Prattville outlet, Butt Valley Powerhouse, Butt Valley Reservoir, the Caribou 2 Powerhouse and Belden Reservoir in the Project vicinity and in downstream reaches of the North Fork Feather River to Oroville Reservoir.³⁰

It was always our understanding that water temperature improvements would be achieved by making changes at the head of the system, i.e. increased flows from Canyon Dam or infrastructure changes at Prattville. This is consistent with the understanding reached during the Rock Creek – Cresta settlement negotiations, where participants recognized that any significant improvements in water temperature would have to occur at Lake Almanor.

In proposing “alternative minimum flows,” staff implicitly recognized the challenge of adjusting flows in the Belden and Seneca reach while attempting to keep the other components of the Settlement agreement intact. The DEIR states:

In an effort to mitigate impacts to water supply on an annual basis, State Water Board staff excluded the provision in the 2004 Settlement Agreement that would have required

³⁰ Project 2105 Settlement Agreement, Section 2.3.

pulse flows in normal and wet water years. This adjustment to the 2004 Settlement Agreement flow schedules would be water neutral.³¹

While Staff's attempt to not infringe on water available for generation and/or to limit water needed to meet the lake level agreement is laudable, the decision to make the Solomon's choice of eliminating channel maintenance pulse flows is improper. The DEIR does not consider the Project impacts that the channel maintenance pulse flows were designed to mitigate.

Channel maintenance pulse flows were included in the Settlement and in the USFS 4(e) conditions because of the particularly serious need to maintain the channel in both the Belden and Seneca reaches. FERC agreed with the need for channel maintenance pulse flows in the FEIS:

We recommend this modification to ensure that periodic flows of the magnitude necessary to flush fine substrates from spawning gravels, redistribute small gravels, and activate floodplain habitat would occur with enough frequency to improve conditions for the aquatic biota in the bypassed reaches, especially during periods of drought.³²

The Upper North Fork Feather Project eliminates virtually all high flow events in the Seneca and Belden reaches. The channel in both reaches has become seriously encroached with vegetation. The recreation flow study performed during relicensing repeatedly reported that channel vegetation was a serious concern for the boaters who participated in that study.³³

Eliminating geomorphic pulse flows would also eliminate whitewater boating opportunities that were part of the package agreed to in Settlement.³⁴ As Appendix 1 to these comments shows, these flows have economic as well as recreational value. The recreation releases that have occurred since 2002 as a result of the Rock Creek – Cresta Settlement Agreement have gained regional and national significance. The popularity of the NF Feather River as a whitewater recreation destination is a clear indication of the value of this river as a recreation resource.

In addition, we frankly do not understand the basis for the “alternative minimum flows” for the Seneca reach, because even at their maximum high values the water temperatures in the Seneca reach will always be substantially less throughout the reach than the mean daily 20°C benchmark adopted by FERC and also adopted in the DEIR.³⁵

The “alternative minimum flows” for the Belden reach would not be expected to benefit reaches downstream. A superior approach, and one that would keep the Settlement Agreement flows intact, would be to assure that water temperature in Belden Reservoir was sufficiently cold to cool the reach with the Settlement Agreement flows; this would benefit not only the Belden

³¹ DEIR pp. 4-10.

³² FERC FEIS p. 5-2; USFS 4e condition 25 part 4.

³³ *Flow Assessment for Recreation Upper North Fork Feather River Hydroelectric Project* in Upper North Fork Feather Project, FERC No. 2105, *Application for New License*, p. E5-1021, eLibrary 20021029-0172.

³⁴ Project 2105 Settlement Agreement, p.20.

³⁵ See Appendix E, Level 3 Report, Figures 2-5a (p. 2-20) and 2-5b (p. 2-21).

reach, but also reaches downstream. The way to achieve this is to provide river-cooling flows in the Seneca reach that provide sufficient cold water in Belden Reservoir to cool both the Belden Reach and the Rock Creek and Cresta reaches downstream.

In sum, CSPA and AW believe that there is a clear distinction between flows that are intended to improve temperature for the entire North Fork Feather River and changes in flows that are intended to cool any one specific reach (“the alternative minimum flows”). While the first case is clearly outlined as an unresolved issue in the Settlement, the second has the potential to unravel many of the flow conditions of the Settlement. The negotiations that created the Project 2105 Settlement Agreement required careful consideration of a wide array of interests. We recommend that the State Board make every effort to respect the balancing embedded in the Project 2105 Settlement Agreement to the degree that this is compatible with the Basin Plan and with the Board’s mandate to protect cold water habitat and associated beneficial uses.

VIII. Conclusion

Staff should perform the modeling requested in these comments forthwith, and should release the modeling results to the public for immediate review. This modeling must be analyzed before details of additional alternatives for a recirculated DEIR or a supplement to the DEIR can be fully developed.

Staff should recirculate a revised DEIR or issue a supplement. A recirculated DEIR or a supplement must:

- Describe the impairment of the NF Feather River’s cold water beneficial uses by the Upper North Fork Feather River Project and by PG&E’s associated Rock Creek – Cresta and Poe Projects.
- Describe the impacts of this impairment to the NF Feather River’s recreational fishery and associated economic impacts.
- Define a Proposed Project that will comply with the Clean Water Act.
- Clearly define the Proposed Project.
- Clearly define an adaptive management program if any is proposed, consistent with the principles from the Rock Creek – Cresta adaptive management program as quoted above.
- Define a reasonable range of alternatives. We recommend that these be:
 1. The “Present Day” alternative;
 2. A stand-alone thermal curtain at Lake Almanor (we oppose this alternative, but it must be evaluated given its part in twenty-five years of regulatory proceedings);
 3. A stand-alone 250 cfs release from Canyon Dam from June 15 through September 15;
 4. A stand-alone 600 cfs release from Canyon Dam from July 1 through August 31;
 5. A stand-alone optimized release from Canyon Dam from July 1 through August 31 to be managed real-time to meet a determined temperature target. The water budget for this alternative must be based on modeling

results that show the maximum amount of water available from the Project that allows meeting the Lake Level requirements in the Project 2105 Settlement Agreement and that also allows PG&E reliable operation of the Project for ancillary services; and

6. An oxygenation alternative for the protection of cold water beneficial uses in Lake Almanor. This alternative should be analyzed as a complement to suggested alternatives 3-5 above.
 - Eliminate from consideration the preferential use of Caribou I and a Butt Valley thermal curtain on the grounds that modeling shows they would be ineffective in protecting cold water beneficial uses.
 - Model alternatives 1-5 above on a stand-alone basis, and transparently provide modeling assumptions, inputs, and results.
 - Transparently provide the stand-alone costs of each alternative.
 - Analyze remediation of both of the low level gates at Canyon Dam as necessary infrastructure maintenance required for the safe operation of the Project and for protection of cold water beneficial uses under prolonged outage scenarios for Prattville, Butt Valley and Caribou infrastructure.
 - Eliminate unnecessary inconsistency with the Project 2105 Settlement Agreement by removing from the Proposed Project both the “alternative minimum flows” and the proposed elimination of required pulse flows and associated whitewater boating opportunities.

For decades prior to the construction of the Rock Creek – Cresta Project, PG&E pulsed hundreds of cfs down the NF Feather downstream of Caribou to suit the needs of hydropower. We are convinced that without substantially constraining its system, PG&E can find a way to run up to 600 cfs down one reach (Seneca) for two months a year to restore the aquatic habitat that its three power projects have substantially diminished.

The DEIR as written does not provide us, other stakeholders or decision makers the tools to figure out how to help PG&E determine how to protect NF Feather River cold water resources and still operate its system for the hydropower benefits for which it was constructed.

In 2011, CSPA and AW wrote to FERC following the widespread mortality of foothill yellow-legged frogs following an abrupt drop in flow in the Poe reach of the NF Feather River.³⁶ PG&E at first protested that there was nothing it could do to address such abrupt drops. However, after several years of discussion in the Rock Creek – Cresta ERC, and associated investigation and development by PG&E, PG&E has developed a solution for similar issues on the Cresta reach that will likely not be perfect but that will make a substantial improvement.

This provides an important lesson to all interested persons. What appears infeasible at this moment, particularly to a limited set of stakeholders, may not be as unresolvable as it may appear. There is a long history of solving problems in this watershed. It begins with making sure all the relevant information is available to everyone. Such availability comports with the

³⁶ CSPA and AW, *Comments, Mortality of Foothill Yellow-Legged Frogs on Poe Project*, FERC eLibrary 20110729-5200.

fundamental purpose of CEQA that an EIR be sufficient to allow informed decision making. “[An EIR] must consider a reasonable range of potentially feasible alternatives that will foster informed decisionmaking and public participation.” (CEQA Guidelines, §15126.6 subd. (a).)

CSPA and AW believe that an answer can be found on the NF Feather River that substantially improves both the river fishery and the lake fishery, while allowing PG&E to operate its project for hydropower and specifically for ancillary services. We look forward to a recirculated DEIR or a supplement that provides the tools to advance that effort.

Thank you for the opportunity to comment on the *Draft Environmental Impact Report for the Water Quality Certification of Pacific Gas & Electric Company's Upper North Fork Feather Hydroelectric Project, Federal Energy Regulatory Commission Project No. 2105.*

Respectfully submitted,



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Appendix 1

Comments on the DEIR for the Upper North Fork Feather River Hydroelectric Project: Economic Issues Related to Coldwater Angling and Whitewater Boating

Sarah Reich and Ed MacMullan

ECONorthwest

March 25, 2015

[Filed as separate pdf file]

Appendix 2:
The Effect on the Fishery
of the North Fork of the Feather River, California,
of Proposed Hydro-Electric Developments
with Special Reference to
Cresta and Rock Creek Projects

J.H. Wales and H.A. Hansen

1952

[Filed as separate pdf file]

2-14

THE EFFECT ON THE FISHERY OF THE NORTH FORK OF THE FEATHER RIVER,
CALIFORNIA, OF PROPOSED HYDRO-ELECTRIC DEVELOPMENTS WITH
SPECIAL REFERENCE TO CRESTA AND ROCK CREEK
PROJECTS

(Wales et al. 1952) By J. H. Wales and H. A. Hansen

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Revised July, 1951
Second revision June, 1952

F O R W A R D

It is the purpose of this report to show what effect a series of proposed hydro-electric power dams and diversions on the North Fork of the Feather River will have on fish and fishing in that stream. The development of hydro-electric power usually, if not invariably, alters stream conditions and profoundly affects natural fish life in the areas involved. At times altered water courses prove beneficial to fish populations, but in many cases the effect is detrimental.

Rock Creek Dam and Cresta Dam together with their conduits and power houses are under construction on the North Fork Feather River by the Pacific Gas and Electric Company as two major units in their series of seven proposed power units on the North Fork.

On the pages immediately following will be found the summary of important data and recommendations. The problem and investigation data are presented in Section I-IV and in Section V will be found an analysis of the problem.

The appendix section contains: 1/ a report by United States Fish & Wildlife Service, River Basin Section, entitled "A Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the Proposed Feather River Basin, Rock Creek and Cresta Projects (Power Project No. 1962)" 2/ United States Forest Service Report on Feather River for Federal Power Commission--Project No. 1391; 3/ Tables 1,2,3; Maps 1 & 2 and Figures 1 & 2. and 4/ List of References.

SUMMARY OF IMPORTANT DATA

Distance or Length of Stream Altered

1. Miles of river altered by Rock Creek and Cresta projects--
16 miles.
2. Miles of river to be altered by all projects below Almanor--
56 miles.

Recreation Use

3. Number of commercial resorts affected by proposed power developments--11.
4. Number of Forest Service camps affected by proposed power developments--6.

Angling Use

5. Estimated number of angler days spent on North Fork in
1946--36,000.
6. Estimated as minimum number of trout caught from North Fork
in 1946--108,000.
7. Number of trout fingerlings from hatchery stock planted in
1945--143,800/
8. Number of resident anglers in Plumas County, 1942--2,353
1949--3,300.
9. Number of anglers fishing in Plumas County in 1942--14,750
1948--25,000
10. Calculated catch of trout in Plumas County in 1942--828,000
1948--720,000
11. Average (mean) river flow - 28 years at Big Bar, California
2,710 c.f.s.

Estimated
Catch

RECOMMENDATIONS

Exhibit 1.

Copy

March 25, 1947

Federal Power Commission
Washington, D. C.

Gentlemen:

On March 13, 1947 we wrote to you making certain recommendations for the release of water for fish life and recreational purposes in connection with the application of the Pacific Gas & Electric Co. for a water-power project (No. 1962) located on North Fork of the Feather River in Butte and Plumas Counties, California.

Subsequently, at our request, you granted an additional period to March 25, 1947 for the submission of additional recommendations. Discussion of the matter with the Pacific Gas & Electric Co. during this period has indicated that the following modified conditions with respect to fish life would be acceptable to them for inclusion in the terms of the license and they would also be satisfactory to us in lieu of the recommendation made in our letter of March 13, 1947. If the Commission therefore finds these present recommendations satisfactory for inclusion in the license our previous proposals can be disregarded.

It is our recommendation that the license for Project No. 1962 provide the following for the support of fish life and for recreation purposes on the North Fork Feather River,

A. 1. Immediately below Almanor Dam:

- (a) Provide a flow of not less than 35 c.f.s. during the summer period (May 1 to October 31).
- (b) Provide a flow of not less than 10 c.f.s. during the winter period (November 1 to April 30).

Note -- These flows will result in probably minimum flows immediately above Caribou power house of about 60 c.f.s. during the summer period and 40 c.f.s. during the winter period.

2. Immediately below Rock Creek diversion dam:

- (a) Provide a flow of not less than 100 c.f.s. during the summer period.
- (b) Provide a flow of not less than 50 c.f.s. during the winter period.
- (c) Summer flows to be reduced to not less than 50 c.f.s. on dry years.

