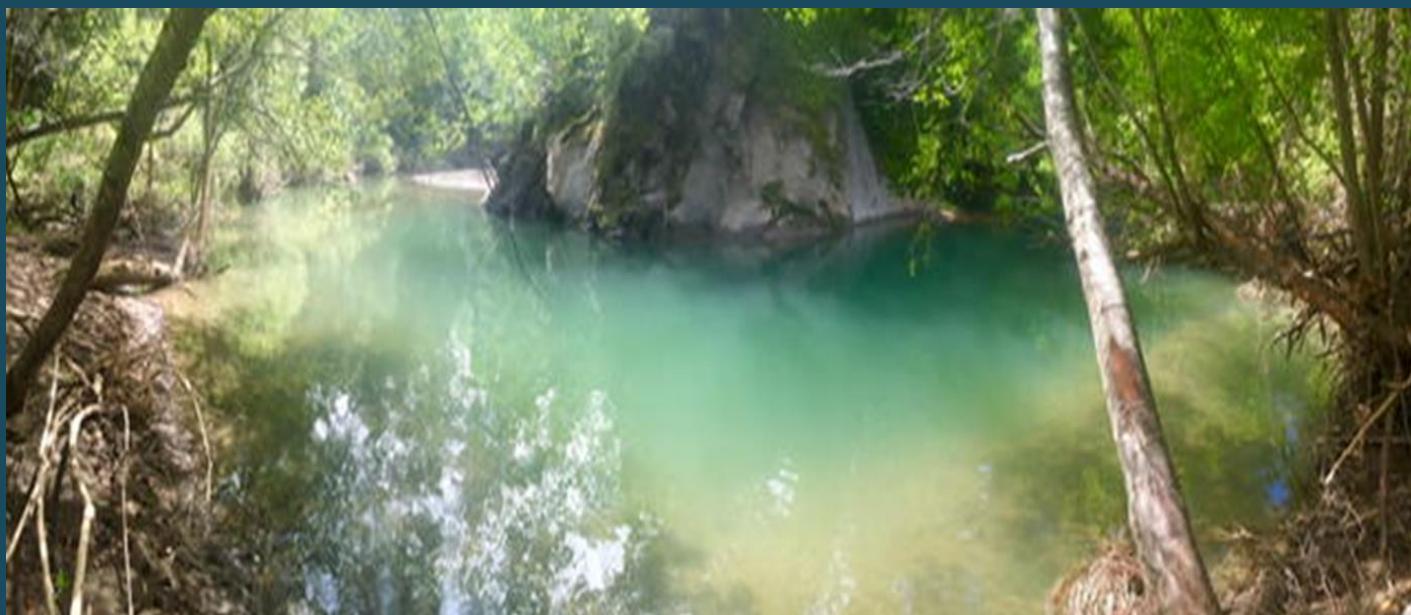




2019 Year In Review

The California Department of Fish & Wildlife



2019 Year in Review

The California Department of Fish and Wildlife (Department) Water Branch Instream Flow Program conducts instream flow studies and develops ecological flow regime criteria needed for long-term protection, maintenance, and effective stewardship of fish and wildlife resources.

Program Highlights

Priority Streams Update.....	3
California Environmental Flows Framework.....	4
Watershed Flow Criteria.....	5
Assessing Passage Criteria for California's Anadromous Salmonids.....	6
Cannabis Program Support.....	7
Flow Regimes in Coastal Steelhead Streams.....	8
Method Spotlight: Wetted Perimeter.....	9
Quality Assurance and Training.....	10
Presentations and Publications.....	11
2019 Performance Objectives.....	12



All photographs in this report were taken by Department staff.

Cover page, clockwise from top left: Mark West Creek (Sonoma County); South Fork Eel River (Humboldt County); West Fork San Gabriel River (Los Angeles County); Redwood Creek (Humboldt County)

