

KERN RIVER BOATERS STUDY REQUEST SEVEN

Environmental Flow Study

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 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.

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

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) (16 U.S.C. section 803 (j)). CDFW has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of those species (Fish & Game Code § 1802). 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.

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

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. (USFS CMP W&S NSFKR, at p. 45.) 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.

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

The PAD proposes individual studies on elements of the entire affected Kern River ecosystem: 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 reduced hydrology through the diverted stretch (which may render the inventorying efforts fruitless), nor to define the ecologically necessary flows 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 (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, the IFP has not been applied or proposed for the

NF Kern, and there is only a short list of special status streams that are considered for 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 No 14797-001, Doc# 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.

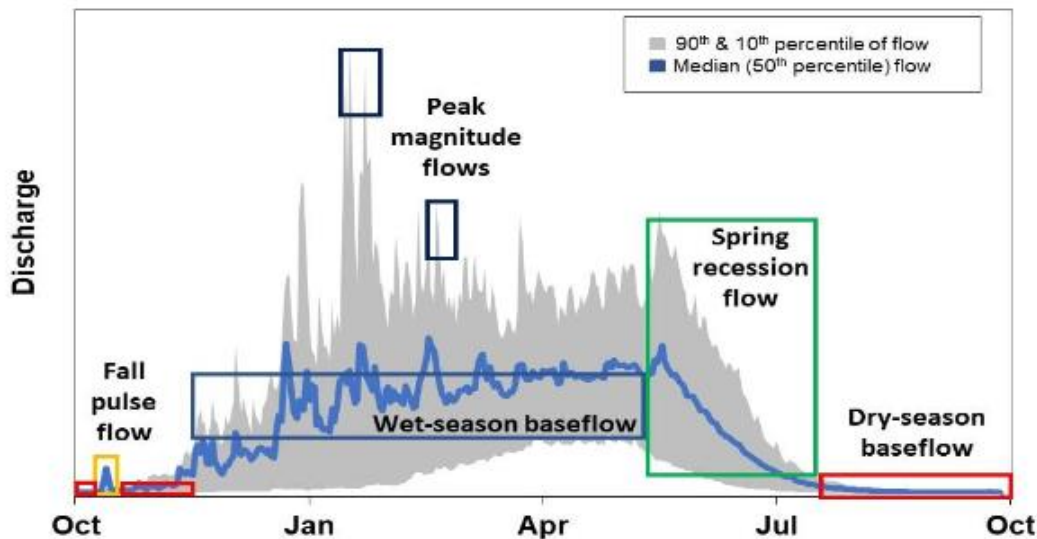


Figure 1: Image of functional flow components for a representative California hydrograph from CEFWG, 2021.

Using only the 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.

<p style="text-align: center;">Location of Interest (LOI) = Kern River COMID: 14972877 NF Kern River between Camp Owens and Kernville</p>			
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 > 600cfs
	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.

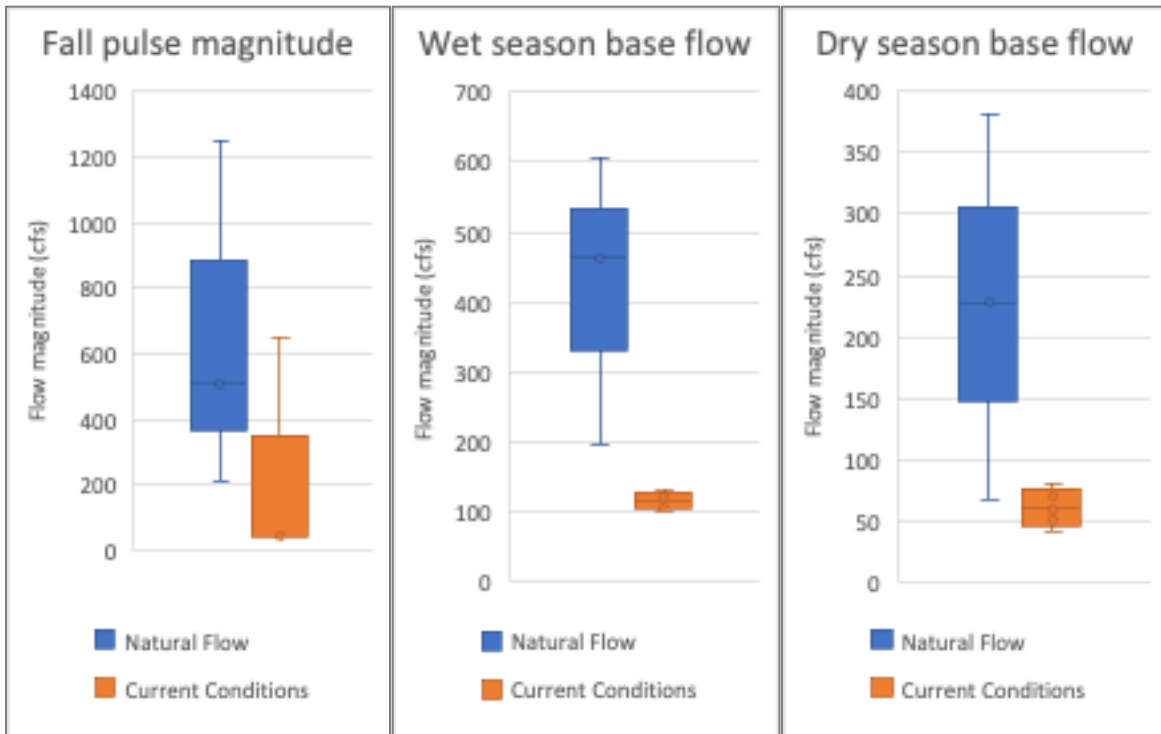


Figure 2: Comparing Natural Flow and Current Conditions of NF Kern. Box plots show whiskers from 10th - 90th percentile as well as median values. 25th/75th percentile box lines estimated.

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 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). Yet nowhere in the PAD is there suggested a review of environmental flow needs, nor is there mention of the changing state of environmental science and ecological management in California.

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 recommendations that will directly inform the development of 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:

- A. Identify ecological flow criteria using natural functional flows;

- B. Develop ecological flow criteria for each flow component requiring additional consideration;
- C. Develop environmental flow recommendations.

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) 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.

“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 study is meant to provide.

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