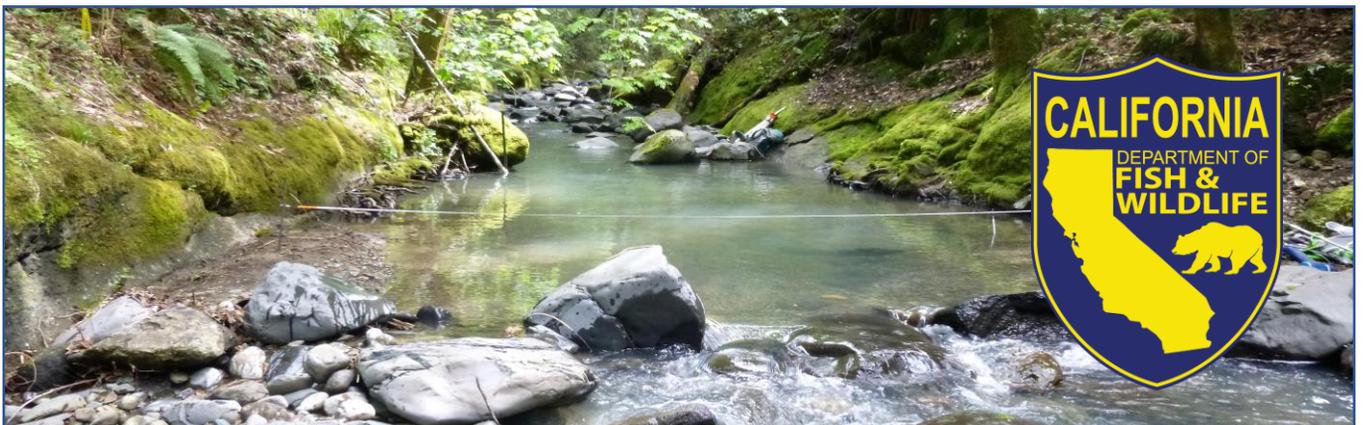
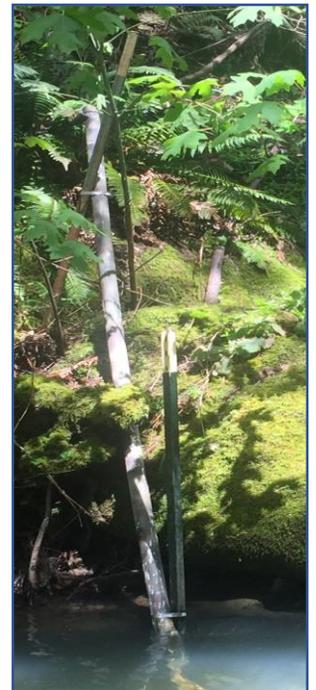




2018 Year In Review

CALIFORNIA DEPARTMENT
OF FISH AND WILDLIFE

INSTREAM FLOW
PROGRAM



2018 Year In Review

The Instream Flow Program is a Statewide Water Planning Program within the Water Branch, California Department of Fish and Wildlife (Department). The Instream Flow Program conducts flow studies and develops ecological flow regime criteria necessary for the long-term protection, maintenance, and effective stewardship of fish and wildlife resources.

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Cover page: Photos of Mark West Creek, Sonoma County

All photographs in this report were taken by Department staff.

