

KRB STUDY REQUEST 7: Environmental Flows
(in conjunction with KERN RIVER FLY FISHERS' COUNCIL)

COMMENTS & RESPONSE

Original Study Request (Goals and Objectives):

The goal of this study is to apply the California Environmental Flows Framework (CEFF)(CEFWG, 2021) to the Wild and Scenic North Fork Kern River in order to provide environmental flow assessment and environmental flow recommendations. The objectives of this study are to:

- (1) Identify the ecological flow criteria using natural functional flows for the NF Kern River. Determine the natural ranges of the flow metrics for each of the five functional flow components (fall pulse flow, wet-season base flow, wet-season peak flows, spring recession flow, dry-season base flow);
- (2) Develop any additional ecological flow criteria for each flow component requiring additional consideration (e.g., additional constraints imposed by water temperature, dissolved oxygen concentration limits, and fish habitation requirements);
- (3) Develop environmental flow recommendations which reconcile the ecological flow needs with the non- ecological hydropower management objectives to create a balanced environmental flow recommendation.

SCE Comment

- Stakeholder Requested Study Not Adopted
- Study request is not necessary because existing information is sufficient to answer the questions posed.

Determining functional flow criteria ranges is feasible for this system; however, existing data are available to assess the ecological needs served by functional flows (i.e., fish population data, water quality). Where existing data are not available to assess the ecological needs related to minimum instream flows, SCE is proposing study plans to gather additional information (e.g., studies WR-1 and WR-2). The effects of current managed flows in the NFKR on water and aquatic resources will be assessed in SCE's Application for New License. Following the assessment of Project-related effects, which will be included in the License Application, the FERC ILP includes opportunities for participants to make recommendations regarding license conditions, including potential changes to ecological flow releases. Therefore, applying the California Environmental Flows Framework as a separate study is unnecessary given that the framework utilizes data generated by other proposed studies (and/or existing data), and requires the agreement of and negotiation with all Stakeholders in order to make final flow recommendations, which would not be completed as part of a relicensing study.

KRFFC/KRB Response

We agree the study request was too broad. As pointed out by SCE, the FERC ILP includes a process to submit and develop recommendations on the basis of the study reports and to generate the final flow recommendations with the support of all stakeholders. This FERC process would certainly supersede proposed study objectives (2) and (3) which describe a similar pathway.

However, it remains a fact that there is evidence of a problem in the health of the North Fork Kern River. It consistently fails to meet water quality standards, and the trout populations in the diverted reach are nearly annihilated according to SCE's own data after each dry year while operating under the current minimum flow regime.

While SCE currently proposes additional individual studies on a few unique and problematic elements of the North Fork Kern during a single season (e.g., temperature and D.O.), there remains an absence of holistic data to understand how the quantity, quality, and timing of flows work to support physical, chemical, and biological functions of streams that, in turn, sustain ecosystem health. This is exactly the kind of understanding that modern environmental science can provide with the calculation and eventual management of the functional flow components, as defined in the CEFF.

This proposed study remains a purely desktop study that should be able to be performed much like SCE's proposed hydrology study, and this study has been deemed "feasible for this system" according to SCE. Our proposed study has been rewritten to conform with these comments.

KRB SR-7: ENVIRONMENTAL FLOWS UPDATED STUDY REQUEST

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of this study is to apply the California Environmental Flows Framework (CEFF)(CEFWG, 2021) to the Wild and Scenic North Fork Kern River in order to provide environmental flow assessment and functional flow analysis. The objectives of this study are to:

- (1) Identify the ecological flow criteria using natural functional flows for the NF Kern River. Determine the natural ranges of the flow metrics for each of the five functional flow components (fall pulse flow, wet-season base flow, wet-season peak flows, spring recession flow, dry-season base flow);
- (2) Determine functional flow criteria for each of Dry, Moderate, and Wet water years using hydrological data available;

(3) Provide the resulting functional flow criteria ranges to all stakeholders.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

Not applicable.

Criterion (3) – if the requester is not a resource agency, explain any relevant public interest considerations in regards to the proposed study.