Note -- Those flows will result in probable minimum summer flows above Bucks Creek power house of 125 c.f.s. except on dry years when they will reduce to about 75 c.f.s. above Bucks Creek plant. Bucks Creek plant would add about 200 c.f.s. during the summer period.

3. Below Cresta dam:

- (a) Provide a flow of not less than 50 c.f.s. at all times below the mouth of Grizzly Creek.
- B. Company will advance the sum of \$40,000 toward the construction of two "rough" fish barriers on the North Fork of Feather River if such are later found to be necessary; one to be located above the mouth of Yellow Creek and the other between Bucks Creek and the upper end of Cresta Diversion Reservoir. The necessity for either or both of these barriers shall be determined during the first ten years following the commencements of operation of Cresta project.
 - C. Company will provide electric fish screens at the intakes to the diversion tunnels for the Rock Creek and Cresta projects.
 - D. Company will design its structures for the release of the flows to be provided under "A" so that water will be taken from as near to the bottom of the reservoir as is practicable.
 - E. Company agrees to cooperate with the State Division of Water Resources and the Division of Fish and Game in the establishment of suitable criteria for the determination of dry years for the purpose of fixing summer water releases under Section A.
 - F. The Federal Power Commission to reserve the right to adjust said rates of flow in item A (2) and (3) if the Commission shall find after notice to interested parties and opportunity to be heard, that the rates of flow are more than necessary or insufficient for such purposes.

COPY

Federal Power
Commission

3

March 25, 1947

The Pacific Gas & Electric Co. has agreed that the preceding conditions and requirements will be satisfactory to them if they are made a part of the license for Project No. 1962.

Yours very truly,

EMIL J. N. OTT, JR.
Executive Director
California Division of Fish and Game

ACT:LG

V.

ORDER AUTHORIZING ISSUANCE OF LICENSE
(MAJOR)

Project No. 1962

Exhibit 2.
COPI

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Nelson Lee Smith, Chairman; Claude L. Draper, and
Commissioners: Harrington Wimberly.

June 17, 1947

In the matter of)
Pacific Gas and Electric Company) Project No. 1962

(1) On January 6, 1947 Pacific Gas and Electric Company, of San Francisco, California, filed an application for license under the Federal Power Act to authorize the construction, operation, and maintenance of proposed Rock Creek and Cresta hydro-electric developments, designated as Project No. 1962, on the North Fork of Feather River, in Butte and Plumas Counties, California, affecting lands of the United States within the Plumas and Lassen National Forests.

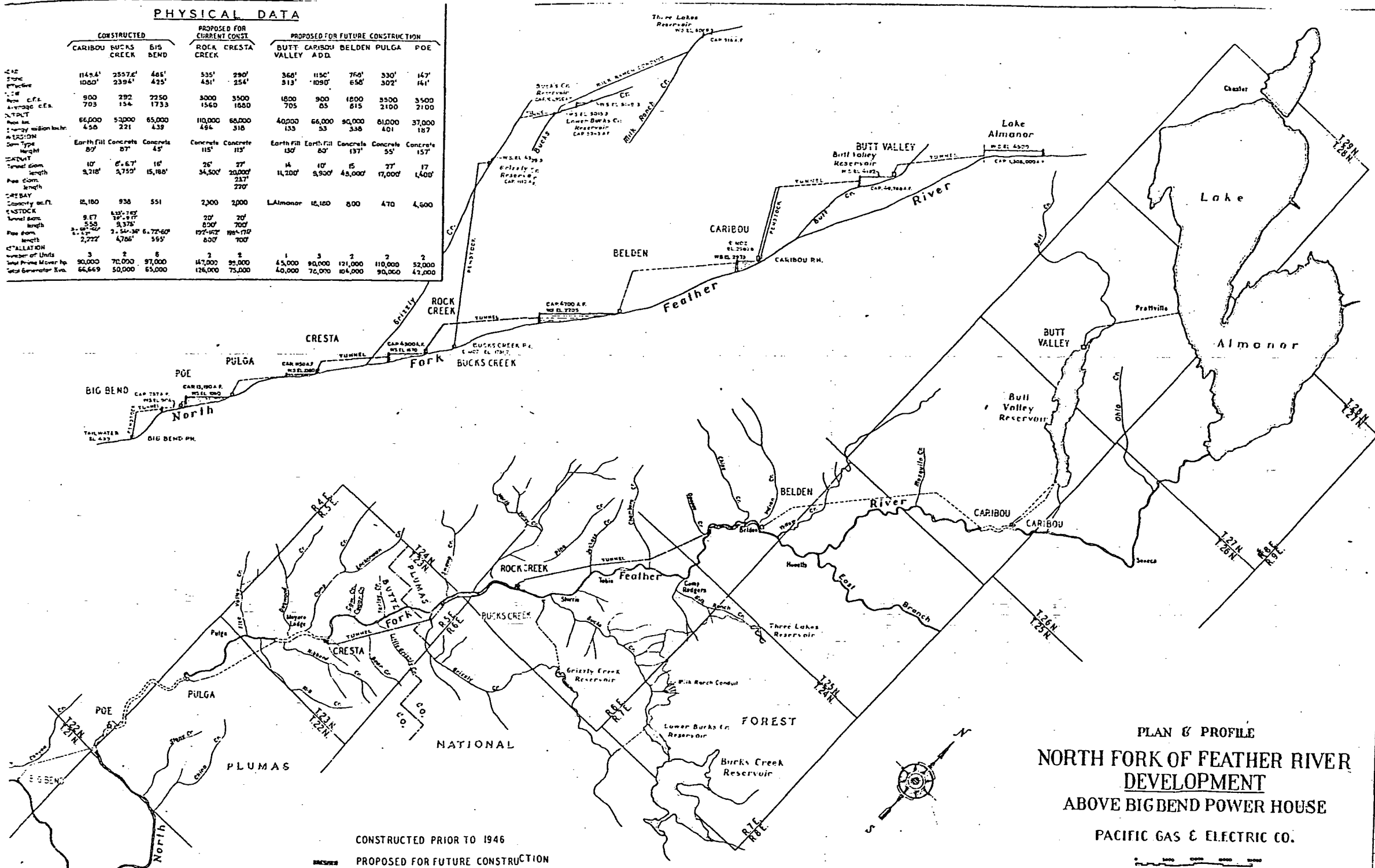
(2) The proposed developments comprise:

(a) The Rock Creek development consisting principally of a concrete gravity diversion dam about 115 feet high and about 550 feet long, creating a reservoir about 2 miles long with about 2300 acre-feet of storage; an intake structure; a pressure tunnel about 34,500 feet long; a penstock and surge chamber; a powerhouse containing two 73,500 horsepower vertical Francis turbines each direct-connected to a 63,000 Kva. generator; a substation; and two single-circuit 230-Kv. transmission lines each about 500 feet long, connecting to lines of or proposed for Project No. 737.

(b) The Cresta development consisting principally of a concrete gravity diversion dam about 113 feet high and about 360 feet long, creating a reservoir about 1 3/4 miles long with about 2000 acre-feet of storage; an intake structure; a pressure tunnel about 20,000 feet long; a penstock and surge chamber; a powerhouse containing two 46,500 horsepower vertical Francis turbines each direct-connected to a 37,500 Kva. generator; a substation; and

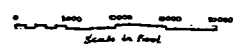
PHYSICAL DATA

| | CONSTRUCTED | | | PROPOSED FOR CURRENT CONST. | | PROPOSED FOR FUTURE CONSTRUCTION | | | | |
|-------------------------|-------------|-------------|-----------|-----------------------------|-----------|----------------------------------|---------------------|----------|----------|----------|
| | CARIBOU | BUCKS CREEK | BIG BEND | ROCK CREEK | CRESTA | BUTT VALLEY | CARIBOU VALLEY ADD. | BELDEN | PULGA | POE |
| Canal | 114,941 | 25,572 | 481 | 535 | 990 | 366 | 1150 | 760 | 330 | 147 |
| Stone | 10,000 | 23,941 | 425 | 431 | 254 | 313 | 1050 | 650 | 302 | 141 |
| Concrete | 900 | 292 | 2250 | 3000 | 3500 | 1800 | 900 | 1800 | 3500 | 3500 |
| Area c.f.a. | 703 | 154 | 1733 | 1560 | 1680 | 705 | 85 | 615 | 2100 | 2100 |
| Output | 66,000 | 53,000 | 65,000 | 110,000 | 68,000 | 40,000 | 66,000 | 90,000 | 81,000 | 37,000 |
| Power in million kw-hr. | 4.50 | 2.21 | 4.39 | 4.94 | 3.18 | 1.53 | 3.38 | 4.01 | 4.01 | 1.87 |
| Excavation | Earth Fill | Concrete | Concrete | Concrete | Concrete | Earth Fill | Earth Fill | Concrete | Concrete | Concrete |
| Depth | 80' | 87' | 45' | 115' | 115' | 130' | 80' | 137' | 55' | 157' |
| Height | 10' | 6'-6.7' | 16' | 26' | 27' | 14' | 10' | 15' | 27' | 17' |
| Tunnel diam. | 9,218' | 9,750' | 15,180' | 34,500' | 20,000' | 11,200' | 9,900' | 48,000' | 17,000' | 1,400' |
| Flow diam. | | | | | | | | | | |
| Length | | | | | | | | | | |
| Capacity | 12,180 | 936 | 551 | 2,300 | 2,000 | L. Almonor | 12,120 | 800 | 470 | 4,500 |
| Capacity ac-ft. | | | | | | | | | | |
| Stock | 9.87 | 1.51-7.85 | 10'-9.17' | 20' | 20' | | | | | |
| Tunnel diam. | 5.58 | 5.375 | | 8.00 | 7.00 | | | | | |
| Flow diam. | 2.00-2.00 | 2.50-3.80 | 6.72-6.00 | 19.2-10.2 | 19.4-17.0 | | | | | |
| Length | 2,722' | 4,765' | 555' | 800' | 700' | | | | | |
| Installation | 3 | 2 | 6 | 2 | 2 | 1 | 3 | 2 | 2 | 2 |
| Number of Units | 30,000 | 70,000 | 97,000 | 147,000 | 95,000 | 45,000 | 90,000 | 121,000 | 110,000 | 52,000 |
| Total Prime Mover hp. | 64,669 | 50,000 | 65,000 | 126,000 | 75,000 | 40,000 | 76,000 | 104,000 | 90,000 | 42,000 |



PLAN & PROFILE
**NORTH FORK OF FEATHER RIVER
 DEVELOPMENT**
 ABOVE BIG BEND POWER HOUSE
 PACIFIC GAS & ELECTRIC CO.

CONSTRUCTED PRIOR TO 1946
 PROPOSED FOR FUTURE CONSTRUCTION



FEBRUARY 1947

NOTE: HYDRAULIC DEVELOPMENT, CROWN CREEK DEVELOPMENT, ETC.

two single-circuit 230-Kv. transmission lines each about 3,500 feet long, connecting to lines of or proposed for Project No. 737.

- (3) The applicant owns and operates the following existing projects within the North Fork drainage basin: the Caribou project, with 49,000 acre-feet of storage, licensed as Project No. 1352; the Bucks Creek plant with 106,000 acre-feet of storage, licensed as Project No. 619; the Big Bend power plant which is unlicensed, Lake Almanor reservoir licensed as Project No. 616, and transmission line Project No. 737, leading from the Bucks Creek plant. Lake Almanor reservoir, whose water storage benefits the Caribou and Big Bend plants, can conserve all of the water coming down from the drainage area above the outlet and is designed to be used for seasonal storage and for cyclic or long carry-over storage from one year to another although it is not now so used due to certain structural defects in the dam.
- (4) The Secretary of War and the Chief of Engineers have reported favorably on the application.
- (5) The Secretary of the Interior has been requested to report on the application.
- (6) The Assistant Secretary of Agriculture for the Secretary of Agriculture, who has supervision over the Plumas and Lassen National Forests, and the California Division of Fish and Game have each recommended that the license contain certain conditions for the protection and support of fish life. Since the conditions recommended are greatly at variance, provision is herein-after made whereby the Commission may hereafter prescribe reasonable conditions for the protection and support of fish life after consideration of the respective conditions of the Secretary of Agriculture, the Secretary of the Interior, and the State of California.

The Commission, having considered the application and the record thereon, finds that:

- (7) The applicant is a corporation organized under the laws of the State of California and has submitted satisfactory evidence of compliance with the requirements of all applicable State laws insofar as necessary to effect the purposes of a license for the project.
- (8) No conflicting application is before the Commission.