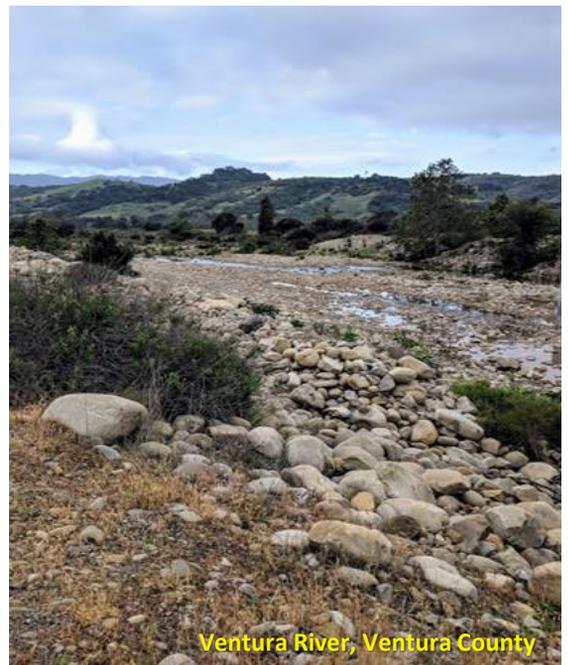
Priority Streams Progress

2008: The Public Resources Code §10000-10005 requires the Department to gather scientific information on California streams for use in developing flow recommendations for consideration by the State Water Resources Control Board (State Water Board) in future water allocation requests and determinations. In 2008 the Department developed a list of 22 priority streams or watercourses statewide where instream flow criteria were needed to assure the continued viability of stream-related fish and wildlife resources. **To date, studies are completed or underway in 14 of the 22 priority streams.**



2009: Senate Bill X7-1, also known as the Delta Reform Act, required the State Water Board to develop new flow objectives for the Sacramento-San Joaquin Delta. The Department was tasked with identifying streamflow needs for priority tributaries related to the Sacramento-San Joaquin Delta. **As part of this effort, studies were developed and completed on Mill and Deer Creeks (Tehama County) and Butte Creek (Butte County). The technical reports are currently available on the Instream Flow Program website.**

2014: Governor Brown released The California Water Action Plan (CWAP). The Instream Flow Program was identified to satisfy the requirements in Action 4: Protect and Restore Important Ecosystems, and specifically the sub-action to Enhance Water Flows in Stream Systems Statewide. The CWAP states that the State Water Board and the Department “will implement a suite of individual and coordinated administrative efforts to enhance flows in at least five streams that support critical habitat for anadromous fish.” The five streams identified are: Mark West Creek, Sonoma County; Mill Creek, Tehama County; South Fork Eel River, Humboldt and Mendocino counties; Shasta River, Siskiyou County; and Ventura River, Santa Barbara and Ventura counties. **Study planning is complete on all five streams, and studies are underway or completed in four streams. Upon completion, technical reports will be available on the Instream Flow Program website.**

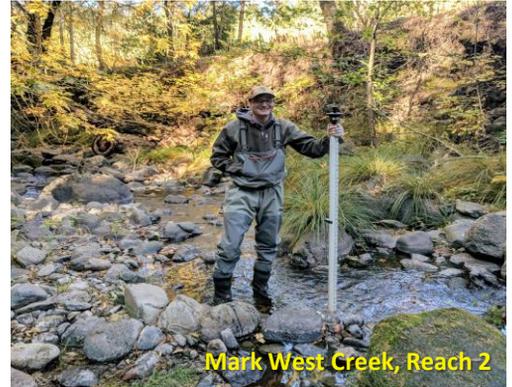


CA Water Action Plan: Study Updates

Upper Mark West Creek

Sonoma County

Mark West Creek provides important over-summer rearing habitat for juvenile Central California Coast Coho Salmon (*Oncorhynchus kisutch*) and steelhead trout (*Oncorhynchus mykiss*). In June 2018, the study plan was posted to the Department's Instream Flow Program webpage. The goal of the study was to develop a relationship between streamflow and salmonid rearing habitat in Upper Mark West Creek. To achieve this, data collection necessary for the development of several two-dimensional models began. So far, Instream Flow Program staff have surveyed over 22,000 streambed elevations, using a total station, within two of three identified reaches.