The Commission is charged by the Federal Power Act to balance developmental values with “the protection, mitigation of damage to, and enhancement of, fish and wildlife ..., and other aspects of environmental quality” in its formation of hydropower licenses. The California Department of Fish and Wildlife (CDFW) is the relevant State fish and wildlife agency for resource consultation pursuant to the Federal Power Act Section 10(j).²¹⁹ CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of those species²²⁰s. Information generated through this study will further inform the managing agencies’ goals by providing a modern, state of the art science-based flow assessment and recommendation that balance ecosystem and human needs for water.

The dewatered reach of the Wild and Scenic North Fork Kern River attracts vast members of the public throughout the year. It is the closest major perennial river to Southern California. It also has inherent outstanding values, and its environmental values (ecological, fish, and wildlife assets) are to be conserved and enhanced under the Wild and Scenic River Act. Flows have been diverted for hydropower on the NF Kern since 1921 when the Kern River No. 3 (“KR3”) project first went online, and diversion has continued in similar manner for the subsequent 100 years. Over those 100 years, the science of ecology, hydrology, and environmental protection has evolved significantly. In support of those ecological, fish, and wildlife assets, it is in the interest of the public to review the long-standing ecological impact on the NF Kern, and define a modern, scientifically-based and environmental sound means of balancing resource allocation and preserving the ecological health of one of Southern California’s premiere rivers.

USFS is also responsible under Section 7 of the Wild and Scenic River Act with evaluating whether a proposed license renewal for KR3 would cause any direct and adverse consequences on the outstanding resource values provided by the North Fork Kern. This study would help address the information-gathering obligation raised by complaints about angling and the health of the river on the North Fork Kern. USFS should want adequate information on which to determine whether any new license for the project directly and adversely impacts the fishery. And to be clear, recreational fishing is an outstanding resource value identified by USFS in its Wild and Scenic environmental analysis, record of

²¹⁹ 16 U.S.C. § 803(j)

²²⁰ Fish & Game Code § 1802

decision-making, and management plan for the dewatered reach of the North Fork Kern (called “Segment 4” in those documents): The 1994 FEIS states, “The outstandingly remarkable values for Segment 4 include fishing, camping, picnicking, Whitewater boating, hiking, driving for pleasure, and enjoying the scenic beauty.”²²¹ The 1994 ROD states, “Segment 4, was identified as possessing outstandingly remarkable recreational values because of the variety of opportunities it offers to a vast majority of citizens who live within a short distance of this major river (3-4 hours driving distance from the Southern California basin).”²²² The 1994 W&SR Plan directs USFS to “maintain or enhance viable populations of native wildlife and fish species,” conduct an “active program of stream habitat improvement,” maintain a “riffle to pool ratio [of] approximately 1:1,” and manage the area to “maintain or achieve adequate user safety and experience levels.”²²³ As far back as the 1982 NFK W&SR FEIS, USFS stated that designation of all segments — including segment 4 — “will ensure that [it] continue to provide a riverine (free-flowing) type of fishery.”²²⁴

Criterion (4) – Describe existing information concerning the subject of the study proposal, and the need for additional information.

There is evidence of a problem in the health of the NF Kern River. It consistently fails to meet water quality standards and particularly dissolved oxygen (DO) standards, and the trout populations in the diverted reach are nearly annihilated according to SCE’s own data after each dry year while operating under the current minimum flow regime which was developed under exactly the previous 1996 FERC process and with the same existing information available. While SCE currently proposes additional individual studies on a few unique and problematic elements of the NF Kern River, there is still an absence of holistic data to understand how the quantity, quality, and timing of flows work to support physical, chemical, and biological functions of streams that, in turn, sustain ecosystem health. This is exactly the understanding that modern environmental science can provide with the calculation and eventual management of the functional flow components, as defined in the CEFF.

Water quality data on the NF Kern is only sparsely available to the public. Even with the minimal data set available, it becomes apparent that the project has an ongoing negative effect on the water quality results, and results within the diverted stretch fail to meet water quality standards. See Table 1 (below) which shows that the presence of the Fairview dam exacerbates poor water temperature, poor dissolved oxygen, and poor conductivity measurements on the diverted stretch of the NF Kern.