- (9) Public notice has been given as required by the Act.
- (10) The issuance of a license for the project, as hereinafter provided, will not interfere or be inconsistent with the purposes for which the Plumas and Lassen National Forests were created or acquired.
- (11) The project will not affect any Government dam now in existence, nor will the issuance of a license therefor, as hereinafter provided, affect the development of any water power resources for public purposes which should be undertaken by the United States itself.
- (12) The project is best adapted to a comprehensive plan for the improvement and utilization of water power development and for other beneficial public uses, including recreational purposes.
- (13) For the purpose of determining annual charges, the horsepower capacity hereinafter authorized to be installed in the project is 147,000 horsepower at the Cresta plant, making a total installed capacity of 240,000 horsepower.
- (14) The amount of annual charges to be paid under the license for the purpose of reimbursing the United States for the costs of administration of Part I of the Act, and for recompensing the United States for the use, occupancy, and enjoyment of its lands, including transmission line right-of-way, is reasonable as hereinafter fixed and specified.
- (15) In accordance with Section 10(d) of the Act, the rate of return upon the net investment in the project and the proportion of surplus earnings to be paid into and held in amortization reserves are reasonable as hereinafter specified.
- (16) The following maps, plans, specifications, and statements filed as part of the application or subsequent thereto, conform to the Commission's rules and regulations, with the exception of Sheets A1 and A3 of Exhibit L, the approval of which should be deferred for further consideration of certain details:

- Exhibit J: Sheet A1 (401419) FPC No. 1962-1
- Exhibit K: Sheet A1 to A5 inclusive (401420-401424 inclusive) FPC Nos. 1962-17 to 21 inclusive
- Exhibit K: Sheet A6 (401425) FPC No. 1962-7
- Exhibit L: Sheet A1 (401426) FPC No. 1967-8
- Exhibit L: Sheet A2 (401427) FPC No. 1962-9
- Exhibit L: Sheet A3 (401428) FPC No. 1967-10
- Exhibit L: Sheets A4 to A9 inclusive (401429-401434 inclusive) FPC No. 1962-11 to 16 inclusive
- Exhibit M: Pages 1 to 3 inclusive

It is ordered that:

- (17) A major license be issued for a period of 35 years, effective as of the first day of the month in which it is executed, to Pacific Gas and Electric Company for the construction, operation, and maintenance of the proposed Rock Creek and Cresta developments, subject to the provisions of the Federal Power Act, and the rules and regulations thereunder, said license to contain the usual conditions and provisions for licenses issued under Section 4 (e) of the Act for such projects and the following special conditions:
 - (a) The licensee shall make such reasonable provisions for the protection and support of fish life and the recreational resources of the North Fork of Feather River as the Commission may hereafter prescribe after consideration of the recommendations of the Secretary of Agriculture, the Secretary of the Interior, and the State of California.
 - (b) The licensee shall begin construction of Cresta development not later than December 31, 1947, and shall complete the same not later than July 1, 1950; shall begin construction of the Rock Creek development not later than July 1, 1948, and shall complete the same not later than July 1, 1951.
- (18) After the first 20 years of operation of the project under this license, six (6) percent per annum shall be the specified rate of return on the net investment in the project for determining surplus earnings in accordance with the provisions of Section 10 (d) of the Act for the establishment and maintenance of amortization reserves to be held until termination of the license, or in the discretion of the Commission, to be applied from time to

6/17/47

time in reduction of the net investment in the project, and one-half of all surplus earnings in excess of six (6) percent per annum received in any calendar year shall be put into and held in such amortization reserves.

- (19) Subject to the provisions of Section 10 (e) of the Act and the rules and regulations of the Commission thereunder, the licensee shall, effective as of the date of the license, pay to the United States the following annual charges:

(a) For the purpose of reimbursing the United States for the costs of administration of Part I of the Act, one (1) cent per horsepower on the horsepower capacity authorized to be installed by this license (240,000 horsepower), plus two and one-half (2½) cents per 1,000 kilowatt-hours of gross energy generated by the project during the fiscal year ended June 30 of the calendar year for which the charge is made. A statement of the number of kilowatt-hours generated in both power plants during the said fiscal year, certified under oath, shall be filed with the Commission on or before September 1 following the end of said fiscal year;

(b) For the purpose of recompensing the United States for the use, occupancy, and enjoyment of its lands, exclusive of those used for transmission line right-of-way, \$474.00;

(c) For the purpose of recompensing the United States for the use, occupancy, and enjoyment of its lands for transmission line right-of-way, \$10.64;

- (20) The maps, plans, specifications, and statements referred to in paragraph (16) above as conforming to the Commission's rules and regulations are hereby approved for incorporation in the license, but approval of Sheets #1 and A3 of Exhibit L is hereby deferred.

By the Commission.

Leon M. Fuquay,
Secretary.

Date of Issuance: June 17, 1947

ORDER AUTHORIZING AMENDMENT OF
ARTICLE 13 OF LICENSE (MAJOR)

Project No. 1962

Exhibit No. 3

COPY

UNITED STATES OF AMERICA
FEDERAL POWER COMMISSION

Before Nelson Lee Smith, Chairman; Thomas C. Buchanan, Claude L.
Commissioners: Draper, Mon C. Wallgren and Harrington Wimberly.

February 14, 1950

In the Matter of)
Pacific Gas and Electric Company) Project No. 1962

Article 13 of Pacific Gas and Electric Company's license for Project No. 1962 consisting of the Rock Creek and Cresta developments on the North Fork of Feather River, California, provides that the licensee shall make such reasonable provisions for the protection and support of fish life and the recreational resources of the North Fork of Feather River as the Commission may hereafter prescribe after consideration of the recommendations of the Secretary of Agriculture, the Secretary of the Interior, and the State of California.

The Division of Fish and Game, State of California, has submitted certain provisions, hereinafter set forth, for inclusion in the license for Project No. 1962 for the support of fish life and for recreational purposes. The licensee, the Secretary of Agriculture, and the Secretary of the Interior as hereinafter provided, has each advised this Commission that the provisions proposed by the State fish and game agency are satisfactory.

The Commission orders:

Article 13 of the license for Pacific Gas and Electric Company's Project No. 1962 be amended to read as follows:

Article 13: For the protection and support of fish life and the recreational resources of the North Fork of Feather River:

A. The Licensee shall provide -

1- Immediately below Almanor Dam:

a flow of not less than 35 c.f.s. from May 1 to October 31 and a flow of not less than 10 c.f.s. from November 1 to April 30;

2- Immediately below Rock Creek Diversion Dam:

a flow of not less than 100 c.f.s. from May 1 to October 31, which flow may be reduced to

2/14/50

not less than 50 c.f.s. in dry years;
and a flow of not less than 50 c.f.s.
from November 1 to April 30;

3- Below Cresta Dam:

a flow of not less than 50 c.f.s. at
all times below the mouth of Grizzly
Creek;

- B. The Licensee shall design its structures for the re-lease of the flows, provided in "A" above, so that the water will be taken from as near to the bottom of the reservoir as is practicable and suitable criteria for the determination of dry years for the purpose of fixing the May 1 to October 31 water releases provided in "A" above shall be established by the Commission.
- C. The Commission reserves the right to adjust said rates of flow in items A(2) and A(3), above, if it shall find, after notice to interested parties and opportunity to be heard, that the rates of flow are more than necessary or insufficient for such purposes.
- D. The Licensee shall provide electric fish screens at the intakes to the diversion tunnels for the Rock Creek and Cresta projects if such be found by the Commission to be justifiable;
- E. The Licensee shall advance the sum of \$40,000 toward the construction of two "rough" fish barriers on North Fork of Feather River if such are later found to be necessary: one to be located above the mouth of Yellow Creek and the other between Bucks Creek and the upper end of Cresta Diversion Reservoir. The necessity for either or both of these barriers shall be determined during the first ten years following the commencement of operation of Cresta project.
- F. The entire project area shall be open to free public access for fishing and other recreational uses, except such portions as may be reserved by the Licensee in the interest of safety, efficient operation and protection of property.

By the Commission.

Leon M. Fuquay,
Secretary.

Date of Issuance: February 15, 1950

THE EFFECT ON THE FISHERY
OF THE NORTH FORK OF THE
FEATHER RIVER, CALIFORNIA,
OF PROPOSED HYDRO-ELECTRIC
DEVELOPMENTS WITH SPECIAL REFERENCE
TO CRESTA AND ROCK CREEK PROJECTS

I. INTRODUCTION

A plan for development of hydro-electric power from run-off water in the North Fork of the Feather River has been considered by the Pacific Gas and Electric Company for many years. The first of the series of dams contemplated was built in 1912 at the lower end of Big Meadows near Prattville. It impounds a reservoir of water which has since been known as Lake Almanor. Water from Lake Almanor, is diverted through a tunnel to Butt Valley reservoir, which in turn forms the forebay of the hydro-electric power plant at Caribou power house. Water from Lake Almanor is thus diverted by tunnel to Butt Valley reservoir and thence through conduit and penstock to Caribou power house where it is again released into the stream bed of the North Fork about 10 miles below Lake Almanor dam. Water released through Caribou power house then flows unimpeded down the North Fork channel for a distance of 35 miles to Big Bend diversion dam. This dam is located at the upstream end of "The Big Bend" of the North Fork of the Feather River and its purpose is to divert water through a tunnel conduit and penstocks to the Big Bend power house about 11 miles downstream.

The two sections of the stream which have a very much reduced flow at the present time are, the portion from Almanor dam to the Caribou power house and the portion from the Big Bend dam to the Big Bend power house, a total distance of approximately 21 miles. This is roughly 33 percent of the river from Almanor dam to the mouth of the North Fork.

The Pacific Gas and Electric Company is contemplating immediate construction of two new units in their North Fork power development plan. These are Rock Creek and the Cresta projects (see Map #1 and Table #1, of distances, pp. 20-21.) These two projects will reduce the quantity of water in the stream to a fraction of the natural flow for several miles below each diversion dam. Rock Creek power house will be located approximately seven miles below Rock Creek dam and Cresta power house will be about four miles below its diversion dam. The sections of stream between the diversion dams and the power houses could very well become dry during part of the year. Thus, about eleven miles of the stream will, upon completion of the two new units, be altered by having the flow reduced for several months of the year.

With ultimate development of the company's plan for power generation the entire North Fork from the Almanor dam to the Big Bend power house, a distance of about fifty-six miles will be altered. Approximately forty-four and one-half miles of the stream channel may be dry at certain seasons of the year and roughly eleven and one-half miles will be covered by deep pools formed by the dams.

Along the banks of the North Fork for most of its length runs Highway 24, the "Feather River Highway", and the main line of the Western Pacific Railroad. Each offers to the traveling public, an opportunity to vacation in an area of excellent trout fishing. It is less than an hour's drive along the highway for early morning and late afternoon trout anglers from Oroville, Quincy, and other nearby towns who, for various reasons, cannot leave their duties for more extended vacation periods.

At the present time there are game fish in abundance (rainbow and brown trout) in the North Fork in the section to be altered by proposed developments. Several species of rough fish are also inhabitants of the stream.

II. THE PRESENT BIOLOGICAL PICTURE

The North Fork Feather is, at present, a partially regulated river flowing at the rate of around 1,500 cubic feet per second but with great fluctuation in times of spring runoff and floods. United States Geological Survey records show the average discharge of the stream at Big Bar gaging station to be 2,710 c.f.s. for the period from 1911 to 1944. The maximum rate for the period was 66,900 c.f.s. which occurred on December 11, 1937. The minimum recorded (regulated) flow of 235 c.f.s. occurred on October 31, 1932. Fig. 1, p.22 ; Table 2, p.23 shows the mean monthly flow from 1926 to 1944 inclusive.

The stream gradient between Big Bend dam and Belden is approximately 43 feet per mile. This is the section in which the two power developments, Cresta and Rock Creek, are proposed for immediate construction, and where two others, Poe and Pulga are planned for future development. North Fork Feather above Belden has a somewhat steeper gradient in the section from Rock Creek forebay at Belden to the proposed Belden diversion dam eight miles farther upstream. The only reservoir or "slack water" at present in the stream above Intake dam is the forebay of Big Bend powerhouse. This relatively small pool is formed by the Big Bend diversion Dam.

Fishes Present

The species of fishes present in the North Fork Feather at the present time are:

1. rainbow trout
2. brown trout
3. black bass (large & small mouth)
4. suckers
5. squawfish (Sacramento pike)

6. hardheads (also called pike)
7. carp
8. bullheads (cottoids)
9. dace

In order of importance rainbow trout ranks first and brown trout second as species most anglers prefer. Black bass are not common and are, therefore, not considered important by anglers at the present time. Rough fishes are considered by some anglers as more or less of a nuisance because they are common in the stream and are caught on trout tackle. Rough fishes are seldom utilized for food. A natural balance exists at the present time between trout and rough fish populations and the less desirable species are not considered too harmful to trout. If, however, stream flow is greatly reduced for several miles of river the natural balance becomes upset and competition between species may cause the trout to disappear from the stream. Rough fish have a greater tolerance for the type of stream formed by low flow, i.e. low velocities, high temperatures, and less amounts of dissolved oxygen.

Spawning Time

With the present stream flow in the North Fork, natural propagation of trout is providing anglers with an important part of the catch in their creels and the stream is considered a very good one in terms of spawning areas and food production. Trout spawn during the winter and spring. Brown trout lay their eggs in the gravel in October, November, and December, and rainbow trout from December to May. This is the period normally of low temperatures and high stream flow. The fry and fingerlings emerge from the gravel during the spring and begin feeding at a time when stream food organisms are in greatest abundance.

III. THE FUTURE BIOLOGICAL PICTURE

When the two power projects, Cresta and Rock Creek, proposed for immediate construction are built and when the complete plan for power development on the North Fork is ultimately developed, ^{Map #2} Figs. , pp. 24 , the biological "picture" will be very different from the present. The stream sections between each of the diversions and its corresponding powerhouse will have only a fraction amount as compared with the amount of the present quantity of water. This will mean that those sections will have water with less velocity, higher temperature, and lower oxygen content during a large portion of the year. Such conditions are inevitable results of reduced flow.

The reservoirs formed by the diversion dams will form long narrow pools. Cresta reservoir will be over three miles long and Rock Creek over two. Their widths will be about 600-700 feet. The surface layers of the reservoirs will have higher temperatures than those prevailing in the present stream. The deeper layers should have cooler water.

Fish populations will change markedly. Trout will no longer be able to use, for reproduction, the sections of stream occupied by reservoirs and therefore, a large per cent of the trout spawning areas will be automatically exterminated. Furthermore, the reservoirs will provide a much better environment for the development of most of the rough fish. For example: hardheads (Mylopharodon) are "pool" fish and develop most rapidly in large deep natural pools. Under present conditions the balance between pools and fast flowing riffles is such as to keep the population of hardheads down to competition levels with trout. When that balance is upset by

formation of several large pools connected by shallow, slow-flowing warm water riffles, the competition between trout and hardheads becomes one-sided with overwhelming odds favoring the development of hardheads and the extermination of trout. This serious situation has developed in Shasta reservoir.

IV. WATER RELEASES

In view of the increased temperatures which will accompany reduced stream flow below each diversion dam on the North Fork, it becomes necessary that releases from each impoundment be drawn from the coolest water possible if trout fishing is to be maintained in the stream. The coolest water is at the bottom of the reservoirs and, therefore, outlets for water release should be near the bottom of the dam. Water for minimum release should not be supplied from skimmer gates, weirs or spillway overflow, because the temperature of the surface water layers will, in all probability, be too high for trout to tolerate. The optimum temperature for trout growth is about 60°F. Rainbow trout can tolerate higher temperatures for short periods. Records as high as 80°F. have been taken where rainbow trout were living but such temperature is very near the limit of tolerance for the species. (Needham, 1938).

