

Determining Environmental Flow Criteria in California Rivers

Improving coordination to support California river ecosystems

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Flow alterations are a significant driver of species population declines and biodiversity loss in California and globally. When stream flows are altered by human intervention, a wide range of physical and biological processes can be affected, triggering changes in habitat condition, and the distribution, diversity, and abundance of species. Ensuring the preservation of key flow components can improve riparian and freshwater ecosystem health by restoring physical processes and habitat conditions.

The Challenge

Multiple state and local agencies across California share responsibility for setting flow criteria that protect and improve the health of California's water resources. These approaches historically have not been coordinated at the statewide level, resulting in fragmented and siloed flow management programs.

Improving coordination among those involved with setting flow criteria is a challenge. Environmental conditions and pressures vary widely, as do the priorities and capacities of agencies responsible for water resource management.



The California Environmental Flows Framework (CEFF)

In 2016, a group of experts came together to pool knowledge and data, evaluate methods, and develop a statewide framework for determining environmental flow criteria for California. The California Environmental Flows Framework (CEFF) utilizes a *functional flows approach* that varies in scale and level of detail to determine ecological flow criteria. CEFF provides a set of reference-based flow criteria for the state via a suite of tools and databases, and provides guidance in the form of a technical document for determining refined flow criteria at a regional or local scale. See ceff.ucdavis.edu for more information.

KEY FEATURES OF THE FRAMEWORK

- Avoids a "one size fits all" approach
- Offers a cost-effective statewide method and guidance on more intensive methods for setting refined flow criteria
- Focuses on specific functional elements of flows linked to ecosystem health and other beneficial uses
- Can be applied to gauged and ungauged streams
- Enables use of multiple ecological targets (e.g., fish and invertebrates)
- Assumes competing demands on limited water resources

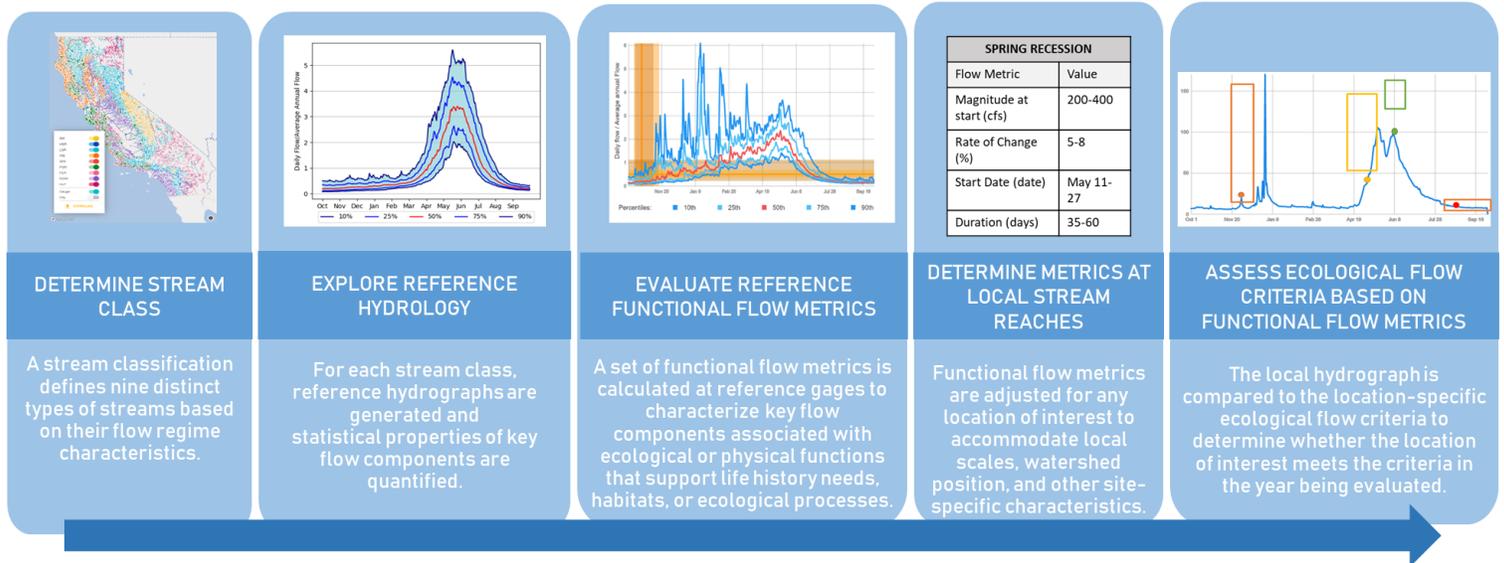
ceff.ucdavis.edu

Determining Ecological Flow Criteria

CEFF is a statewide approach for developing reference-based flow criteria protective of river-dependent ecosystems through the use of reference hydrologic data and the functional flows approach. Products aid in the assessment of regional statuses and trends related to hydrologic condition, and can help the user to develop a planning study if refinement of criteria is needed.