²²¹ 1994 USFS N&SFKR W&SR FEIS at “Affected Environment” at 61 [.pdf 113]

²²² 1994 USFS N&SFKR W&SR ROD&CMP at ROD 10

²²³ 1994 USFS N&SFKR W&SR ROD&CMP at CMP 24, 48-49

²²⁴ 1982 USFS NFKR W&SR FEIS at 57

Table 1: Recent Water Quality Sampling, NFKR (Adventure Scientists, 2021)

| DATE | TEMP | TEMP | D.O. | D.O. | COND | COND | FLOW | FLOW |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|
| | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW |
| 7/3/2021 | 20.0 | 23.7 | 7.4 | 6.4 | 83 | 254 | 144 | 102 |
| 7/17/2021 | 19.3 | 23.3 | 7.0 | 6.2 | 157 | 194 | 126 | 86 |
| 8/7/2021 | 18.7 | 22.9 | 7.7 | 6.8 | 166 | 199 | 113 | 71 |
| GOAL | <20.0 | <20.0 | >8.0 | >8.0 | <200 | <200 | | |

(ABOVE=Above Fairview Dam, BELOW=Below Fairview Dam, TEMP=Temperature (C), D.O.=Dissolved Oxygen (mg/L), COND=Conductivity (μ S/cm), FLOW=Average Daily Flow (cfs))

The PAD proposes individual studies on elements of the entire affected Kern River ecosystem: additional water temperature and dissolved oxygen (WR-1), inventorying of foothill yellow-legged frogs (BIO-1), western pond turtles and special-status salamanders (BIO-2), and general wildlife and botanical resources (BIO-3 and BOT-1). However, there is no attempt to define the long-term ecological impacts from drastically altered and reduced hydrology through the diverted stretch (which may render the inventorying efforts fruitless), nor to define the ecologically necessary flows or flow features required to mitigate present and future environmental damage. In the PAD there is also no mention of rapidly evolving ecological science and international flow management guidelines for environmental integrity in hydropower operations (summarized in Duxbury, 2022), nor citation of any of the broad array of environmental guidance developed specifically by the state of California.

The California Department of Fish and Wildlife (CDFW) has a well-developed Instream Flow Program (IFP) and supports the use of a variety of methods to quantify flow regimes for fish, wildlife and their habitats (CDFW, 2017). Used in conjunction with habitat and hydraulic modeling, flow duration analysis and exceedance probabilities are used as standard operating procedures by the state (CDFW, 2013). They acknowledge that “There is a consensus among experts that cumulative flow alterations resulting in instantaneous flows that are $\leq 30\%$ of the MAD have a heightened risk of impacts to ecosystems that support fisheries” (CDFW, 2017). The current NF Kern minimum instream flow regime is perpetually below that threshold as it remains below 20% MAD for the entirety of the year, and is categorized between “Severe degradation” and “Poor or minimum habitat” at all times (Duxbury, 2022). However, while component of the IFP have been studied, a more comprehensive analysis or characterization has not been proposed for the NF Kern, and there is only a short list of special status streams that are considered for full IFP protections according to the CDFW.

Even more recently, the California Environmental Flows Working Group (CEFWG), a collaboration between experts at the CDFW, State Water Resources Control Board, and other academic and advocacy groups, developed the California Environmental Flows Framework (CEFF). Unlike the IFP which is inconsistently applied to only a few designated streams, the CEFF is meant to provide a consistent statewide approach, and “improve the

scale and pacing at which environmental flow protections can be extended to rivers and streams across the state” (CEFWG, 2021). In fact, the CEFF has already been recommended by the CDFW for use in the relicensing of Devil Canyon Project in the Mojave River watershed (FERC Project No. 14797, FERC eLibrary No. 20210909-5090).

The CEFF is based upon desktop methods using readily available data (CEFWG Database, 2021 and Zimmerman, 2021) that characterize natural instream flows based upon five functional flow components (fall pulse flow, wet-season base flow, wet-season peak flows, spring recession flow, dry-season base flow). Ecological flow criteria are developed which correspond to these components, and recommendations should match the natural flow values.