In a study of the fishes of the Willamette River System in Oregon in 1944* it was observed that no salmonoid fish was found in water of 73°F. or above but "rainbow trout, cut throat trout, and fingerling chinook salmon in healthy condition were obtained near Peoria Ferry in water of 72°F. on August 29". It was further stated, however, that "in the majority of cases, cut throat trout, rainbow trout and chinook salmon were observed and collected during August and September in waters having a temperature range of 55 to 66°F. They were always less numerous in water ranging from 67 to 72°F." (underscoring added)

* "The Fishes of the Willamette River System in Relation to Pollution" by R. E. Dimick and Fred Merryfield, Bulletin Series No. 20, June, 1945; Engineering Experiment Station, Oregon State College, Corvallis, Oregon.

trout vs
water temp
ref.

It is difficult to predict what the surface temperatures of proposed impoundments on the North Fork will be, but it is known that Lake Almanor on the North Fork has surface water temperatures approaching 80°F. and Shasta reservoir records show temperatures of 90°F. It seems reasonable to assume that the North Fork reservoirs which will lie between these two elevations will have temperatures at the surface between 80° and 90°F.

It is likewise difficult to predict what the stream temperatures below the diversion dams will be. An estimate of what might be expected when the flow below the dams is reduced may be made by comparison with a stream having the same quantity of flow. Deer Creek, a tributary entering the Sacramento River near Vina, is a stream with a flow of about 100 c.f.s. in summer. That is the approximate amount to be expected below each of the diversion dams on the North Fork. Water temperature in Deer Creek rises in late summer 7 to 9°F. while the water travels from the Deer Creek Irrigation Diversion Dam to the Stanford-Vina diversion dam, about six miles below. Thus, if 100 c.f.s. of water is released from Rock Creek or Cresta diversion dams, at about 70°F. the stream will become unsuitable for trout a few miles below. It is, however, anticipated that water in the deeper portions of the reservoirs will be cooler than 70°F. and, therefore, the stream should provide suitable environment for trout for most of the distance between diversion dams.

V. EVALUATION OF THE TROUT FISHING

Destruction of trout fishing streams in California by removal of water for power, irrigation and other purposes is proceeding at an accelerated pace. Certain of these streams are particularly important. Their trout-carrying capacity may be especially high, they may be located in especially beautiful surroundings or they may be easily accessible to many thousands of people. Only a few rivers in California have all of these advantages. Of these few, the North Fork of the Feather is an outstanding example.

Map No. 2 with its insert map shows the central location of the Feather River. The map also shows the famous Feather River Highway and the Feather River Route of the Western Pacific Railroad. (See page 24).

Not only is the North Fork canyon a particularly favorable route through the mountain range but it is an ideally located recreation ground. At present the Feather River canyon is inadequately supplied with resorts and public camp grounds. If fishing could be maintained, construction of additional facilities could be expected which would make the North Fork of the Feather even more popular than it is at present.

Commercial resorts on the North Fork within the area to be affected by the proposed power developments (Almanor dam to the mouth of the North Fork) are listed below:

1. Belden
2. Yellow Creek Inn
3. Guy's Place
4. Tobin

Commercial Resorts on the East Branch of the North Fork are:

1. Keddie
2. Rainbow's End
3. Feather River Hot Springs

4. Twain
5. Grays Flat (Mill, Store, P.O.)
6. Pine Aire Motel
7. Jack's Place at Virgilia

Following are listed the United States Forest Service Campgrounds on the North Fork:

- | | |
|-----------------------|------------------------------------|
| 1. Queen Lily | 13 camp facilities |
| 2. North Fork | 23 camp facilities |
| 3. Belden Public Camp | 23 camp facilities |
| 4. Indian Jim | 12 camp facilities |
| 5. Gansner Bar | Intended to become a trailer camp. |
| 6. Hallstead Flat | (on E. Branch)-25 camp facilities |

An attempt has been made to determine the number of anglers who used the resorts and campgrounds listed above. Estimates were also made of the number of anglers from nearby cities who fished the North Fork and also the number of fishermen among the local residents. These figures and estimates are almost certainly below the actual numbers.

The Belden Resort at Belden estimates that the guests of the resort spent approximately 3,000 angler days on the river and on its few tributaries. The Belden Resort is the largest resort on the North Fork within the area to be affected by the power developments.

Col. J. W. McCrellis, owner of the Belden Resort, also estimated that the Yellow Creek Inn, Guy's Place, and Tobin's combined had about the same patronage as that of the Belden resort. We, therefore, assume from these resorts another 3,000 angler days for 1946.

In addition to these, on the North Fork within the area being considered, there are seven resorts on the East Branch of the North Fork (see the list above and also the accompanying maps). The guests at these resorts spend part of their angling effort on the North Fork proper. A conservative estimate

of this time would be 2,500 angler days.

U. S. Forest Service Campgrounds

The Plumas Forest Headquarters at Quincy estimated that during the 1946 season 8,500 campers used the six campgrounds in the North Fork Feather River canyon. The average stay was 5 days per person or 42,500 man days. Roughly 50% of the campers were anglers though these anglers probably did not fish each day. It would be conservative to say that 20,000 angler days were expended by the fishermen in this group.

U. S. Forest Service Picnic Grounds

The Plumas Forest Headquarters at Quincy estimated that during 1946 2,500 picnickers used the picnic facilities in the North Fork Feather River canyon. Possibly one-third of the picnickers were also fishermen, making about 800 angler days.

Residents of Nearby Towns

Between six and seven thousand people live in the cities of Oroville and Quincy which lie at either end of the Feather River area. It is only a 45-minute drive from either Oroville or Quincy to the most productive sections of the North Fork. The number of anglers who drive to the river and back again the same day cannot be accurately estimated but 3,000 angler days is probably very conservative. It was estimated that on May 1, 1946 2,000 anglers fished the North Fork.

Residents of the North Fork Feather River Canyon

It was estimated by J. W. McCrillis of the Belden resort and by the Forest Service in Quincy that between 600 and 700 people make their homes in the canyon for a large part of the year. Probably 150 of these fish

the river frequently, accounting for roughly 4,000 angler days.

TABLE NO. 2 - SUMMARY OF ANGLING INTENSITY

| <u>Category of Anglers</u> | <u>Angler Days Expended</u> |
|---|-----------------------------|
| Visitors to Commercial Resorts | 8,500 |
| Visitors to Forest Service Camp Grounds | 20,000 |
| Picnickers at Forest Service Picnic Grounds | 800 |
| Residents of Nearby Towns | 3,000 |
| Residents of Feather River Canyon | 4,000 |
| Total Angler Days | <u>36,300</u> |

Angling Values

For the purpose of this report it would be desirable to place a monetary value on the estimated 36,000 angler days spent on the North Fork or upon the estimated 108,000 trout caught.* Unfortunately this type of calculation is one of the most complex.

There are two distinctly different matters to consider in such an evaluation:

1. Fishing as a business stimulant.
2. Fishing as a psychological stimulant.

Obviously the first can be assigned monetary values even though no two persons will agree. Fishing as a psychological stimulant is well recognized, but no one has ever been able to place a satisfactory value upon it.

* Estimated 3 trout per angler day.

The effect of trout fishing in the North Fork upon business can be divided into two parts:

1. Increased business relating to travel.
 - a. Increased automobile, stage or railroad business.
 - b. Increased food and lodging expenses.
 - c. Increased expenditures for luxuries.
2. Increased sales of angling paraphernalia.

The tangible benefit of this business increase is largely local but ramifies into a much greater zone.

Naturally we cannot take the entire living costs and fishing gear costs of the average fisherman on the North Fork and multiply that by the number of anglers involved anymore than one can take the monetary value of the electricity produced at the North Fork powerhouse without making complex modifications.

The hydro-electricity produced on the North Fork will have a definite value to the company producing it but it would make little difference to the consumers whether it was generated on some other river or by a steam turbine located nearer the area of use. Similarly, if there were no trout fishing on the Feather River, the anglers and vacationists might go to the ocean or any one of many places for their fishing and recreation.

The power company or the local chamber of commerce can assign values to electricity and to fishing. Such values may appear quite real to those doing the figuring, but they cannot bear up under critical analysis.

Presuming that there were roughly 36,000 angler days spent on the North Fork in 1946, if fishing on this river were ruined by power developments, could the State multiply 36,000 by the \$2.00 angling fee and say

that it had lost \$72,000 in 1946? Obviously this would be a gross exaggeration for most of these anglers would simply go elsewhere to fish. They would still buy their angling licenses and instead of patronizing the local business houses and resorts they would spend their money elsewhere in the State.

Similarly if the proposed power developments on the North Fork of the Feather were ruled out the same electricity could and would be generated elsewhere. It might work an appreciable hardship on the power company but similarly an appreciable hardship would be worked on those seeking recreation if the North Fork were even partially ruined for trout fishing.

In conclusion, we claim that it is impossible to compare the money involved when hydro-electricity is not generated on a river with the money involved when fishing is impossible on that river.

If we rule out the comparison of monetary values we have left some interesting but highly theoretical considerations.

With a nation of people suffering from nervous disorders, and the suffering is becoming increasingly acute, could it not be said that the recreational value of fishing is just as important as increased business through cheap power.

Relaxation through trout fishing is widely recognized as being an important remedy for the nervous strain of modern life. However, this relaxation might be obtained in other ways if the North Fork Feather were ruined by complete utilization of the water for electricity.

How often is it said that the relaxation and the sport of trout fishing and the beauties of these mountain streams need not be ruined by power developments, that this same electricity can be generated at only slightly

greater cost in steam turbines?

We recognize hydro-electrical developments as part of our modern business world, we would not contend that they should be abandoned simply to provide more fishing but we do strongly believe that power developments should not be allowed to completely ruin even one stream or river. It is our contention that there is room for both power development and trout fishing in the waters of California.

Although the immediate power development program calls for only two plants (Cresta and Rock Creek) the plan for five new power houses on the North Fork has been submitted. The present evaluation of trout fishing on this river would be incomplete if it were to consider the Cresta and Rock Creek developments alone. In asking for protection to the fish and fishing we must recognize that it will be but a short time until the remaining three developments are undertaken.

At present the entire sixty-two and one-half mile section of the North Fork, from Almanor Dam to its mouth is trout fishing water. When all five power plants have been installed the normal flow of this section will be altered as follows:

TABLE 3

| | <u>Miles</u> | <u>Percent</u> |
|--|--------------|----------------|
| River below diversion dams containing only controlled water | 44.5 | 73% |
| Impoundments | 11.5 | 18% |
| "Normal" river flow | 6.5 | 9% |
| Total | <u>62.5</u> | <u>100%</u> |

Assuming that the release water flow below the proposed diversion dams (Belden, Rock Creek, Cresta, Pulga, and Poe) were similar to the present

release from the Almanor Dam (minimum 3.2 c.f.s. in 1944), how seriously will this effect the value of the present trout fishery and the potential fishery?

Due to the highly accessible location of the North Fork it would be inevitable that without power development it would eventually become one of the most heavily fished trout streams in California. The recreational value of this canyon would rank well up among similar areas in the State. The beauties of the Feather River Route have been publicized throughout the nation by the Western Pacific Railroad. To a very large extent this reputation is due to the beauty of the river itself. As the normal flow of the river is reduced its beauty and its trout carrying capacity will be reduced. The greater the flow of water, the greater the number of trout it will support. If the release from these proposed diversion dams has the same minimum as that from Almanor dam, the Feather River will be reduced to a series of ponds with an unimportant trickle of water between them. The minimum flow from Almanor dam, at present 3.2 c.f.s., would constitute a modest brook in surroundings proportional to that flow, but when spread out over the broad, boulder-strewn bed of the North Fork it is scarcely worth consideration. A river canyon formed to carry an average of about 2,710 c.f.s. is barely wet when carrying only 3.2 c.f.s. or even several times that amount.

In the published "1946 Annual Traffic Count" by G. T. McCoy, State Highway Engineer, it will be seen that at Belden Junction-Highway 21-A, the east bound traffic was as follows:

| | <u>1945</u> | | <u>1946</u> |
|---------|-------------|---------|-------------|
| July 15 | - 487 cars | July 14 | - 891 cars |
| July 16 | - 373 cars | July 15 | - 581 cars |

Sunday gain of 1946 over 1945 - 87.80%

Monday gain of 1946 over 1945 - 73.39%

The normal year-by-year increase in traffic over the Feather River highway would bring a several-fold increase in the angling pressure if the trout catch would increase proportionally. To meet this increased pressure and provide the increased catch would require heavy additional planting of artificially reared trout. However, fish cannot be planted beyond the point where the volume of water and its fish food supply will permit. Regardless of fish planting a small flow of water will only support a small number of fish. The future of this river depends upon the amount of water released through the diversion dams.

It will be stated that the ponds formed by the diversion dams will produce more fishing than the "normal" river would produce. We believe that this would not be the case. In fact the impoundments might be less productive, mile for mile because in summer the surface temperatures may be too high for trout. Such high temperatures can be expected to encourage the rough fish which will feed upon both the small trout and the trout's food.

The foregoing statements should not be taken to mean that we favor the abandonment of the proposed power developments on this river. It is assumed by all that hydro-electric power plants are a necessary part of our business development but it is also assumed that there must be a compromise

between the power companies and the fishermen. How much water can the power company afford to release below its diversion dams on the North Fork? How much trout fishing can the people of the State afford to have them destroy?