Mark West Creek, Reach 2

Ventura River

Santa Barbara & Ventura Counties

The Ventura River provides essential habitat for endangered Southern California steelhead. In 2018, the Instream Flow Program implemented data collection to achieve the goals outlined in the study plan. In the mainstem Ventura River, where adult steelhead passage is needed through a complex, intermittently flowing stream channel, this included data collection for development of a mile-long two-dimensional (2D) model. Data for one-dimensional (1D) hydraulic habitat model development were collected in the lower Ventura River, where flow regimes to sustain aquatic life are needed, and in San Antonio Creek, where steelhead spawn and rear.



Ventura River, Live Reach

South Fork Eel River

Humboldt & Mendocino Counties

The South Fork Eel River watershed supports threatened Coho Salmon, Chinook Salmon, and steelhead. In 2018, snorkel surveys continued in Hollow Tree Creek providing necessary data for the development of Habitat Suitability Criteria. Habitat Suitability Criteria developed for Coho Salmon and steelhead in Hollow Tree will be applied to the physical habitat simulation models developed for the Redwood Creek watershed.



Hollow Tree Creek, Site 978 Glide

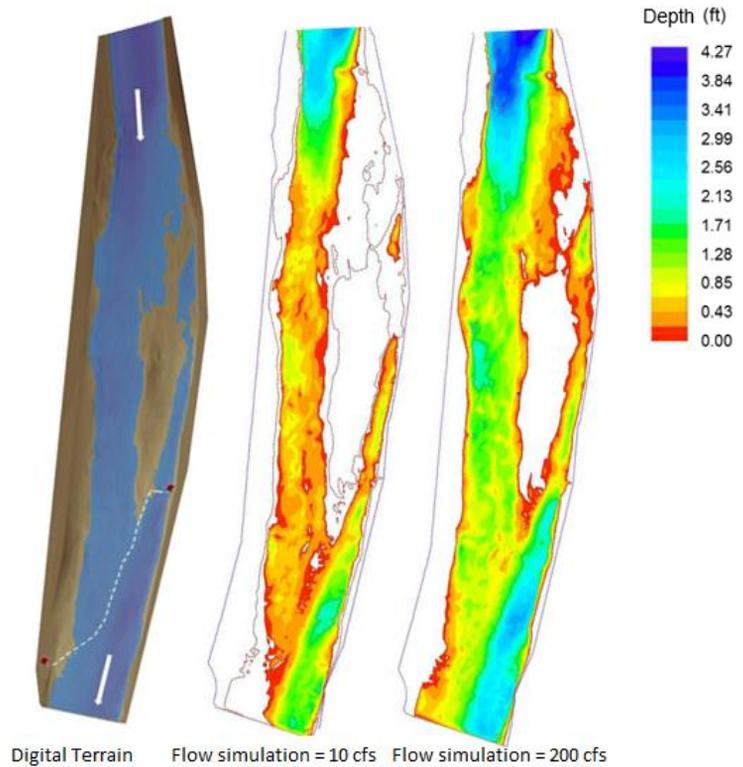
Mill Creek, Tehama County

Two-Dimensional Hydraulic Habitat Model: River 2D

Mill Creek, Tehama County, is among the essential streams for recovery and perpetuation of wild stocks of Central Valley spring-run Chinook Salmon, and supports Central Valley steelhead and fall- and late fall-run Chinook Salmon. Although upper Mill Creek provides ideal cold water holding pools and spawning habitat, critically shallow riffles in lower Mill Creek limit hydrologic connectivity and are potential barriers to upstream passage. To address these issues, passage through a hydraulically complex, depth sensitive, low gradient critical riffle was evaluated using a two-dimensional hydraulic habitat model, River2D.

River 2D generates a digital terrain model from streambed and water surface elevation data, substrate and cover surveys, and discharge measurements. Habitat characteristics within the model can be simulated using the terrain model to develop a relationship between flow and water depth.

The River 2D model was used to assess the total wetted stream length and contiguous wetted stream length across the riffle meeting species-specific depth criteria relative to incremental changes in flow (cfs). These results are presented in the Instream Flow Evaluation Report *Temperature and Passage Assessment for Salmonids in Mill Creek, Tehama County*. The results were also used to develop draft Instream Flow Criteria in 2018 for the passage of adult salmonids and a summertime low flow threshold in Mill Creek.