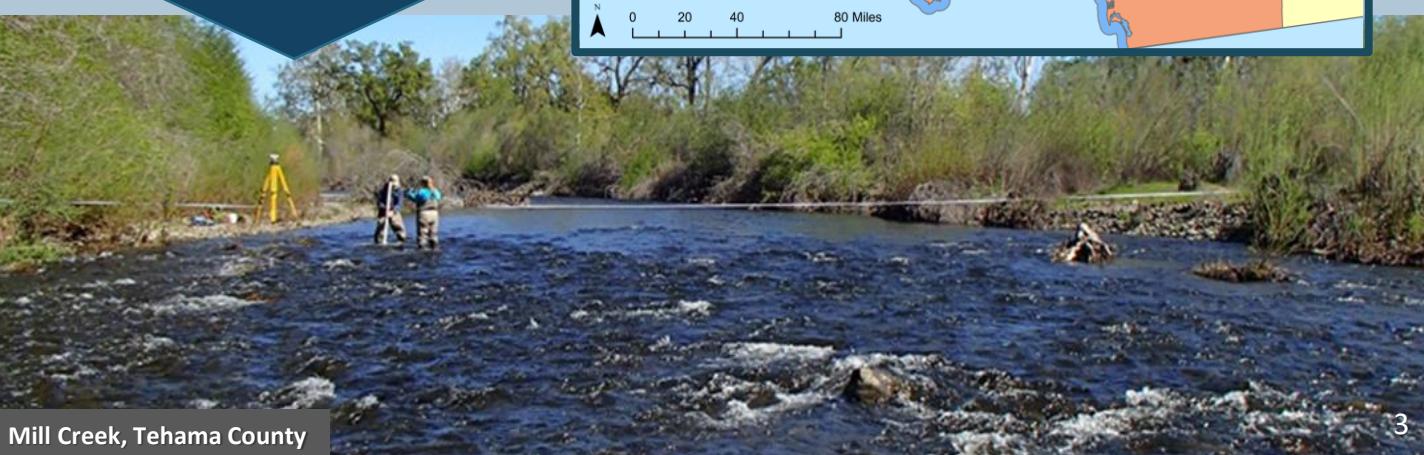
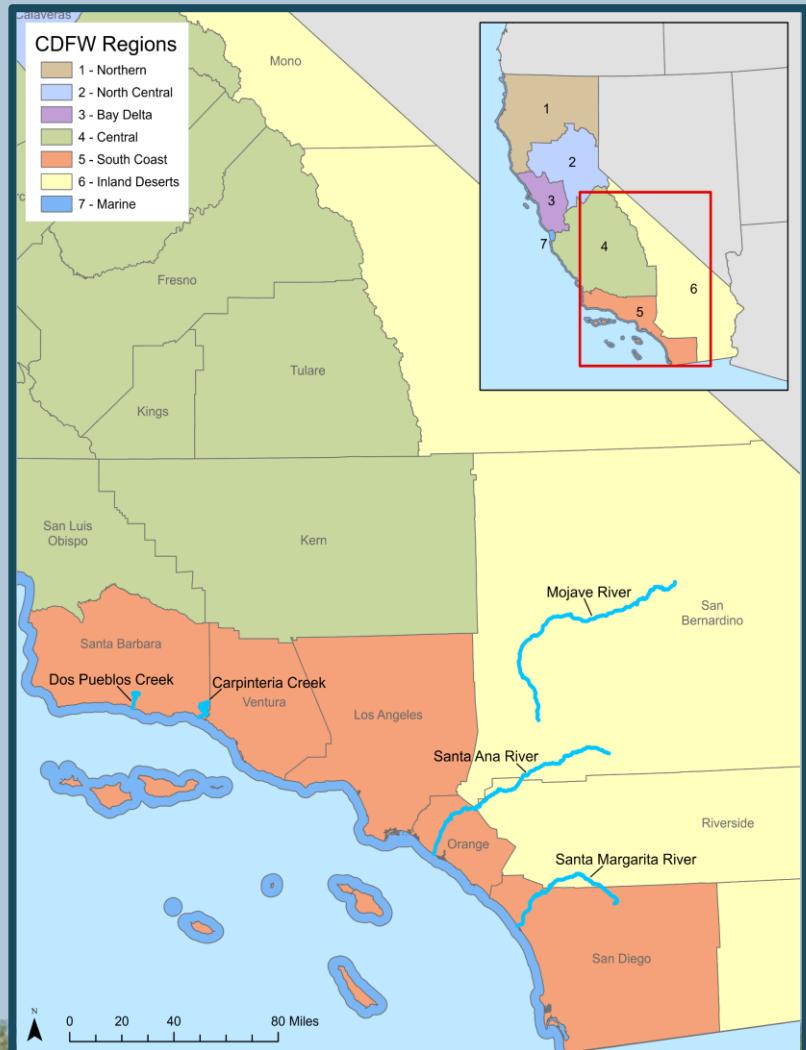
Priority Streams Update

In 2019, as required by the Public Resources Code (PRC) §10000-10005 mandate, the Instream Flow Program began performing studies to develop criteria for five streams in Southern California. The flow regime criteria developed from these studies can be adapted to the specific needs and management goals of each watershed. Study planning and coordination with regional staff is underway for the following streams, with field work scheduled for 2020.

2019-2020 PRC streams include:

- Carpinteria Creek,
Santa Barbara County
- Dos Pueblos Creek,
Santa Barbara County
- Mojave River,
San Bernardino County
- Santa Ana River,
Riverside, Orange, and San
Bernardino Counties
- Santa Margarita River,
Riverside and San Diego Counties

PRC §10000-10005 requires the Department to develop streamflow requirements for each stream on the 2008 priority streams list. For more information, visit the Instream Flow Program website at:
<https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow>