APPENDIX

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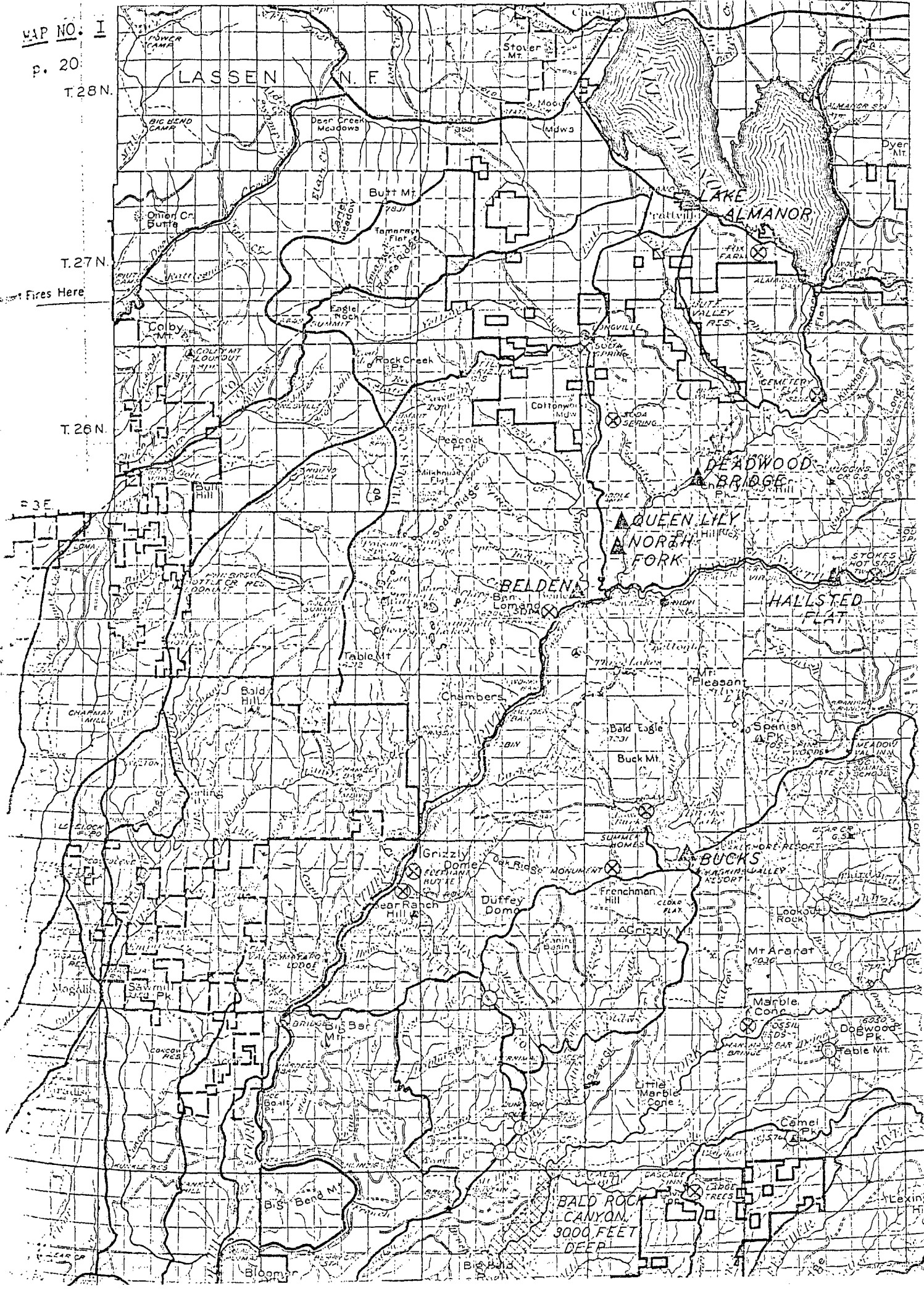


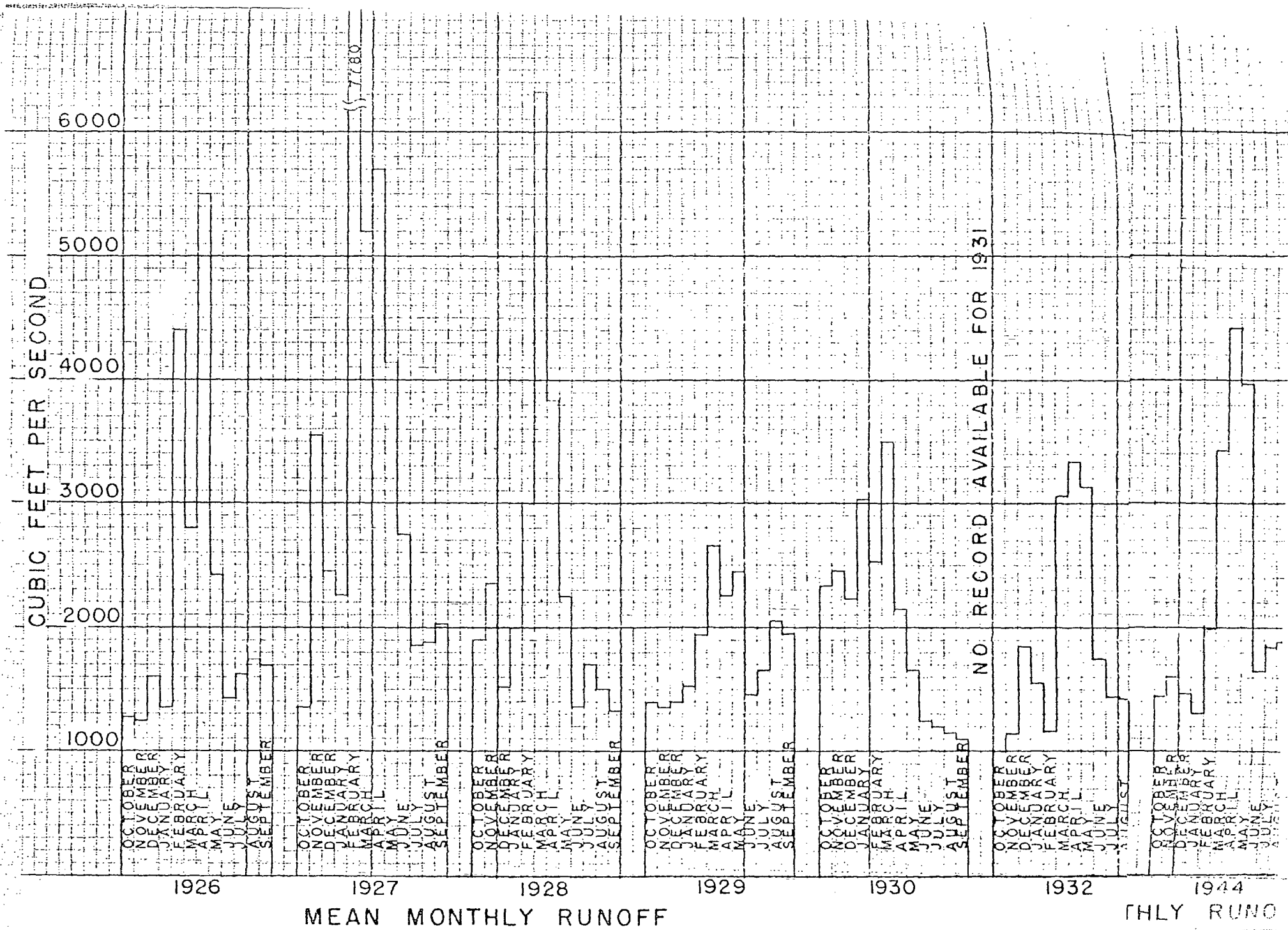
TABLE NO. I
NORTH FORK FEATHER RIVER

Breakdown of Distances Between
Existing and Proposed Power Developments

| MILESTONES | LOCATION | MILES | FUTURE WATER CONDITIONS |
|------------|------------------------------|-------------|-------------------------|
| 0 | Almanor dam | 0 | |
| 10.0 | Caribou power house | 10 | Control Flow |
| 10.0 | Head of Belden reservoir | 0 | |
| 11.0 | Belden diversion dam | 1 | Reservoir |
| 19.0 | Belden power house site | 8 | Control Flow |
| 19.0 | Head of Rock Creek reservoir | 0 | |
| 21.0 | Rock Creek Diversion dam | 2 | Reservoir |
| 28.0 | Rock Creek power house site | 7 | Control Flow |
| 28.0 | Head of Cresta reservoir | 0 | |
| 31.0 | Cresta diversion dam | 3 | Reservoir |
| 35.0 | Cresta power house site | 4 | Control Flow |
| 35.0 | Head of Pulga reservoir | 0 | |
| 36.5 | Pulga diversion dam | 1.5 | Reservoir |
| 40.5 | Pulga power house site | 5 | Control Flow |
| 43.5 | Poe diversion dam | 3 | Reservoir |
| 44.0 | Poe power house | .5 | Control Flow |
| 45.0 | Big Bend diversion dam | 11 | Reservoir |
| 56.0 | Big Bend power house | 11 | Control Flow |
| 62.5 | Mouth of North Fork Feather | 6.5 | Normal river flow |
| | TOTAL | <u>62.5</u> | |

SUMMARY OF RIVER TYPES BETWEEN
ALMANOR DAM AND MOUTH OF NORTH FORK

| | | |
|-----------------------------------|-------------------|-----|
| Control flow below diversion dams | 44.5 | 73% |
| Reservoir water | 11.5 | 18% |
| Normal river flow | 6.5 | 9% |
| TOTAL | <u>62.5 miles</u> | |



MEAN MONTHLY RUNOFF

THLY RUNO

TABLE NO. 2

MEAN MONTHLY DISCHARGES IN CUBIC FEET PER SECOND
 NORTH FORK FEATHER RIVER, BIG BAR, CALIFORNIA

| | 1926 | 1929 | 1930 | 1932 | 1933 | 1934 | 1936 | 1937 | 1940 | 1941 | 1942 | 1943 | 1944 |
|-----------|-------|------|------|------|------|------|-------|------|-------|-------|-------|-------|------|
| October | 1270 | 1390 | 2340 | 1000 | 479 | 1400 | 1498 | 1572 | 1233 | 2063 | 1515 | 2039 | 1446 |
| November | 1260 | 1370 | 2470 | 1140 | 572 | 1410 | 1298 | 1155 | 958 | 1758 | 1682 | 2125 | 1604 |
| December | 1600 | 1400 | 2220 | 1850 | 1110 | 1490 | 1808 | 1047 | 1267 | 4735 | 5656 | 3016 | 1468 |
| January | 1380 | 1530 | 3020 | 1580 | 1490 | 1850 | 4392 | 992 | 3995 | 5319 | 6302 | 6266 | 1309 |
| February | 4400 | 1940 | 2530 | 1160 | 1310 | 1980 | 6104 | 1200 | 8034 | 8894 | 8844 | 4886 | 1998 |
| March | 2790 | 2650 | 3510 | 3060 | 1530 | 1770 | 4985 | 2706 | 10320 | 7263 | 4538 | 9426 | 3418 |
| April | 5500 | 2280 | 2170 | 3310 | 2050 | 1730 | 4194 | 5123 | 8668 | 6353 | 8462 | 7434 | 4405 |
| May | 2430 | 2430 | 1680 | 3130 | 2110 | 1460 | 3634 | 4178 | 4005 | 8371 | 7394 | 4036 | 3974 |
| June | 1420 | 1450 | 1270 | 1740 | 1530 | 1340 | 2390 | 2030 | 1965 | 3663 | 4790 | 3066 | 1633 |
| July | 1640 | 1650 | 1230 | 1440 | 1320 | 1430 | 1844 | 1649 | 1515 | 1866 | 2098 | 1644 | 1845 |
| August | 1750 | 2040 | 1180 | 1410 | 1390 | 1410 | 1895 | 1314 | 1570 | 1591 | 1751 | 1651 | 1886 |
| September | 1700 | 1990 | 1120 | 898 | 1130 | 1310 | 1935 | 1378 | 1944 | 1486 | 1973 | 1395 | 1441 |
| Minimum | 924 | 1070 | 950 | 448 | 235 | 890 | 917 | 355 | 259 | 620 | 1280 | 1270 | 765 |
| Maximum | 20500 | 4490 | 8440 | 6300 | 2940 | 5700 | 25000 | 8630 | 50900 | 28400 | 31500 | 24500 | 6290 |