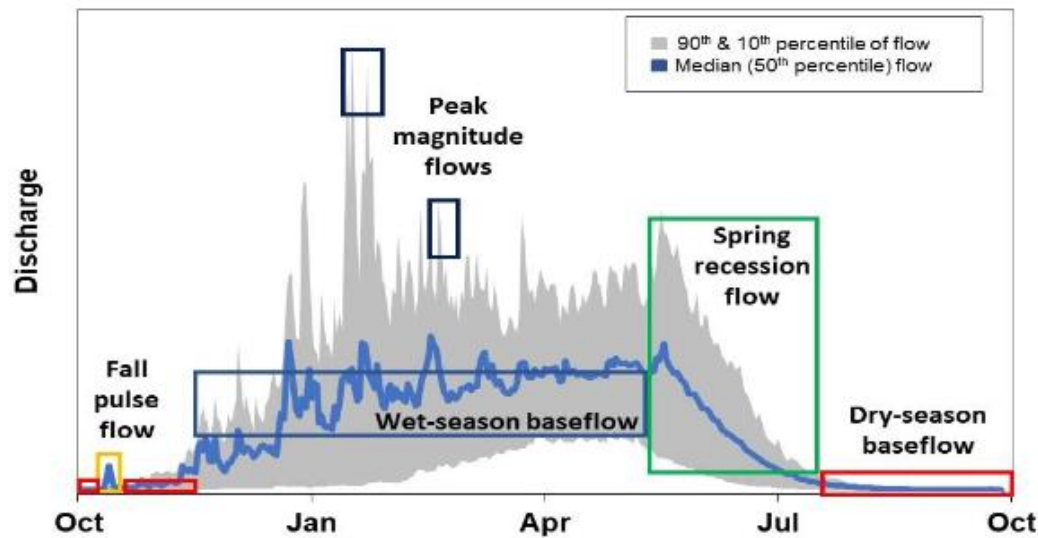


Figure 1: Image of functional flow components for a representative California hydrograph from CEFWG, 2021.

Using the publicly available CEFWG Database’s median data from all years, a functional flow metrics table was generated for the NF Kern River. An additional column was added to map the current MIF regime values to the flow components for comparison.

| Location of Interest (LOI) = Kern River COMID: 14972877 NF Kern River between Camp Owens and Kernville | | | |
|--|----------------|--|---|
| Flow Component | Flow Metric | Predicted Range at LOI median (10th - 90th percentile) | Current MIF regime in NF Kern in diverted stretch |
| Fall pulse flow | magnitude | 510 (213 - 1250) cfs | 40 (40 - 650) cfs |
| | timing | Nov 14 (Oct 5 - Dec 2) | only present if incoming pulse > 600 cfs |
| | duration | 3 (2-7) days | reduced |
| Wet-season baseflow | magnitude | 464 (198 - 605) cfs | 100-130 cfs |
| | timing | Feb 7 (Jan 18 - Mar 26) | April - September |
| | duration | 124 (60-146) days | 182 |
| Wet-season peak flows (2 yr. flood) | magnitude | 2930 (1880 - 10000) cfs | 2330 (1280-9400) cfs |
| | duration | 63 (1-47) days | reduced |
| | frequency | 6 (1-5) occur | reduced |
| Spring recession flow | magnitude | 2440 (1400 - 5250) cfs | 1850 (800 - 4650) cfs |
| | timing | June 11 (May 21 - June 25) | earlier |
| | duration | 78.5 (49-104) days | reduced |
| | rate of change | 4.12 (4.27 - 8.94) % | ~ |
| Dry-season baseflow | baseflow | 228 (67 - 382) cfs | 40-80 cfs |
| | timing | Aug 25 (Jun 23 - Sept 14) | October - March |
| | duration | 168 (149 - 236) days | 182 |

Comparing between the natural flow regime and the current MIF regime, it can be seen that the fall pulse flow, wet-season baseflow, and dry-season baseflow are significantly different and therefore likely altered from what a natural flow regime would be. This can also be seen graphically in Fig. 2.