California Environmental Flows Framework



Introducing the California Environmental Flows Framework

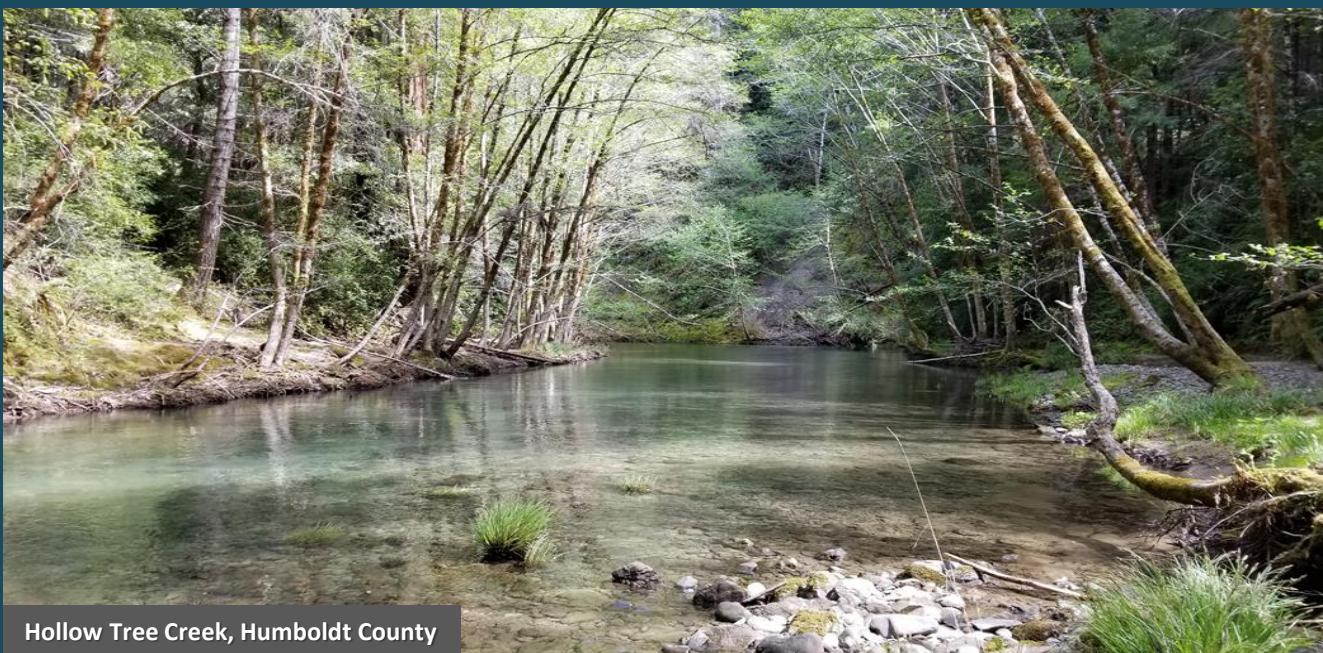
The California Environmental Flows Framework (CEFF) is a statewide approach for determining ecological flow criteria. CEFF provides a consistent and defensible approach to identifying ecological flow needs for California's rivers and streams. CEFF is being developed by the Environmental Flows Technical Workgroup (eFlows TWG), a subgroup of the California Water Quality Monitoring Council. A central focus of the eFlows TWG is to improve coordination, collaboration, and data sharing among agencies, nonprofits, and other parties interested in instream flows. The eFlows TWG meets quarterly at the State Water Resources Control Board in Sacramento, California.

A screenshot of the Instream Flow Program website. The main title is "Determining Ecological Flow Criteria for California Streams". Below it, a text box explains that ecological flows are necessary to sustain aquatic and riparian ecosystems. It describes CEFF as a stepwise process for developing ecological flow criteria using functional flows. Five key functional flows are identified: fall pulse flows, peak flows, wet season base flows, spring recession, and dry season low flows. The text box also mentions that these metrics can be quantified using flow metrics like magnitude, frequency, duration, timing, and rate of change. At the bottom of the page, there are links for "INSIDE", "Functional Flows", "CEFF Applications", and "Partnerships".

The California Environmental Flows Framework (CEFF) is a statewide effort to provide a consistent and defensible approach to identifying ecological flow needs for California's rivers and streams. Since 2018, the Instream Flow Program has actively participated in the CEFF partnership and framework development through the Environmental Flows Technical Workgroup, a subgroup of the California Water Quality Monitoring Council. By supporting rapid flow assessment methodologies to develop regional functional flow criteria through CEFF, the Department has also initiated implementation of the objectives described in Section 9 of the Water Resilience Portfolio.

In 2019, Instream Flow Program senior staff gave several presentations outlining the Department's study planning processes, examples of the methods involved with instream flow studies underway, and examples of how this relates to the CEFF framework.

For more information on functional flows, visit our website at:
<https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/Functional-Flows>



Hollow Tree Creek, Humboldt County

Watershed Flow Criteria

Watershed flow criteria are developed using existing hydrologic and modeling tools that estimate natural monthly flows and a broad array of functional flow components needed for ecosystem structure and function. Functional flows identify the key elements of the flow regime, such as fall pulse flows, wet-season baseflows, peak magnitude flows, spring recession flows, and dry season baseflows. Watershed criteria provide multiple flow criteria components to address differing study objectives so that flow prescriptions can be tailored to the ecological management goals for a particular stream or watershed.

Watershed flow criteria can be applied when intensive site-specific data and hydraulic habitat models are not warranted or are cost prohibitive, where site access is restricted, or where information must be developed quickly for water management decisions. This information can be used by agencies, water managers, non-governmental organizations, and the public. For more information on watershed flow criteria and how they compare to other Department instream flow studies, see our fact sheet available at:

<http://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=17720>

The Instream Flow Program is currently applying CEFF concepts to develop instream flow criteria for watersheds throughout the state in a series of “Instream Flow Regime Criteria on a Watershed Scale” reports (Watershed Criteria Reports).

Currently available Watershed Criteria Reports include:

Ventura River Watershed: The Ventura River is a priority stream under the California Water Action Plan. The Watershed Criteria Report presents stream assessments and instream flow criteria for the Ventura River using modeling tools, desktop analyses, and site-specific measurements.