RUN OFF IN ACRE FEET
IN NORTH FORK OF FEATHER RIVER AT ALMANOR DAM AND BIG BAR

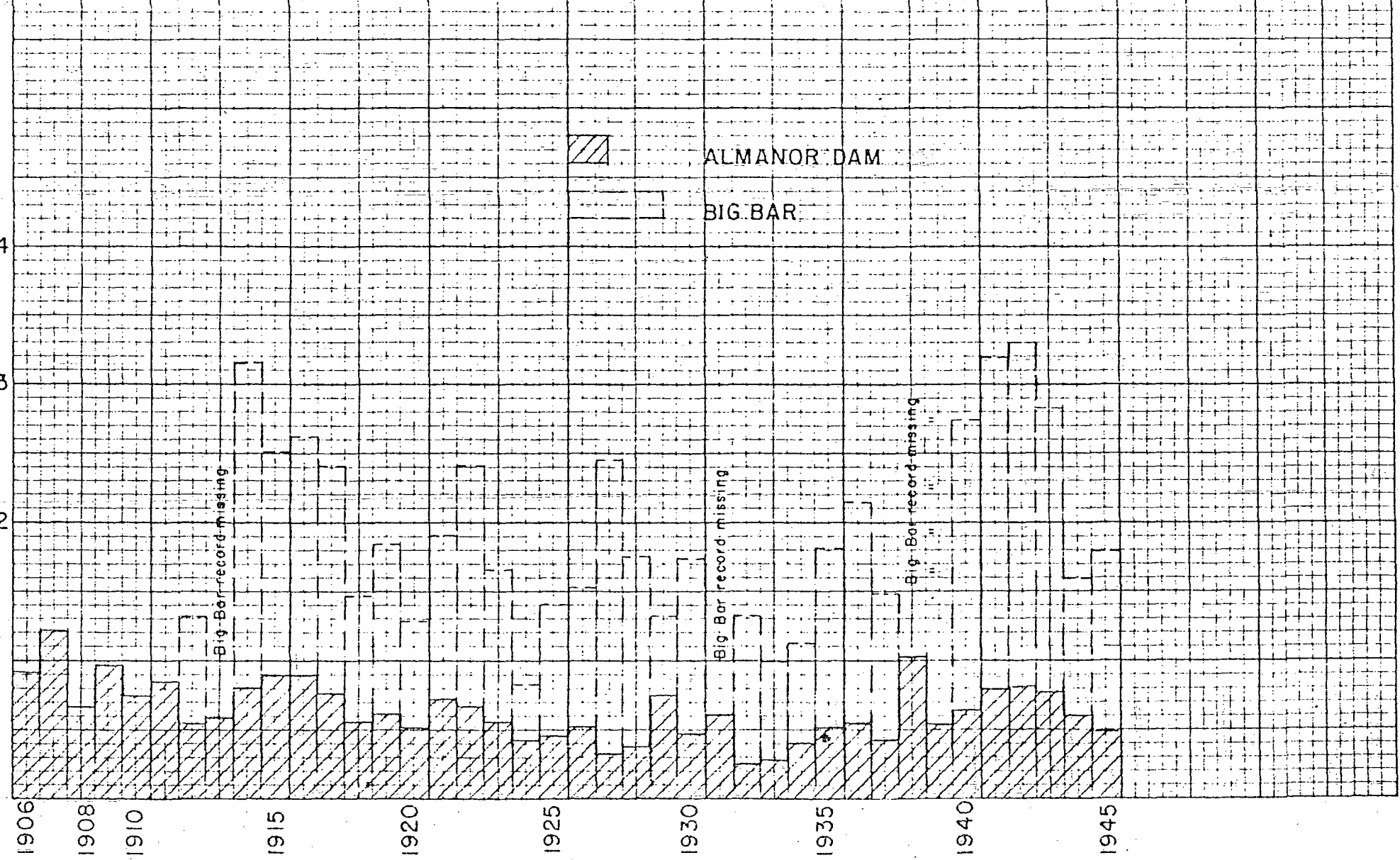


TABLE 3

ANNUAL RUNOFF IN ACRE FEET IN NORTH FORK, FEATHER RIVER

Unit - 1000 acre feet

| <u>End of Water Year</u> <u>Sept. 30</u> | <u>Gage at Lake</u> <u>Almanor Dam</u> | <u>Per cent release</u> <u>@ 35 c.f.s.</u> (25294.5 acre ft. per year) | <u>Big Bar</u> <u>Gage</u> | <u>Per cent release</u> <u>@ 50 c.f.s.</u> (36190. acre ft. per year) |
|---|---|---|-------------------------------|--|
| 1906 | 931.3 | 2.7 | | |
| 1907 | 1227.5 | 2.0 | | |
| 1908 | 691.9 | 3.6 | | |
| 1909 | 985.6 | 2.5 | | |
| 1910 | 757.1 | 3.3 | | |
| 1911 | P 864.1 | 2.9 | | |
| 1912 | 527.2 | 4.8 | 1311.6 | 2.7 |
| 1913 | 588.0 | 4.3 | | |
| 1914 | 824.5 | 3.1 | 3166.5 | 1.1 |
| 1915 | 897.2 | 2.8 | 2506.7 | 1.4 |
| 1916 | 904.4 | 2.8 | P 2614.7 | 1.4 |
| 1917 | 778.9 | 3.2 | 2416.0 | 1.5 |
| 1918 | 567.0 | 4.5 | 1483.0 | 2.4 |
| 1919 | 613.4 | 4.1 | 1852.8 | 1.9 |
| 1920 | 510.5 | 5.0 | 1288.2 | 2.8 |
| 1921 | 734.1 | 3.4 | P 1906.5 | 1.9 |
| 1922 | 680.8 | 3.7 | 2412.1 | 1.5 |
| 1923 | 556.8 | 4.5 | 1662.8 | 2.2 |
| 1924 | 440.8 | 5.7 | 802.5 | 4.5 |
| 1925 | 455.7 | 5.6 | 1423.6 | 2.5 |
| 1926 | 524.1 | 4.8 | 1622.8 | 2.2 |
| 1927 | 308.5 | 8.2 | 2448.6 | 1.5 |
| 1928 | 387.7 | 6.5 | 1769.2 | 8.2 |
| 1929 | 768.7 | 3.3 | 1333.5 | 2.7 |
| 1930 | 477.1 | 5.3 | P 1740.5 | 2.1 |
| 1931 | 608.1 | 4.2 | | |
| 1932 | 254.3 | 9.9 | 1316.8 | 2.7 |
| 1933 | 278.1 | 9.1 | 967.1 | 3.7 |
| 1934 | 407.4 | 6.2 | 1119.7 | 3.2 |
| 1935 | 528.0 | 4.8 | 1820.5 | 2.0 |
| 1936 | 565.2 | 4.5 | 2168.5 | 1.6 |
| 1937 | 427.9 | 5.9 | 1489.1 | 2.4 |
| 1938 | 1131.2 | 2.2 | | |
| 1939 | 542.2 | 4.7 | | |
| 1940 | 655.6 | 3.9 | 2737.6 | 1.3 |
| 1941 | 791.0 | 3.2 | 3201.7 | 1.1 |
| 1942 | 803.8 | 3.1 | 3295.8 | 1.1 |
| 1943 | 785.1 | 3.2 | 2832.3 | 1.3 |
| 1944 | 611.1 | 4.1 | 1599.1 | 2.3 |
| 1945 | 510.7 | 5.0 | 1797.8 | 2.0 |

Note: P -- Partial record, --percent is somewhat above actual.

The release at each gaging station would have been the amount of water provided for fish protection expressed as percentage of the total annual runoff, if the two projects, Rock Creek and Cresta, had been in operation during the period from 1906 to 1945.

REPORT NO. 1

UNITED STATES DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service
River Basin Studies
Portland 18, Oregon

A Report on Fish and Wildlife Resources in Relation to the
Water Development Plan for the
Proposed Feather River Basin, Rock Creek and Cresta Projects
(Power Project No. 1962)^{1/}

Sponsor : Pacific Gas and Electric Company,
California

Sponsor's Status of Project : The project is in planning stage.
Plan for same has been submitted to
the Federal Power Commission.

Location : Butte and Plumas Counties, California

Source of Engineering Data : Pacific Gas and Electric Company.
Application to Federal Power Commis-
sion for License for Power Project
No. 1962.

Field Investigation : February, March, and April, 1947.

Report Prepared : May, 1947. Revised December, 1947
Revised February, 1948.

^{1/} Field work and report by River Basin Studies Staff, Fish and Wildlife Service, Region one, Portland, Oregon.

SUMMARY

The present application of the Pacific Gas and Electric Company (Power Project No. 1962) proposes the development of two units (Rock Creek and Cresta) of a comprehensive plan that will fully utilize the flow and gradient of North Fork of Feather River for the production of hydro-electric power. The entire plan includes ten units exclusive of Lake Almanor. Three units, Caribou, Buck's Creek, and Big Bend, have been constructed and are in operation; two, Rock Creek and Cresta, are proposed for present construction; and five, Butt Valley, Caribou Addition, Belden, Pulga, and Poe are proposed for future construction. Completion of all of the units of the plan will place the entire flow of North Fork in tunnels and conduits, except for diversion dam fore-bays, flood spill, and minor contributions of tributary inflow.

It is of the greatest importance to the valuable fishery resources of North Fork and to its general recreational attractiveness as well, that the present application be considered not only on its own merit, but also in terms of the ultimate development of the entire stream. Decisions that are made at this time in consideration of the Rock Creek and Cresta Projects will unquestionably establish precedent for all subsequent units of the comprehensive plan of development as proposed by the sponsor.

In its present application, the sponsor makes no provision whatsoever for minimum flows for the protection and maintenance of fish life in North Fork. The only flow that would remain in 12.3 miles of North Fork would be minute quantities of inflow from tributaries, an unknown, but slight amount resulting from leakage around the dams, and flood spills of short duration during periods of heavy run-off. This condition would virtually eliminate present fish populations in this section of North Fork for all time. The power potential and fishery resources of the stream are the property of the people of the State of California specifically and of the United States generally. These and all other resources that might be involved in any water development plan must be considered before making far-reaching decisions in favor of certain beneficiaries who would profit thereby.

The State of California Division of Fish and Game estimated that in 1946, 36,000 angler-days were spent on North Fork of Feather River, and that a minimum of 108,000 trout were caught. The Division further commented that the stream had long been recognized as an outstanding trout stream and that destruction of any appreciable amount of it would have far-reaching consequences. The California State Chamber of Commerce estimates the annual average expenditure of a California angler to be \$120. Estimates made by the Division of Fish and Game, based on catch records, indicate that anglers average 10-12 fishing days per year which would place the per day expenditure at about \$10. On the basis of these estimates, the value of the fishery resources of North Fork is sufficiently high to warrant the expenditure of \$360,000.00 annually by anglers to fish it.

The above estimates apply to 35.85 miles of North Fork from Lake Almanor downstream to the site of the proposed Cresta powerhouse. Operation of the Rock Creek and Cresta projects will affect the lower 16.35 miles of this section. The estimated annual fishery value of these affected sections (\$315,000) is based on a per second-foot-mile value of approximately \$50 as calculated from the total second-foot-miles from Lake Almanor to the proposed Cresta Powerhouse. Under the plan as proposed by the sponsor, this value would be reduced to \$33,000 greater than those based on the sponsor's plan but would be at least \$155,000 less than under present conditions.

CONCLUSIONS

Construction of the proposed project as presently planned would result in annual losses to the fishery resources of the North Fork of Feather River of approximately \$280,000. If Recommendations 1a and 1b are followed, the net annual loss would be \$155,000. Partial compensation for this loss would be possible through provision of greater releases from Almanor Dam to provide flows suggested in Recommendation 1c. The annual fishery value from Lake Almanor to Rock Creek Reservoir would thus be increased by \$85,000. The net annual loss for the entire stream would be reduced to \$70,000.

It is requested that the Fish and Wildlife Service be advised of all changes in construction and operational plans so that a reconsideration of the effects may be made.

RECOMMENDATIONS

It is recommended that:

- (1) Minimum flows be maintained at all times in sections of North Fork as follows:
 - a. Not less than 200 second-feet in the 7.5-mile section from Rock Creek Dam to the head of Cresta forebay to be measured at the point of release from the dam.
 - b. Not less than 200 second-feet in the 4.8-mile section from Cresta Dam to Cresta powerhouse tailrace to be measured at the point of release from the dam.
 - c. Not less than 100 second-feet in the 10.0-mile section from Lake Almanor Dam to Caribou powerhouse tailrace, the flow to be released from Lake Almanor and measured at a point approximately 0.5 mile upstream from the Caribou plant.

- (2) A minimum flow of not less than 200 second-feet be established as a part of any license that may be granted to the Pacific Gas and Electric Company for construction of any project on the main stem of North Fork of Feather River.
- (3) Rock Creek and Cresta dams be constructed with outlet facilities located as low as possible to assure the release of cool water for fish life.
- (4) Further study be given the possibility of constructing an afterbay dam to smooth flow irregularities occasioned by the operation of Caribou power plant on North Fork.
- (5) The license for the project, if granted, be held open with respect to the problem of screening the intakes of diversions from Rock Creek and Cresta Dams. The justification for screens cannot be adequately determined until the project is in operation.
- (6) The entire project area be open to free public access for fishing and other recreational uses, except such portions as may be reserved by the Pacific Gas and Electric Company in the interest of safety, efficient operation, and protection of property.

ACKNOWLEDGEMENT

1. The California Division of Fish and Game assisted in field work and supplied data pertinent to this report.
2. Officials of the U. S. Forest Service supplied certain data and information and concurred in the recommendations made herein.
3. The Federal Power Commission furnished engineering data, maps, and other information.

GENERAL DESCRIPTION OF THE PROJECT

4. Feather River rises near the crest of the Cascade Range and its channel approximates the boundary between that range and the Sierra Nevada. It flows in a general southwesterly direction joining the main stem of Sacramento River about 15 miles northwest of Sacramento, California. The project stream, North Fork, regarded as a continuation of the main stream, rises on the southern slope of Lassen Peak (elevation 10,437 feet) and for the greater length of its course, flows through a deep, narrow canyon joining Middle Fork at elevation 250 feet. Its drainage area is approximately 2,230 square miles. Flow is regulated by Lake Almanor and by the operation of Caribou, Buck's Creek, and Big Bend power plants, existing units of the Pacific Gas and Electric Company.

5. The present application of the power company proposes the development of two units (Rock Creek and Cresta) of a comprehensive plan that will fully utilize the flow and gradient of North Fork for the production of hydro-electric power. Completion of all units of the plan (see map) will place the flow of North Fork in tunnels and conduits, except for diversion dam forebays, from Lake Almanor to Middle Fork.

6. In the Rock Creek Unit, the applicant proposes construction of a concrete dam 115 feet high and 550 feet long to be located on North Fork immediately below the confluence of Opopee in the NW $\frac{1}{4}$ of NW $\frac{1}{4}$ of Section 35, Township 25 North, Range 6 East, Mount Diablo Base and Meridian. A 315-foot, overflow-type spillway 315 feet long with a capacity of 120,000 second-feet controlled by 3 drum gates, 105 feet by 22 feet, would be provided. Two sluice gates, 7x7 feet, located at almost stream level, would also be provided.