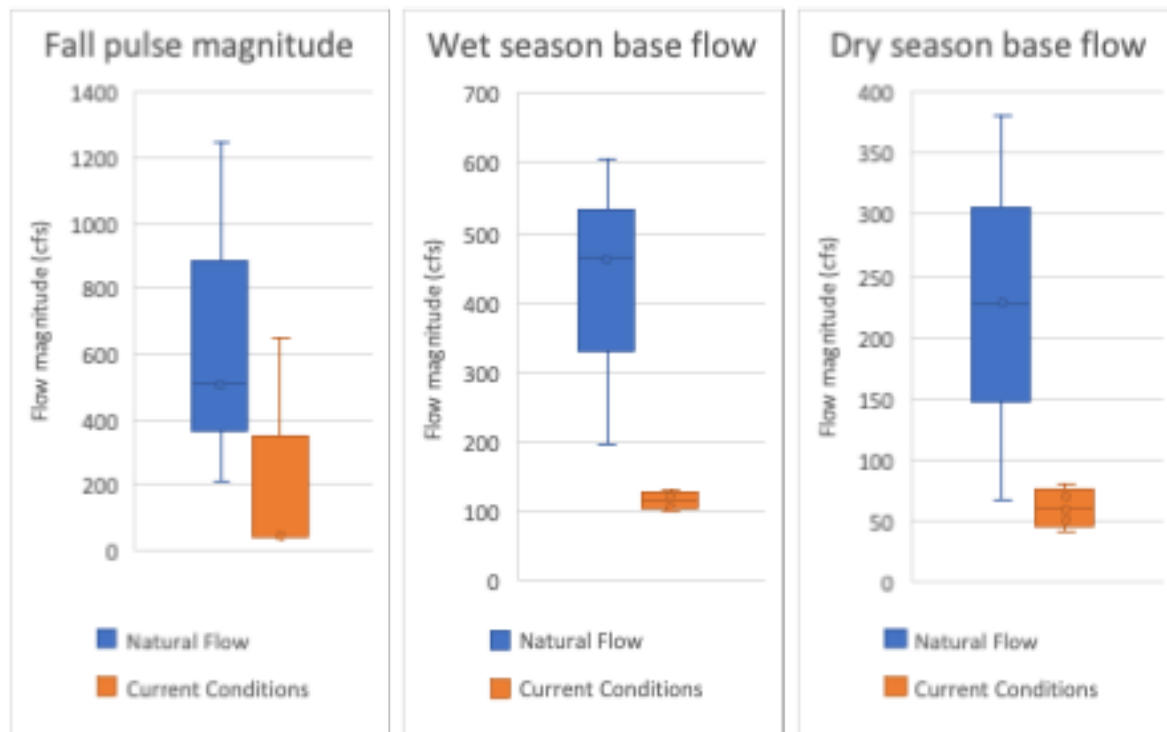


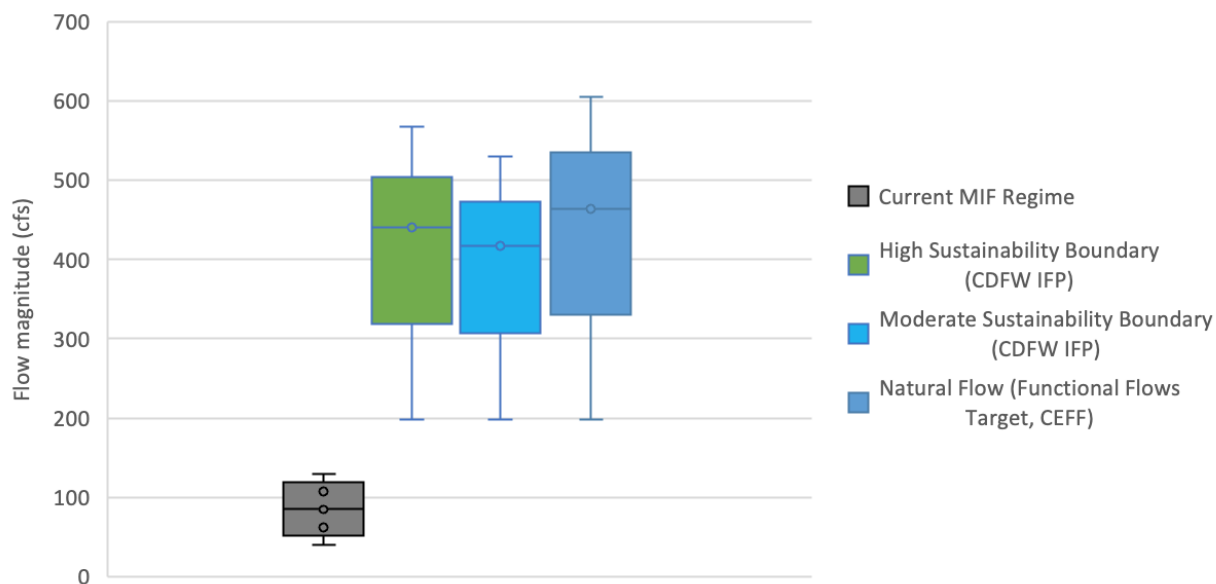
Figure 2: Comparing Natural Flow and Current Conditions of NF Kern. Box plots show whiskers from 10th - 90th percentile as well as median values. 25th/75th percentile box lines interpolated from available data.