Fresno River Watershed: Due to a petition for statutory adjudication of water rights, the Fresno River is a regional priority stream. This report is intended to provide watershed-scale information to inform public trust resource needs throughout the negotiation and adjudication processes.

For more information and to access Watershed Criteria Reports, visit our website at:
<https://wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/Functional-Flows>

The image shows the cover of the 'FALL 2019 FACT SHEET' for the 'IN STREAM FLOW PROGRAM'. It features a photograph of a person fishing in a river. The title 'Introducing Watershed Flow Criteria' is prominently displayed, along with the text 'The California Department of Fish & Wildlife IN STREAM FLOW PROGRAM'. A circular graphic on the right side contains the text: 'Watershed Criteria address an important data gap in California by providing scientifically robust instream flow information that spans entire watersheds for fish, wildlife, and their habitats.'

1. What are Watershed Flow Criteria?

Watershed Flow Criteria (also referred here as Watershed Criteria) are complementary to site-specific approaches and can provide opportune information to water managers and water allocation decision-making processes.

Watershed Criteria are developed using existing hydrologic and modeling tools that estimate natural monthly flows and a broad array of functional components needed for ecosystem structure and function (Vannell et al. 2015). These tools are combined with desktop methods and site-specific information to produce comprehensive annual flow regimes at the watershed scale.

Assessing Passage Criteria for California's Anadromous Salmonids

Thompson (1972) describes a commonly used empirical method for assessing fish passage flows through seasonal riffles. The method identifies stream flows that promote physical movement of migrating salmonids through lower gradient depth-sensitive riffles and overall habitat connectivity between instream habitats. In 2018, the Department implemented a contract with Normandeau Associates to perform a rigorous scientific evaluation of the Thompson (1972) method at natural riffle sites throughout California.

In 2019, evaluation of adult anadromous fish passage criteria began on 7 streams throughout the state.



Ventura River, Ventura County

The primary goals of this study are to:

- Evaluate the effectiveness of Thompson (1972) criteria for estimating streamflows that provide unimpeded passage through low gradient riffles.
- Identify any modifications to the criteria that would be expected to improve the accuracy of passage study results or increase the efficiency of conducting a passage analysis.

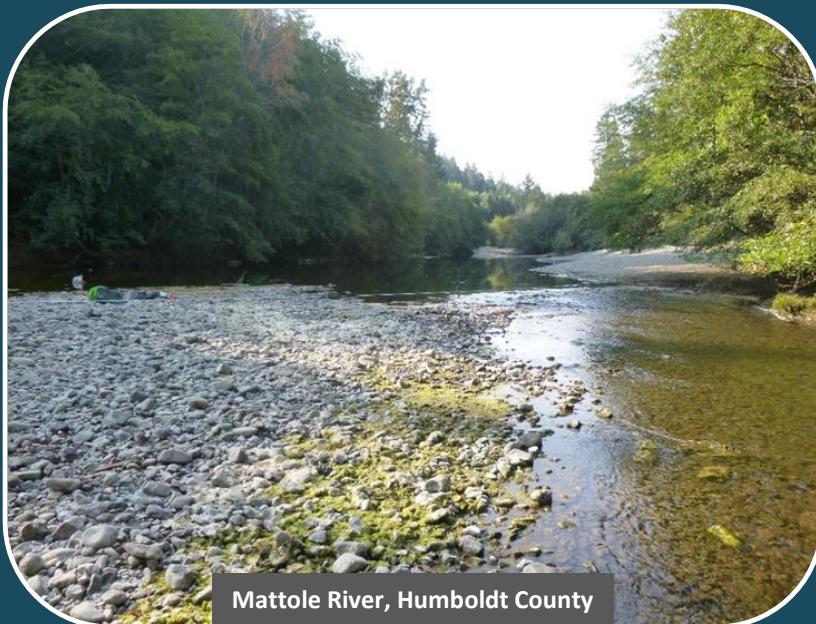
Using hydraulic modeling, study sites are being established in streams representing the Central Valley, North Coast, Central Coast, and Southern Coast California streams. The final study report will be completed in 2021.