7. Water would be diverted from the northwest end of the dam and carried 34,500 feet by means of a 26-foot diameter tunnel having a capacity of 3,000 second-feet (average 1,560 second-feet) to the head of the penstock. The penstock would consist of 800 feet of 20-foot diameter tunnel and 800 feet of 162 to 192-inch diameter pipe leading to the power house. Power plant would consist of a steel reinforced concrete building, 54 x 166 feet, having an abutting switchhouse, 30 x 146 feet. This plant would be equipped with 2 vertical, Francis turbines, each directly connected with a 3-phase, 60-cycle, 13,800 volt, 0.9 factor, 63,000 kva generator. The power plant would be located about 7.5 miles below the dam.

8. The forebay would have a capacity of 2,300 acre-feet and the surface area at normal operating pool level would be 122 acres inundating 2.8 miles of stream.

9. For the Cresta unit, the applicant proposes construction of a concrete dam 113 feet high having a crest length of 360 feet. An overflow, 124,000-second-foot capacity spillway 132 feet long would be provided and controlled by 2 wheel gates, 50 x 50 feet, and 2 drum gates, 16 x 50 feet. Three sluice gates, 7 x 7 feet, located at about stream level would be provided. The dam would be located a short distance downstream from Swamp Creek in the NE $\frac{1}{4}$ of SW $\frac{1}{4}$ of Section 1, Township 23 North, Range 5 East, Mount Diablo Base and Meridian.

10. Water would be diverted from the south end of the dam and carried through a 27-foot diameter, 3,500-second-foot (average 1,880 second-feet) capacity tunnel and through a penstock consisting of 700 feet of 20-foot diameter tunnel and 700 feet of 174 to 198-inch diameter pipe to the powerhouse. The power plant would be located about 4.8 miles below the dam in Section 27, Township 23 North, Range 5 East, Mount Diablo Base and Meridian. Building would be of identical size and similar construction as the Rock Creek plant, but would be provided with two 46,500 horsepower, vertical, Francis turbines, each directly connected to a 3-phase, 60-cycle, 13,800-volt, 0.9 power factor, 37,500 kva generator.

11. Cresta forebay would have a capacity of 2,000 acre-feet and a surface area of 97 acres at normal operating pool level and would inundate 1.75 miles of North Fork.

FISHERY SECTION

A. Preproject evaluation.

12. The project, as proposed by the sponsor, makes no provision for minimum flows for the maintenance of fish life in sections of North Fork below Rock Creek and Cresta dams amounting to a total of 12.3 miles of stream. In addition, forebays of these dams will inundate 4.55 miles of stream, making a total of 16.85 miles that will be affected by the project. This large section of stream supports a sport fishery of considerable magnitude and includes the most picturesque section of North Fork. On the basis of estimates made by the California Division of Fish and Game in 1946, the annual angler effort on these sections would be approximately 31,500 angler days. Rainbow and brown trout are the principal species of game fish in the affected section of stream although smallmouth black bass and occasionally chinook salmon are taken in sections of North Fork below the project area. The Division estimates that a minimum of 108,000 trout were caught by anglers in 1946 in North Fork.

13. The California State Chamber of Commerce ("California" Vol. XXXV, No. 2, Feb. 1945) estimates the average annual expenditure of a California angler at \$120. Estimates based on catch records made by the Division of Fish and Game indicate that anglers average 10-12 fishing days per year or about \$10 per day.

14. On the basis of the above estimates, anglers spent approximately \$315,000 in pursuit of fishing on North Fork of Feather River in 1946.

15. The preproject annual value of the fishery resources of these sections is, therefore, concluded to be \$315,000. The 16.85 miles of stream involved in the project plan are readily accessible to anglers and support the bulk of the existing recreational facilities. The greater part of the total angler effort on North Fork is expended in this section.

B. Postproject evaluation.

16. The mean minimum flow of North Fork through the project area is approximately 1,500 second-feet, although flows of less than 600 second-feet have been recorded at the Big Bar gaging station. With the project in operation as planned by the sponsor, the only flow below Rock Creek and Cresta dams would be that resulting from leakage, flood spill, and inflow of tributaries. Minimum tributary inflow to the 7.5-mile section between Rock Creek dam and Cresta forebay is 17 second-feet and in the 4.8-mile section between Cresta dam and powerhouse 14.5 second-feet. The extent that leakage would supplement these flows is unknown, but quite obviously the total minimum flow from these sources would be inadequate to maintain more than a vestige of the present fishery.

17. On the basis of these flows as compared to those prevailing at the preproject level, it is estimated that fishery values would be reduced about 89 per cent and would amount to approximately \$35,000 annually including a fishery value of \$2,450 for the forebays of Rock Creek and Cresta Dams. Annual losses to the fishery resources would be about \$280,000.

18. The irreducible minimum flow recommended for the maintenance of fish life and fishing in the 12.3 miles of stream that will be affected by the project is 200 second-feet as measured at the point of release from Rock Creek and Cresta dams. Flows greater than this would enhance fishery values, and careful study indicates that the fishery resources might be maintained at or near their present levels of abundance with a minimum flow of about 400 second-feet.

19. Because the present application concerns only two units of a total of ten ultimately planned, three of which - exclusive of Lake Almanor - have already been constructed and are in operation, it seems appropriate to call attention to certain phases of operation of existing units that should be corrected for the protection of fish life.

- a. Releases from Lake Almanor to North Fork are quite erratic and affect about 10 miles of stream between the dam and Caribou powerhouse. According to 1943 flow records, the mean discharge from Lake Almanor was 283 second-feet. However, releases of less than 20 second-feet were made during the months of May, June, July, August, and September, with a minimum release of 4.4 second-feet being made in September. These are the months of the year during which the water demands of trout are greatest. Under present operation schedules, flows are obviously lowest during these months. In order to correct this situation in the interest of fishery maintenance, it is recommended that a minimum flow of not less than 100 second-feet, as measured at a point 0.5 mile above Caribou powerhouse be maintained in North Fork.
- b. The operation of Caribou power plant seriously affects about 7 miles of North Fork from the powerhouse to the confluence of East Branch and to a lesser degree additional miles of stream below that point. The plant apparently operates on a demand basis which results in extreme fluctuations in discharge. During the course of a one-hour observation on April 10, 1947, discharges from the plant varied between 20 and 850 second-feet. Vertical changes in stream level below the plant varied between 6 inches and 3 feet depending on the character of the stream channel. In the interest of conservation and maintenance of fish life in North Fork, this condition should be and can be corrected by construction of an afterbay dam to smooth flow irregularities.

20. If recommendations for minimum flows as made herein are followed below Rock Creek Dam, it is estimated that fishery values in the project area could be maintained at about 50 per cent of the preproject level and would amount to about \$160,000 annually. The fishery resources would sustain annual losses amounting to at least \$155,000. If releases are made from

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Lake Almanor to provide flows of 100 second-feet at Caribou, and this increased flow is carried unimpeded downstream, an additional annual fishery value of \$85,000 would be provided for the stretch from Lake Almanor to Rock Creek Dam. The net annual loss to the North Fork would be reduced to \$70,000. This total value precludes the improvement of stream fluctuations below Caribou powerhouse.

21. Rock Creek and Cresta dams would be constructed solely to create head for the diversion of water. Forebay waters would be rapidly exchanged since storage capacities are low in relation to inflow and discharge. Thus, these waters would retain some stream characteristics while assuming certain reservoir characteristics as depth and increased placid surface area. Their value to the fishery resources of North Fork lies somewhere between typical stream and typical reservoir conditions. However, after careful study, it seems proper to evaluate them on an area basis rather than in terms of volume of flow and limit the per-acre value to one-half of the regular reservoir value for storage impoundments of the same area.

22. The Rock Creek forebay would have an effective area of 122 acres and the Cresta forebay, 97 acres for a total of 219 acres. These forebays would have an annual fishery value of about \$2,450.

23. Fishways would not be required for the dams since migratory fishes are not involved. Consideration should be given the problem of screening diversion intakes to prevent possible loss of fish. However, it is recognized that the screening of the diversions from Rock Creek and Cresta dams might not be economically justified nor physically possible to accomplish.

24. Schedule of Minimum Flows

| Stream Section | Miles | Minimum Flows in Second-feet | | |
|---|-------|------------------------------|------------------------|-------------|
| | | Preproject | Sponsor's Plan | Recommended |
| Lake Almanor to Caribou Powerhouse | 10.00 | 10 | 10 | 100 |
| Caribou Powerhouse to East Branch | 7.00 | 60 | 60 | 150 |
| East Branch to head of Rock Creek Reservoir | 2.00 | 182 | 182 | 272 |
| Head of Reservoir to Rock Creek Dam | 2.80 | 202 | Inundated by reservoir | |
| Rock Creek Dam to Bucks Creek Powerhouse | 6.00 | 220 | 17 | 217 |
| Bucks Creek Powerhouse to head of Cresta Reservoir | 1.50 | 520 | 317 | 517 |
| Head of Reservoir to Cresta Dam | 1.75 | 532 | Inundated by reservoir | |
| Cresta Dam to Cresta Powerhouse | 4.80 | 547 | 14.5 | 214.5 |

25. Summary of Fishery Values in the Project Area

| Preproject | Postproject | | Loss | |
|------------|-------------|-----------|-----------|------------|
| | Sponsor | Service | Sponsor | Service |
| \$315,000 | \$35,000 | \$160,000 | \$280,000 | \$155,000* |

* Excluding recommended flow below Lake Almanor.

WILDLIFE SECTION

26. The project will not appreciably affect existing wildlife resources of the area. In general, the precipitous, rocky canyon of North Fork provides very little suitable habitat for upland game birds and animals. Deer are found in the highlands and to some extent in the canyon. Quail are the only upland game birds found in the area, but they are few in number and their habitat is limited to stream margins.

27. Occasional waterfowl frequent the area in flight between Lake Almanor and Central Valley and might possibly use the forebays of Rock Creek and Cresta Dams as resting areas. But because of the Rocky nature of the terrain that they would inundate, these forebays would not develop feeding areas.

28. A few mink, skunk, and coyotes are known to occur in North Fork canyon, but it is doubtful that any are resident in the areas that would be affected by the proposed impoundments because of the lack of suitable habitat for them.

/s/ Rudolph Dieffenbach,
Coordinator, River Basin Studies,
March 1948.

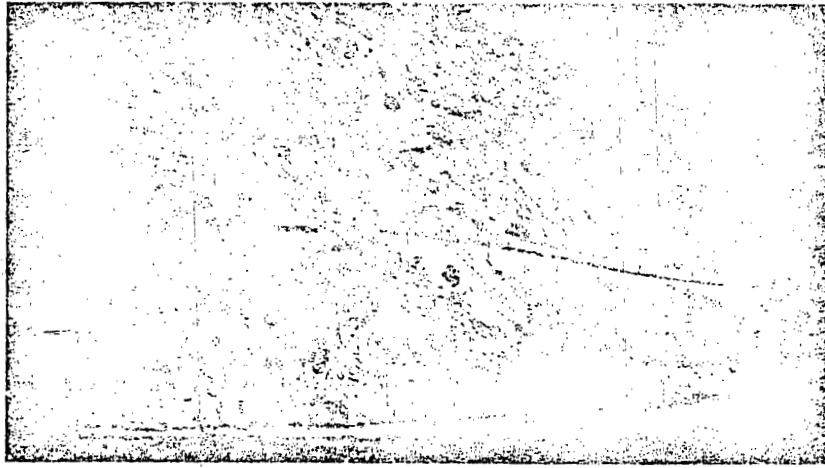


Figure 1. Rock Creek Dam site East bank. Line indicates approximate crest level of dam.



Figure 2. Rock Creek Dam site West bank looking downstream.

1. Mark at crest level of dam.
2. Center line marker of tunnel.



Figure 3. Rock Creek Dam site looking downstream from northwest corner of axis of spillway.



Figure 4. Cresta Dam site (approximate). View looking upstream.

DATE: March 25, 2015
TO: Dave Steindorf, Chris Shutes
FROM: Sarah Reich, Ed MacMullan
SUBJECT: COMMENTS ON THE DEIR FOR THE UPPER NORTH FORK FEATHER RIVER
HYDROELECTRIC PROJECT: ECONOMIC ISSUES RELATED TO COLDWATER ANGLING AND
WHITEWATER BOATING

I. Introduction and Summary

American Whitewater and the California Sportfishing Protection Alliance hired ECONorthwest (ECONW) to provide comment on the Draft Environmental Impact Report (DEIR) for the Upper North Fork Feather River Hydroelectric Project (UNFFR Project). Our focus is on economic issues pertaining to recreation, specifically coldwater angling and whitewater boating.

We have reviewed the pertinent sections of the DEIR, including Chapters 1 and 3, and Chapter 6, sections 6.6, Fisheries, and 6.8, Recreation. We have also reviewed background information and historical documents related to the UNFFR Project. We conducted a review of documents and data related to the economic value of coldwater angling and whitewater boating in the North Fork of the Feather River (NFFR), the Northern California Region, and elsewhere in California and the Pacific Northwest. We bring this information to bear on the conclusions related to recreation in the DEIR. In general, the DEIR does not adequately describe the current use and economic value of coldwater angling and whitewater boating. This memo presents our findings.

II. Recreational Angling on the NFFR Has Economic Value

The DEIR does not provide information about the use levels related to recreational angling, or its economic value, either under current or historical conditions. Omitting this information leaves the reader and decision makers without an adequate context to evaluate the effects of the proposed project and alternatives.