All documents are publicly available online at:

<https://www.wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/Studies/Mill-Creek-Study>



Method Spotlight: Habitat Retention

The Habitat Retention Method (HRM) is used to identify habitat maintenance flows that maintain hydraulic criteria for average depth, average velocity, and wetted perimeter, at the hydraulic control of a riffle. The hydraulic criteria vary depending on the species and life stage of fish that frequent or reside in the stream. The criteria for average depth also increases proportionally to stream width due to the assumption that larger streams support larger fish, which require greater passage depths. A key assumption of the HRM is that if hydraulic criteria are maintained in riffle habitats, adequate flow conditions will also be maintained for other habitat types, such as pools and runs, located in the same stream reach.

Use of the HRM for determining flows necessary for fish and wildlife includes the following considerations:

- Data must be collected along a hydraulic control of a riffle.
- The method only identifies threshold flows for hydraulic parameters (i.e., depth, velocity, and wetted perimeter).
- The method is limited to streams with a bankfull width of 100 ft or less.
- The method is not suitable for complex channels.
- There is a limited ability to identify trade-offs between flow and habitat suitability.

HRM was used in **Ryan Creek, Mendocino County**, to determine a low-flow threshold of 6.3 cfs necessary to allow for the movement and long-term persistence of young-of-year salmonids. A flow of 6.3 cfs provides an average water depth of 0.3 feet across the riffle's hydraulic control.

In **Salmon Creek, Humboldt County**, HRM was used to determine a low-flow threshold of 6-8 cfs to maintain hydraulic habitat sufficient for the movement and survival of 1-2+ year steelhead, requiring an average depth of 0.4 ft. A low-flow threshold of 5-7 cfs maintains an average depth of at least 0.3 ft and conditions necessary for young-of-year salmonids across the riffle's hydraulic control.