Big Sur River, Monterey County

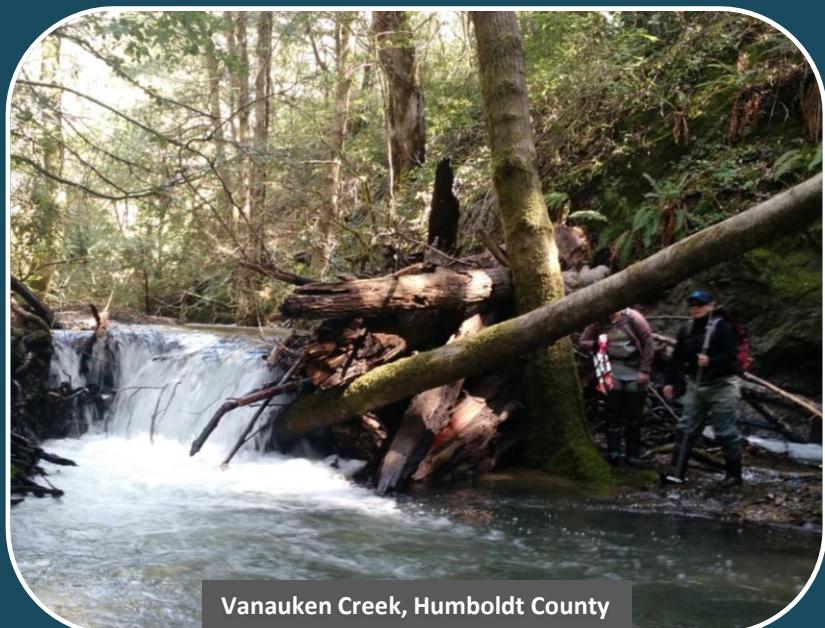
Cannabis Program Support

The Instream Flow Program is participating in a multidisciplinary effort across several branches within the Department. This collaboration is currently developing a statewide monitoring framework that aims to assess whether cannabis cultivation may be having a significant adverse impact on the environment.



This effort is implementing new components of a pilot study to trial-run a statewide monitoring framework in 2020. The framework will use a suite of monitoring approaches and protocols that includes both terrestrial and aquatic monitoring. The Instream Flow Program will coordinate and collaborate with Department cannabis staff and provide instream flow criteria on a watershed scale for the watershed selected in the framework study.

This approach allows the Instream Flow Program to rapidly provide high-quality information on instream flow needs for watersheds potentially impacted by cannabis cultivation. The instream flow criteria provided may be a result of various analyses and field-based methods implemented. The Instream Flow Program's participation in the cannabis effort is an opportunity to provide needed information and input as well as to continue to apply our expertise statewide.



For more information on the Department's Cannabis Program, visit the webpage at:
<https://wildlife.ca.gov/Conservation/Cannabis/Environment>

Flow Regimes in Coastal Steelhead Streams

Instream Flow Program staff prepared a journal publication detailing an instream flow study that assessed patterns in flow thresholds for juvenile steelhead movement. Specifically, the study assessed patterns in the magnitude, duration, and timing of threshold flows and factors (i.e., precipitation, stream width, drainage area, basin slope, and water year type) that influenced these flow components. Flow thresholds were evaluated in 37 coastal streams throughout the state (Ventura to Siskiyou counties). Primary study findings include the following:



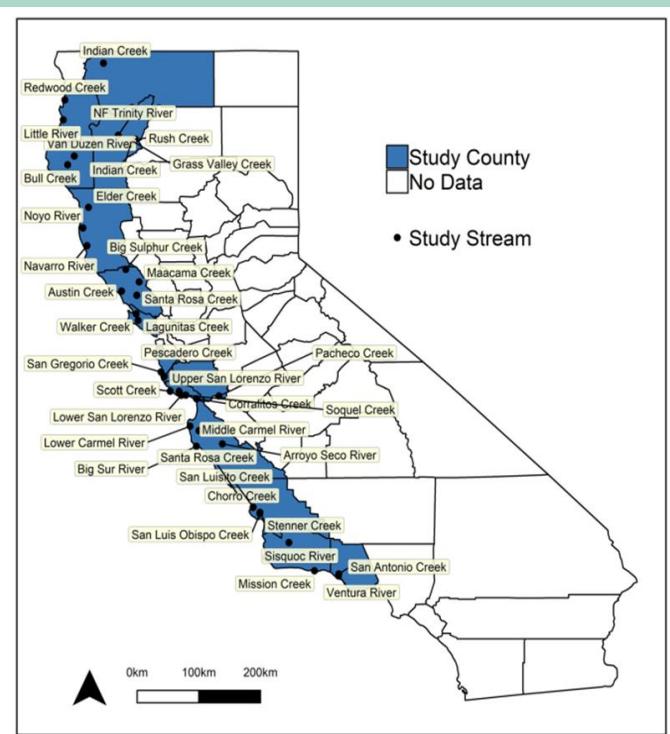
Stream width was the best predictor of the magnitude of flow required to achieve threshold flows.



Precipitation and year type were the dominant drivers of threshold flow duration.



Stream width, precipitation, and year type were the best predictors of threshold flow timing.



The findings of the study concluded that water resource managers should consider local patterns in precipitation, channel form, and prevailing water year conditions when establishing management objectives. In addition, the article described an approach used to determine flow duration and flow timing at annual scales—a process which was automated for the study. The article was accepted for publication by *River Research and Applications* and published online in December 2019.

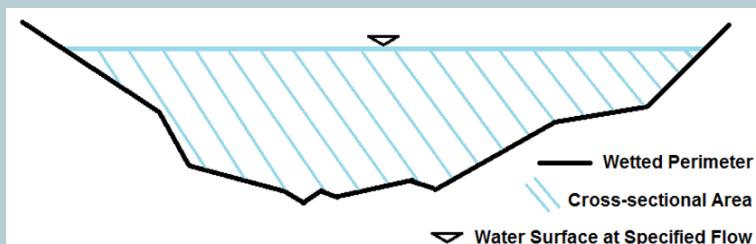
Hwan, J.L., Holmes, R.W. (2019). Flow regimes in coastal California steelhead trout streams: Spatiotemporal patterns in magnitude, duration and timing. *River Res. Applic.* 36: 247-258.
<https://doi.org/10.1002/rra.3571>

Method Spotlight: Wetted Perimeter

How low can you go? The Wetted Perimeter Method (WPM) is a site-specific method used to identify objective low-flow thresholds, also referred to as sensitive period indicator flows. Low-flow thresholds maintain hydraulic criteria for the wetted perimeter, defined as the perimeter of a cross-sectional area of a streambed from wetted edge to wetted edge. A key assumption of the WPM is that these flows support benthic macroinvertebrate (BMI) production in riffle habitats at a level sufficient to maintain fish populations during the dry-season. Low-flow threshold flows are not always present or achievable in California streams, and do not equate to a recommendation for more water than is naturally available.