WHAT IS A FUNCTIONAL FLOW?

A functional flow is a component of the hydrograph that provides a distinct geomorphic or ecological function. The functional flows approach provides a basis for estimating how much water is needed for the environment, where key components of the natural flow regime are targeted rather than the full natural flow regime. Desirable functional flow components have a disproportionately important role in supporting the physical and ecological processes that create and maintain habitat and trigger native species to reproduce, thrive, and migrate.

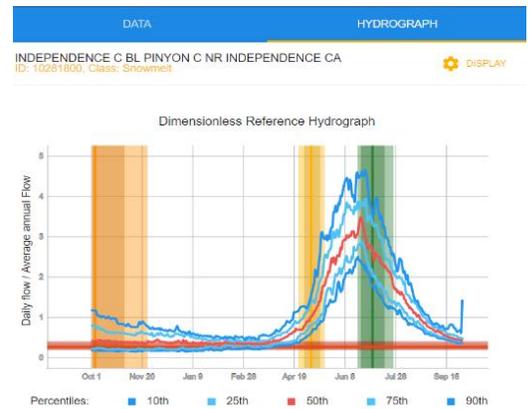


Steps for assessing quantitative flow criteria. Data, tools, and further information available at eflows.ucdavis.edu.

Tools and Products

FUNCTIONAL FLOWS CALCULATOR

The functional flows calculator (FFC) is a web tool for visualizing, downloading, and exploring California's *unimpaired* streamflow patterns, including natural stream classes, reference hydrographs, and functional flow metrics. A functional flow metric is a discrete numeric measurement of a flow characteristic estimated for each functional flow component that is calculated from streamflow data. Functional flow metrics include the magnitude of the annual winter flood (cfs), the daily rate of the spring snowmelt recession (% per day), and the summer baseflow duration (# days).



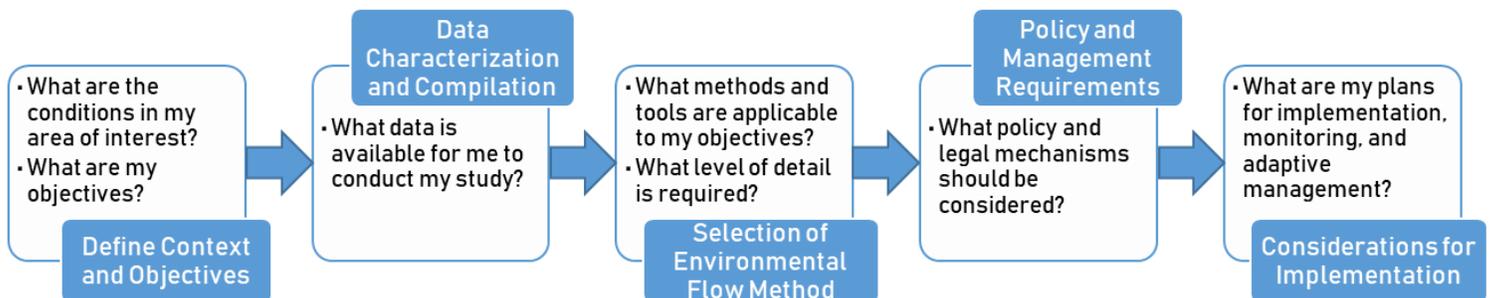
The FFC available at eflows.ucdavis.edu.

PREDICTED FUNCTIONAL FLOW METRICS AT UNGAGED STREAMS

Using a series of statewide models, functional flow metrics are predicted for every ungauged stream in the state under wet, moderate, and dry conditions. Data is accessed via rivers.codefornature.org.

Guidelines for Refining Ecological Flow Criteria

In some cases, reference-based flow criteria are not sufficient. CEFF provides additional detail or specificity when needed by providing an integrated, yet flexible, approach for establishing more refined flow criteria. A guide for practitioners specifies how to develop refined ecological outcomes and incorporate considerations of temperature, geomorphology and other factors. The guide also includes a selection of case studies where CEFF has been or could be applied.



Key steps for practitioners to refine ecological flow criteria as outlined in CEFF.

The Technical Team will continue communicating and collaborating with diverse partners at the state and local level engaged in flow management. For updates and further information visit ceff.ucdavis.edu.