The failure to provide three of these fine functional flow components in the current MIF regime means that key ecosystem functions and overall ecosystem health are not being supported.

If the full functional flow data from this study, it could be used in conjunction with the results of the additional proposed studies (including additional constraints imposed by water temperature, dissolved oxygen concentration limits, and fish habitation requirements) as a starting point for generation of environmental flow recommendations for the North Fork Kern. The final recommendations need not mandate restoration of full natural flows, but should preserve essential patterns of flow variability not currently considered or included.

For example, as one means of implementation, the CDFW provides low flow threshold and percentage take calculation criteria via the Sustainability Boundary methods (CDFW, 2017; Duxbury, 2022). Comparing the current MIF regime with the recommendations provided by either the CDFW or the CEFF, it can be seen that current modern environmental recommendations in California are broadly in agreement, and the current MIF regime is significantly out of sync with all recommendations (Fig 3).

NF Kern: Wet Season Base Flow
 California Current Environmental Standards
 Distribution from 10th - 90th percentile and median values.



NF Kern: Dry Season Base Flow
 California Current Environmental Standards
 Distribution from 10th - 90th percentile and median values.

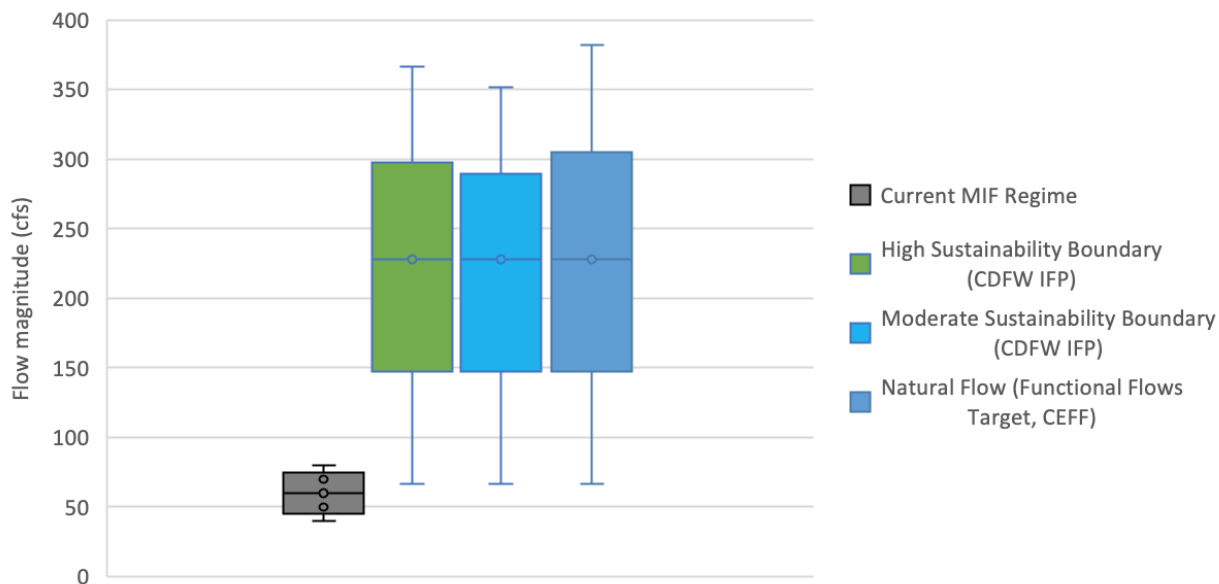


Figure 3: Comparing the Current MIF regime with the modern environmental standards in California

This preliminary analysis suggests that there is a significant discrepancy in these functional flow components between current conditions in the dewatered stretch of the NF Kern and scientifically recommended environmental flows. Therefore, conducting a full analysis per the CEFF, including full analysis by water year type (Wet, Moderate, Dry) as indicated by the framework would provide a full set of environmental flow criteria to be considered as a part of the relicensing.

Finally, note that the reevaluation of the minimum instream flow values also occurred as a part of the previous 1996 relicensing. The previous Environmental Assessment recommended that KR3: “Maintain MIF at Fairview Dam of 100 cfs from October through May and 150 cfs from June through September” (EA KR3, 1996), but this was superseded by the terms of the Settlement Agreement and ignored as a compromise between economic and environmental values.