Use of the WPM includes these considerations:

- The WPM can be used to identify low-flow thresholds that protect productive riffle habitats during the dry-season.
- Data must be collected along a hydraulic control of a representative riffle.
- The method is applicable in streams with well-defined pool and riffle sequences.
- The method is not suitable for most complex channels.
- The WPM is often used along with other instream flow tools and methods.



Protocols for the WPM, including field work preparation and considerations, field procedures, and data analysis are available in the WPM Standard Operating Procedure. More information on low flow thresholds are available in the Low Flow Threshold Fact Sheet.

Documents can be accessed from the Instream Flow Program website at:

<https://www.wildlife.ca.gov/Conservation/Watersheds/Instream-Flow>

WPM was used in Deer and Mill Creeks, Tehama County, to determine a low-flow threshold to maintain aquatic habitat conditions for BMIs throughout the dry-season.

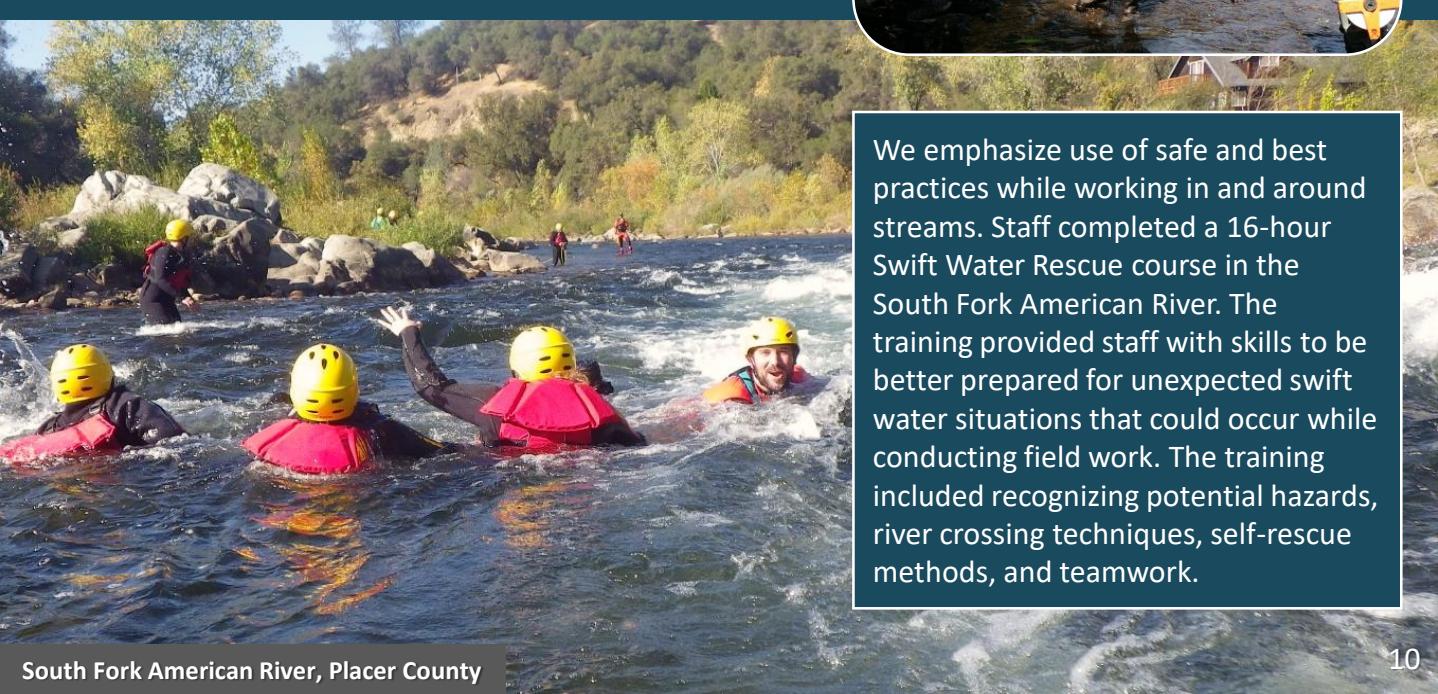
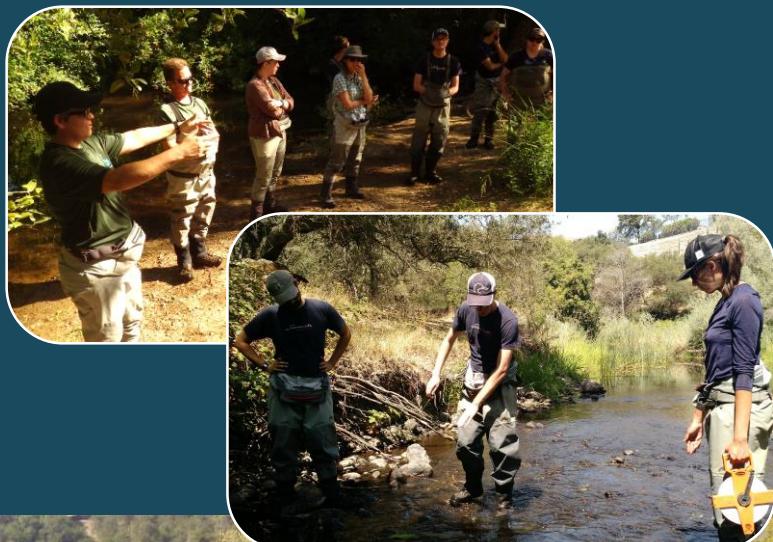
WPM was used to determine a low-flow threshold to maintain aquatic habitat conditions throughout the dry-season in the lower reach of the Ventura River, Ventura County.