The UNFFR Project is located in the upper reaches of the NFFR watershed, upstream of Lake Oroville, in Plumas County, California. The UNFFR Project was originally licensed by the Federal Energy Regulatory Commission (FERC) in 1955. Prior to 1955, there was some hydroelectric development in the upper reaches of the watershed, but the NFFR was also widely known for its scenic beauty and productive trout fishery. Human activity and alterations of the natural habitat in the Feather River basin started as early as 1910 with the construction of the Big Bend dam, which “probably blocked most migratory fish from accessing the North Fork Feather River and its tributaries.”¹ Since then, six more dams have been built, all affecting

¹ California State Water Resources Control Board. 2014. *Upper North Fork Feather River Hydroelectric Project Draft Environmental Impact Report*. 6.6-1-2.

physical habitat by altering its streamflows, water temperature regime, and the river's channel morphology. These alterations have "long been identified as important factors limiting coldwater fishery on the North Fork Feather River."²

Several studies document the economic value of coldwater angling on the NFFR, from the 1940s to the 1980s. We are not aware of studies that describe the value of angling after the 1980s.³ In anticipation of the UNFFR project construction, Wales and Hasen (1952) described the fishery resources on the NFFR.⁴ They concluded the NFFR supported a fishery that rivaled any in the state:

*"Destruction of trout fishing streams in California by removal of water for power, irrigation and other purposes is proceeding at an accelerated pace. Certain of these streams are particularly important. Their trout carrying-capacity may be especially high, they may be located in especially beautiful surroundings or they may be easily accessible to many thousands of people. Only a few rivers in California have all of these advantages. Of these few, the North Fork of the Feather is an outstanding example."*⁵

In their 1952 study, Wales and Hansen documented 11 commercial resorts and six Forest Service campgrounds along the NFFR serving anglers and recreationists. Based on use surveys of these facilities, the authors estimate that the NFFR supported approximately 36,000 angling days in the mid-1940s, though they also say "these figures and estimates are almost certainly below the actual numbers."⁶ In discussing the value of this angling, they recognizing both "fishing as a business stimulant" and "fishing as a psychological stimulant." Although they don't estimate a dollar value for either, the California Chamber of Commerce estimated that the average angler in the mid-1940s spent \$120 on fishing-related expenses each year. Based on an average trip length of 10 to 12 fishing days, the State of California Department of Fish and Game estimated that the 36,000 angling days on the NFFR would be worth approximately

² California State Water Resources Control Board. 2014. *Upper North Fork Feather River Hydroelectric Project Draft Environmental Impact Report*. 6.6-1-2.

³ Although several papers were published in the 1990s (Loomis, J. & J. Cooper. 1990. "Economic Benefits of Instream Flow to Fisheries: A Case Study of California's Feather River." *Rivers*. 1.1. 23-30.; Resource Decisions. 1999. *A Cost-Benefit Analysis of Flow Alternatives Associated with Pacific Gas & Electric's Rock Creek-Cresta Project Relicensing.*), these relied on angling use data from the 1980s.

⁴ Wales, J., and H. Hansen. 1952. *The Effect on the Fishery of the North Fork of the Feather River, California, of Proposed Hydro-Electric Developments with Special Reference to Cresta and Rock Creek Projects*.

⁵ Wales and Hansen. 1952. Pg. 10.

⁶ Wales and Hansen. 1952. Pg. 11.

\$360,000 each year.⁷ Those 36,000 angling days that occurred on the NFFR in the 1940s would be worth approximately \$4 million annually in today's dollars.⁸

Angling opportunities are dependent upon available instream flow in that flow rates determine (at least in part) water temperatures, dissolved oxygen rates, and the amount of fish life the river can support at a given point in time.⁹ Resource managers predicted in the 1940s and 1950s that after PG&E completed the UNFFR Project, a decline in coldwater habitat and ecological changes resulting from the dams could result in a decline in angling quality. Later studies in the 1960s and 1970s confirmed these changes materialized.¹⁰

These changes led to a decrease in the economic value associated with angling activity. The California Department of Fish and Game estimated angling activity on the NFFR between 1981 and 1985. On average during this time, there were approximately 7,000 angler days on two reaches of the NFFR (Rock Creek and Cresta).¹¹ Two studies discussed the economic value of these angler days, in terms of the consumer surplus or net willingness to pay.¹² They found the benefit anglers received from a day of fishing was between about \$32 and \$45 in 2014 dollars.¹³ A 2006 study by the U.S. Fish and Wildlife Service found that Californian trout anglers' net willingness to pay for a day of trout fishing was about \$90 in 2014 dollars.¹⁴ The U.S. Fish and Wildlife Service conducted a review of studies of the value of in-river trout fishing in the western United States, to provide information for economic analyses in FERC relicensing efforts. The review found the median value across 70 estimates of a day of angling was about

⁷ Wales and Hansen. 1952. Appendix, Summary.

⁸ Dollar values are converted to 2014 dollars using the Consumer Price Index (CPI). Available at <http://www.bls.gov/cpi/data.htm>

⁹ Garcia & Associates. 2003. *2002 Angler Creel Survey: Rock Creek-Cresta Project (FERC No. 1962) North Fork Feather River*. San Ramon, CA.; Lindquist, D. & L. Bowie. 1988. "Watershed Restoration in the Northern Sierra Nevada: A Biotechnical Approach." *Proceedings of the California Riparian Systems Conference*. Davis, CA

¹⁰ *Case Study Report #10: Rock Creek Diversion Dam, North Fork Feather River*. 1975. Retrieved March 23, 2015, from http://www.calwater.ca.gov/Admin_Record/C-064104.pdf

¹¹ Resource Decisions. 1999. *A Cost-Benefit Analysis of Flow Alternatives Associated with Pacific Gas & Electric's Rock Creek-Cresta Project Relicensing*.

¹² This value differs from the estimate of value in the 1940s because it measures what anglers are willing to pay for fishing above the amount they actually pay. This value estimates the economic benefit anglers receive from a fishing trip. It does not include angler's spending on fishing equipment or travel and lodging expenses.

¹³ Loomis, J. & J. Cooper. 1990. "Economic Benefits of Instream Flow to Fisheries: A Case Study of California's Feather River." *Rivers*. 1.1. 23-30.; Resource Decisions. 1999.

¹⁴ U.S. Fish and Wildlife Service. 2006. *Trout Fishing in 2006: A Demographic Description and Economic Analysis*. Report 2006-6. Retrieved March 19, 2015, from <https://www.troutmagnet.com/pdf/USFWS.pdf>

\$66 in 2014 dollars.¹⁵ These values translate into a fishery that provides benefits of between about \$225,000 and \$630,000 in today's dollars, assuming the number of anglers has remained constant since the 1980s.¹⁶ If angler participation has increased, the total benefit would be greater.

It is important to keep in mind that the estimates of value from these historical studies don't measure the same thing: the estimate from the 1940s focused on the amount anglers spent at local businesses on things, such as equipment, bait, gas, and lodging, to fish. The more recent studies focused on the amount above what they spent that anglers would have been willing to pay to fish in the NFFR. Both values underscore, however, that angling on the NFFR has value to anglers and the broader economy. Based on the decline in angler days logged on the NFFR, it is also reasonable to conclude that the economic value of fishing has declined, despite the fact that the population of Plumas County and the state of California has increased by 73 percent and 439 percent respectively over that time.

This conclusion is consistent with historical predictions. Researchers have also suggested that, on a trajectory of what the fishery could have been with management aimed at multiple uses, fishing use on the NFFR would have increased, not decreased, from levels in the 1940s. In their 1952 report, Wales and Hansen said:

Due to the highly accessible location of the North Fork it would be inevitable that without power development it would eventually become one of the most heavily fished trout streams in California. The recreational value of this canyon would rank well up among similar areas in the State.¹⁷

In 1987, the California Department of Fish and Game concluded:

It is the Department's view that PG&E's Rock Creek-Cresta Project is responsible for the mitigation of 76,000 angler-days in the Project area. This use estimate would have existed today without power development.¹⁸

It is possible, given population growth in California, that the estimate of lost angler days would be even greater today, nearly 30 years since DFG made this conclusion.

¹⁵ Black, R., B. McKenney, and R. Unsworth. 1998. "Secondary Methods for Valuing Non-Power Benefits: Benefit Transfer." *Economic Analysis for Hydropower Project Relicensing: Guidance and Alternative Methods*. U.S. Fish and Wildlife Service. Retrieved March 23, 2015, from <http://www.fws.gov/policy/hydroindex.htm>

¹⁶ We are unaware of new data on angler participation on the NFFR. However, studies of trout fishing nationally have found participation holding steady or decreasing over the last 20 years.

¹⁷ Wales and Hansen 1952. Pg. 17

¹⁸ Wixom, L.H. 1989. *North Fork Feather River Fisheries Management Plan*. Draft. California Department of Fish and Game. April. Pg. 34.

Using the estimates Resource Decisions (1999) developed for net willingness to pay for angling on the NFFR at theoretical higher flow levels, the annual value of a fishery managed to enhance coldwater angling could be worth \$8 million today. This estimate is in line with the value of other coldwater in-stream fisheries. For example, Duffield (1987) calculated the value of fishing on Montana's rivers between \$106,000 and \$17 million per year depending on the river, with visitation levels calculated from use data collected during the 1980s.¹⁹ The higher values were associated with scenic, coldwater streams with robust trout populations. Presumably, use has increased with population, and values would be even higher if calculated today.

II. Whitewater Boating on the NFFR Has Economic Value

Similarly, the DEIR does not provide information about the use levels related to whitewater boating, or its economic value. It does not address whitewater boating at all, which leaves the reader and decision makers without information to determine how the proposed project and its alternatives may affect the value of whitewater boating.

Like angling, whitewater recreation (e.g., kayaking, rafting, canoeing) is dependent upon instream flow rates. Required flows are often too low for whitewater boating activities, though there are some low flow technical boating opportunities under base flow conditions in some water year types on the Rock Creek and Cresta reaches. Otherwise, whitewater recreation can only take place during special release days (typically once a month in the summer).

During these days, extra water is released from the NFFR dams and instream flows are high enough to support whitewater recreation. Resource Decisions (1999) concluded, based on river surveys conducted by WRC Environmental, a firm specializing in whitewater evaluation, that: "...the river conditions, even with adequate flows is unlike that of any other California river."²⁰ Others have noted that these features, combined with relatively easy access from the road, attract whitewater enthusiasts who use the river like a whitewater park, running the same short stretches of river several times a day.²¹

Demand for whitewater boating on the NFFR consists of individual recreational paddlers. No commercial guide licenses have been issued for the NFFR. The Outdoor Program Coordinator at Feather River College, Rick Stock, operates guided trips on the river under a special educational permit, but only in educational capacities.²² While it is not currently an ideal destination for commercial guides because of the limited time conditions are boatable, the NFFR is growing in popularity among individual paddlers. Each year since 2001, when regular

¹⁹ Duffield, J. 1987. *The Net Economic Value of Fishing in Montana*. Montana Department of Fish, Wildlife, and Parks.

²⁰ Resource Decisions. 1999. Pg. 22.

²¹ Personal communication with Dave Steindorf, American Whitewater. March 18, 2015.

²² Personal communication with Rick Stock, Program Coordinator, Outdoor Recreation Leadership Program, Feather River College. March 19, 2015.

releases through the Rock Creek and Cresta reaches began, American Whitewater and local paddling groups have hosted the Feather River Festival. Attendance has grown over 8 years from about 200 paddlers to 1,500 paddlers. The Feather Festival has become the largest river festival on the West Coast. It has expanded from an event that attracted primarily local residents to a regional event that attracts people from all over the western U.S., and even some participants from the East Coast.²³

No agency formally collects data on whitewater boating participation on the NFFR. Since regular releases began in 2002, there has been one effort to formally estimate use during boatable conditions. During recreational release weekends in 2002, 2003, and 2004, surveyors collected use data for PG&E's Public Recreation Monitoring Report. The number of visitor days ranged from about 230 to about 600 between 2002 and 2004, increasing each year.²⁴ To our knowledge, PG&E has not conducted official user surveys since 2004. However, based on participation in the Feather River Festival, it appears that use has continued to increase since 2004, as more people become familiar with the river and aware of the recreational flow releases.

Two studies used the PG&E user data from 2002 to 2004 to estimate the value of boating on the NFFR. These studies employed a methodology called Zonal Travel Cost Modeling to estimate the value of a recreation day. The first study (Oliver et al. 2005) used only observations from 2004, and estimated the average net willingness to pay for a day of boating at about \$190 in 2014 dollars.²⁵ The second study (Wright 2013) assessed observations in all three years, and found net willingness to pay for a day of boating ranged from about \$80 per day for Californians in 2003 to about \$200 per day for Californians in 2004. Including observations from boaters who came from out of the Oregon, California, Nevada region resulted in higher values, ranging from about \$300 to over \$1,200 net willingness to pay per day.²⁶ From these values, Wright estimated a total average net willingness to pay ranging from about \$150,000 to almost \$1.2 million per year in 2014 dollars. Oliver estimated a total annual benefit from recreational boating of about \$175,000 in 2014 dollars. Both of these studies' estimates of net willingness to pay per boating day were generally higher than the \$107 (in 2014 dollars) that Resource Decisions produced in 1999 using a benefit-transfer technique relying on data from the Pit and Trinity Rivers.²⁷

²³ Personal communication with Dave Steindorf, American Whitewater. March 18, 2015.

²⁴ Wright, J. *Valuing Recreational Water Releases on the North Fork of the Feather River: A Travel Cost Study*. Chico: California State University Chico Department of Geography.

²⁵ Oliver, A., S. Wever, A. James, K. Del Paine, & P. Tsournos. 2005. *The Benefits of Supplemental Water Releases on the Feather River*. Chico: California State University Chico Department of Economics.

²⁶ Wright recognized that most users surveyed traveled only a few hours to get to the NFFR. The few out-of-state visitors (from Hawaii and Texas) were outliers, and skewed the average value of total observations upward.

²⁷ Resource Decisions. 1999. Pg. 23.

III. Conclusion

The DEIR omits information about the value of coldwater fishing and whitewater boating from its discussion of recreational resources impacted by the UNFFR Project. Studies indicate that the NFFR currently supports recreational use that contributes economic value to participants and the broader economy. In the case of coldwater fishing, historical use patterns and evidence from coldwater fisheries elsewhere in the U.S. suggest that managing the resource to enhance coldwater fishing opportunities likely would increase the overall value of coldwater fishing activities in the NFFR. Similarly, whitewater boating use and associated economic value on the NFFR has grown since recreational releases began in 2002, and management of the resource to support this increasing use likely would continue to generate increasing economic value.