Other previous environmental analyses also have suggested that current flow thresholds are too low: SCE presents a PHABSIM analysis which notes that the NF Kern “habitat types provide maximum habitat for [rainbow trout] fry and juvenile rearing at flows of 75 to 200 cfs. For adult rainbow trout, maximum habitat values were reached in these habitats at flows of 200 cfs.” (SCE, 1991). And they also note that repeatedly when the river values are driven to their lowest extremes (as permitted and directed by the current license), population surveys found that “the estimated density and biomass of both naturally produced and hatchery-raised rainbow trout declined abruptly at all monitoring sites in 2016” due to drought, as had happened before “during the 1987 to 1992 drought”. (SCE 2017, 2021). The 2016 study revealed a tragic trout population decline of about 50% above Fairview Dam, but an astonishing, near-total decline of 97% below the dam (PAD at 5-63). Yet nowhere in the PAD is there suggested a review of fish needs, environmental flow needs, nor any mention of the changing state of environmental science and ecological management in California—or indeed a change of any license condition whatsoever.

Instead, the plant has been operating more or less the same way for 100 years, while the ecological science has evolved dramatically. Ultimately, continuing to follow “flow recommendations that deviate from ecological flow criteria may satisfy other management needs, but risk failure in achieving ecological management objectives” (CEFWG, 2021). For the sake of environmental preservation, the ecological flow criteria should be evaluated and included for real consideration.

Criterion (5) - Explain any nexus between project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

The project presently takes the first 40-45 cfs of incoming flows at the Fairview diversion dam for minimum power generation, and then, after the seasonally varying minimum instream flow requirement is satisfied, takes the next 600 cfs. These conditions leave only 40-130 cfs, or less, in the dewatered reach when incoming flows are below 640 and 770 cfs, and decreases all incoming flows above 640 and 770 cfs by 600 cfs. This current project

operational regime is the direct cause of the low flows in the dewatered reach as described above. The results of this study will provide environmental flow data that will directly inform the development of flow recommendations and new license requirements which will align instream flows management with modern environmental management practices.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The study should follow the methods outlined in California Environmental Flows Framework Version 1.0 (CEFWG, 2021). This framework defines each of the objectives as outlined here, and defines steps by which to carry them out:

- (1) Identify the ecological flow criteria using natural functional flows for the NF Kern River. Determine the natural ranges of the flow metrics for each of the five functional flow components (fall pulse flow, wet-season base flow, wet-season peak flows, spring recession flow, dry-season base flow);
- (2) Determine functional flow criteria for each of Dry, Moderate, and Wet water years using hydrological data available;
- (3) Provide the resulting functional flow criteria ranges to all stakeholders.