Quality Assurance and Training

The Instream Flow Program is committed to collecting, analyzing, and reporting high quality, consistent, and defensible data for use in decision making processes. Since 2012, the Instream Flow Program has worked with the Quality Assurance (QA) Team at the Marine Pollution Studies Laboratory at Moss Landing Marine Laboratories. The QA Team has provided technical services related to instream flow, water rights, and water quality. In 2019, the QA Team continued to support quality assurance efforts by assisting with fact sheet development and technical review of study reports.

In support of sound quality assurance practices, Instream Flow Program staff regularly review data collection methods, data analysis techniques, and safe field procedures. Annual calibration trainings provide staff with opportunities to refresh their knowledge and practice field methods using standardized techniques. In 2019, the Instream Flow Program completed group trainings in the Habitat Retention Method and Swift Water Rescue.

Staff reviewed the Habitat Retention Method as it is a component of watershed flow criteria and can be used to identify habitat maintenance and salmonid passage flows. The training included review of riffle characteristics, channel shape, and overall procedures. Staff participated in field data collection exercises, such as bankfull identification and site selection. The training concluded with modeling program review and data analysis exercises.



We emphasize use of safe and best practices while working in and around streams. Staff completed a 16-hour Swift Water Rescue course in the South Fork American River. The training provided staff with skills to be better prepared for unexpected swift water situations that could occur while conducting field work. The training included recognizing potential hazards, river crossing techniques, self-rescue methods, and teamwork.