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

The CEFF is designed specifically to be an efficient and scientifically defensible framework, which should “help managers improve the speed, consistency, standardization, and technical rigor in establishing environmental flow recommendations statewide” (CEFWG, 2021). Performing individual piecemeal studies on individual ecosystem components is expensive, time consuming, and difficult to tie together into a complete watershed management plan. As such, the CEFF presents a streamlined process that can be used in a desktop fashion with data that is readily available already to determine the baseline ecological flow criteria from natural functional flows. The additional flow component data (water temperature, DO, and physical habitat) generated as a result of the already accepted studies can be incorporated with the natural functional flows in order to generate an entire representative set of ecological flow criteria. No additional field work beyond what is already proposed is required for this study. The cost and effort should accordingly be less than that proposed for SCE’s water quality or hydrology studies as that data can fit directly into the CEFF.

“Water managers need a consistent statewide approach that can help transform complex environmental data into scientifically defensible, easy-to-understand environmental flow recommendations that support a broad range of ecosystem functions and preserve the

multitude of benefits provided by healthy rivers and streams” (CEFWG, 2021), and that is exactly what this functional flow study is meant to provide.

Literature Cited

Adventure Scientists, with USFS, NPS & USFWS, “Wild & Scenic Rivers Water Quality” at <https://experience.arcgis.com/experience/981d82b6126743dc8b053ea67aa2497d>.

California Department of Fish and Wildlife (CDFW). (2013) Standard Operating Procedure for Flow Duration Analysis in California. Department of Fish and Wildlife Instream Flow Program Standard Operating Procedure CDFW-IFP-005, 17 p. Available at: http://www.dfw.ca.gov/water/instream_flow.html.

California Department of Fish and Wildlife (CDFW). (2017) Instream Flow Program. Retrieved from <https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow>, May 2021.

California Department of Fish and Wildlife (CDFW). (2021) Strategic Plan for Trout Management: Draft 2021 Update. California Department of Fish and Wildlife.

CDFW Recommendations for the Devil Canyon Project, FERC NO. P-14797-001. Document accession # 2021090-5090, Filed Date 09/09/2021.

California Environmental Flows Working Group (CEFWG). (2021) California Environmental Flows Framework Version 1.0. California Water Quality Monitoring Council Technical Report 65 pp.

California Environmental Flows Working Group (CEFWG). California Natural Flows Database: Functional flow metrics v1.2.1, May 2021. <https://rivers.codefornature.org/> (December 9, 2021)

California Natural Resources Agency, California Environmental Protection Agency and Department of Food and Agriculture. (2019) California Water Resilience Portfolio 2020. Retrieved from <https://waterresilience.ca.gov/wp-content/uploads/2020/01/California-Water-Resilience-Portfolio-2019-Final2.pdf>, May 2021.

Duxbury E. 2022. Environmental Flow Analysis on the NF Kern- A Case Study: 1997-2020 Data Set. Kern River Boaters whitepaper. January 8, 2022. Available: https://www.kernriverboaters.com/s/Environmental_Flows_NF_Kern-1997-2020.pdf

Environmental Assessment for Hydropower License – Kern River No. 3 Hydroelectric. Project FERC Project No. 2290 (FERC and USFS, 1996)

SCE. (1991) Kern River No. 3 Water Power Project (FERC Project No. 2290) Application for New License for Major Project – Existing Dam. Volume 1 of 5: Initial Statement; Exhibits A,

B, C, D, F, G, H; and Appendices. United States of America Before the Federal Energy Regulatory Commission. December 1991.

SCE. (2021) Southern California Edison Kern River No. 3 Hydroelectric Project (FERC Project No. 2290), Pre- Application Document. Volume 1. September 2021.

United States Forest Service. No Date. Comprehensive Management Plan—North and South Forks of the Kern Wild and Scenic River. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region, Sequoia and Inyo National Forests.

Zimmerman, JKH, DM Carlisle DM, JT May, KR Klausmeyer, TE Grantham, LR Brown, JK Howard. California Unimpaired Flows Database v2.1.0, November 2021. The Nature Conservancy. San Francisco CA. <https://rivers.codefornature.org/> (December 9, 2021)