Presentations & Publications

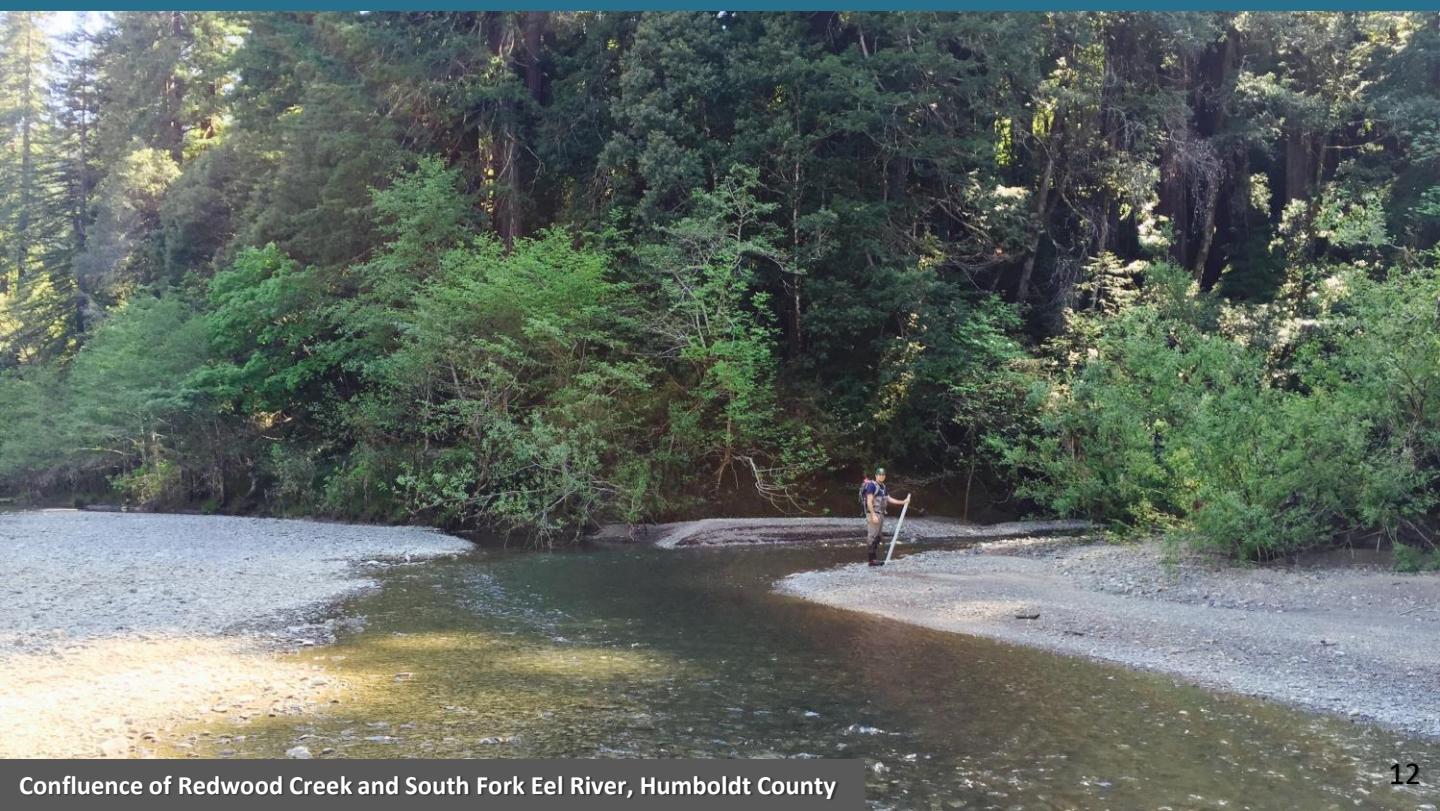
- CDFW (2019). *Watershed Criteria Fact Sheet*. California Department of Fish and Wildlife, Instream Flow Program (CDFW), Sacramento, CA.
- Constantinedes, N., * Casares, H., Haas, D. (2019). *Development of Habitat Suitability Criteria for Juvenile Salmonids in the South Fork Eel River Watershed, CA*. Poster presentation at the American Fisheries Society and The Wildlife Society Joint Conference. September 30, 2019. Reno, NV.
- Cowan, W., Drescher, B., Stanford, B., Villalobos, A. (2019). *Instream Flow Program Overview*. Presentation to the California Environmental Flows Workgroup. November 12, 2019. Sacramento, CA.
- Carlin, T., Drescher, B., (2019) *Mark West Instream Flow Study*. Presentation to the Russian River Coho Water Resource Partnership Technical Advisory Committee Meeting. February 5, 2019. Santa Rosa, CA.
- Drescher, B., Haas, D., (2019). *California Department of Fish and Wildlife Instream Flow Study Overview*. Presentation to Santa Clara River Stakeholders. October 2, 2019. Sacramento, CA.
- Hwan, J.L., Holmes, R.W. (2019). *Flow regimes in coastal California steelhead trout streams: Spatiotemporal patterns in magnitude, duration and timing*. River Res. Applic. 36: 247-258. <https://doi.org/10.1002/rra.3571>
- Ingrassia, D., * Haas, D., Larson, M. (2019). *Stream Flows for Steelhead: Methods to Identify Instream Flow Needs in the Ventura River Watershed*. Poster presentation at the Salmonid Restoration Federation Annual Conference. April 25, 2019. Santa Rosa, CA.
- 
- Mark West Creek, Sonoma County
- McDougall, L., * Villalobos, A. (2019). *Developing Watershed-Wide Instream Flow Criteria Using a Rapid Approach to Inform Water Management Decisions*. Poster presentations at the CA Water Data Science Symposium, California Environmental Protection Agency, July 1, 2019, Sacramento, CA, and the American Fisheries Society and The Wildlife Society Joint Conference, September 30, 2019. Reno, NV.
- Stanford, B. (2019). *Redwood Creek Instream Flow Update*. Presentation to California Department of Fish and Wildlife Region 1 SHaRP Workgroup. June 13, 2019. Via Skype.
- Stanford, B. (2019). *Use of modeled natural flows to develop instream flow regime prescriptions for California*. Presentation at the American Fisheries Society and The Wildlife Society Joint Conference. October 2, 2019. Reno, NV.
- Villalobos, A. (2019). *Instream Flow Methods and Data Collection*. Presentation to the California Department of Fish and Wildlife Region 5. Series of presentations from January and February 2019. Via Skype.
- Villalobos, A. (2019). *West Fork San Gabriel River*. Presentation to the California Department of Fish and Wildlife Region 5. February 8, 2019. Via Skype.
- Villalobos, A. (2019). *Draft Overview and Watershed Criteria Report*. Presentation to the California Department of Fish and Wildlife Fisheries Management Committee. August 21, 2019. Via Skype.

(* Indicates poster presenter)

2020 Performance Objectives

Instream Flow Program activities in 2020 will focus on completing studies already underway and continuing efforts to develop watershed-scale flow criteria for priority streams and watersheds impacted by cannabis. Continued coordination with regional staff, stakeholders, and other project collaborators will be critical to completing ongoing projects.

- Continue Instream Flow Program activities for the California Water Action Plan and PRC §10000-10005 priority stream studies.
- Complete instream flow assessments to support watersheds impacted by cannabis through the Cannabis Program Monitoring Framework Pilot Study.
- Continue to participate in the CEFF workgroup and partnership to further refine available instream flow tools and application of the CEFF statewide.
- Develop quality assurance activities, document generation, and training in support of consistent, comparable, and defensible flow studies and information development.
- Continue coordination and outreach efforts with the State Water Board, National Marine Fisheries Service, US Fish and Wildlife Service, the Regional Water Quality Control Boards and other agencies.
- Support public and stakeholder engagement by continuing outreach efforts.
- Participate in and present instream flow study findings at meetings and workshops across the state.





"A river or stream is a cycle of energy from sun to plants to insects to fish. It is a continuum broken only by humans."

-Aldo Leopold

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Instream Flow Program

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