Standard Operating Procedure for the Habitat Retention Method in California

CDFW-IFP-006

Version 2

December 2018



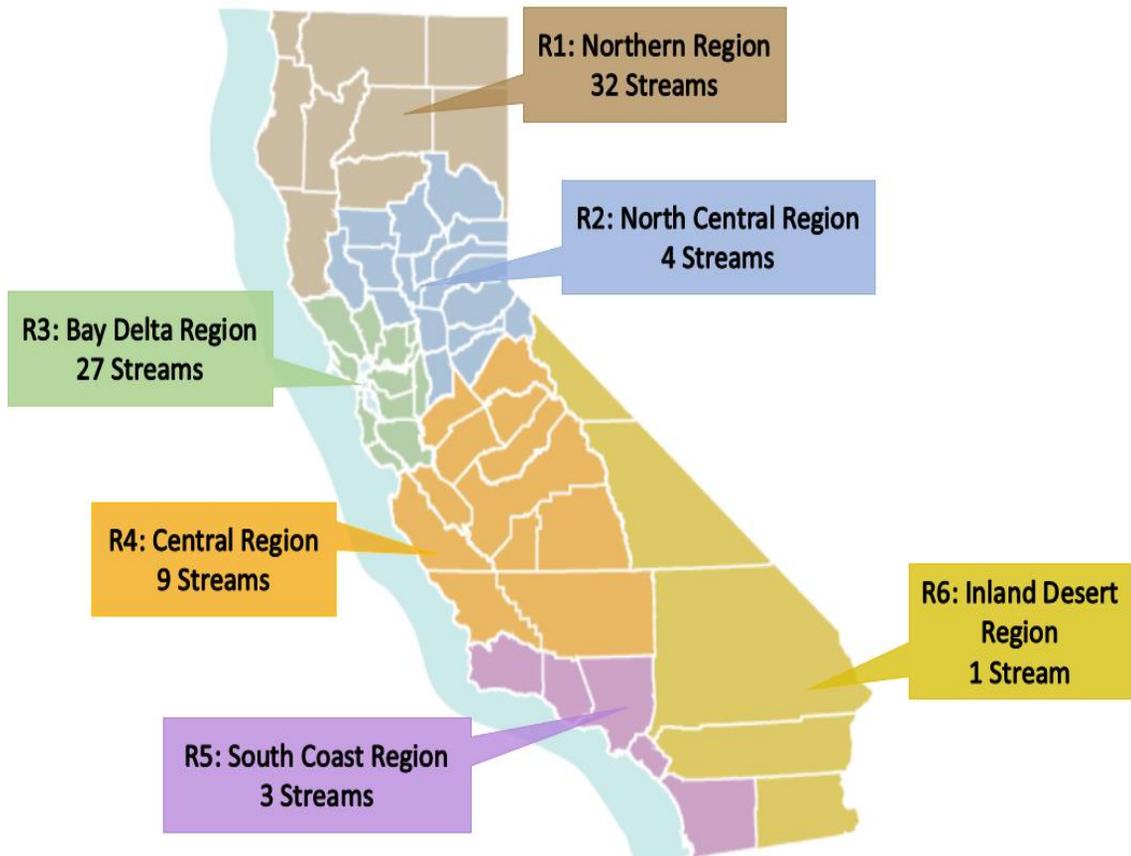
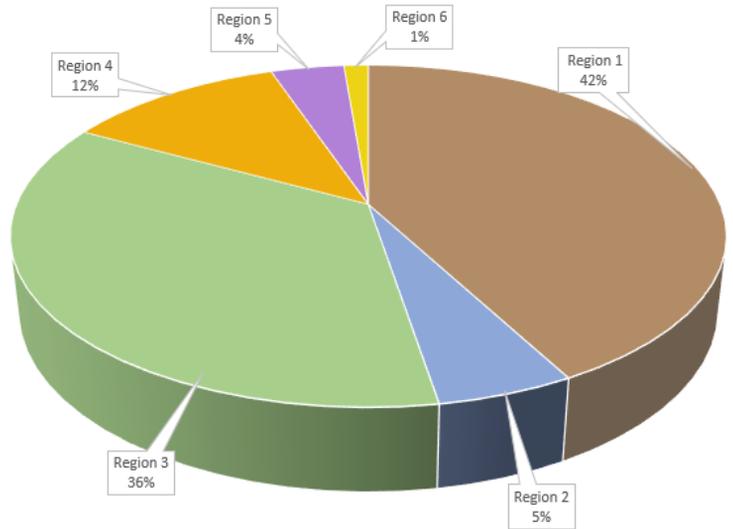
California Department of Fish and Wildlife
Instream Flow Program
Sacramento, California

The HRM Standard Operating Procedure can be downloaded from the Instream Flow Program webpage at:
<https://www.wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/SOP>

Statewide Support

Over the last decade, the Instream Flow Program has developed instream flow information based on sound science, and with a dedication to high standards of quality. In addition to the Instream Flow Program's Public Resources Code (PRC), Senate Bill X7-1 (SB X7-1), and California Water Action Plan (CWAP) studies, the program has provided support to the Regional Water Quality Control Boards, the Department's Regional staff and other Department programs. Programmatic support activities have included hydraulic habitat modeling, site evaluations, training, data collection, criteria development and/or technical review on 76 different streams throughout the state. This information has been used by various programs and regions to maintain healthy conditions for aquatic and riparian species and ensure protection for other important ecological functions statewide.

IFP Stream Work Distribution by Region
(excludes PRC, SB X7-1, and CWAP studies)



Cannabis Program Support

In support of the Department's Cannabis Program and to inform water management decisions, the Instream Flow Program is conducting instream flow assessments on California streams with anadromous fish and cannabis production. In 2018, Instream Flow Program staff assessed instream flow needs for the South Fork Eel River and Mattole River watersheds in areas with cannabis activity and current or historic steelhead presence. Eleven streams were selected for field data collection, 28 sites were surveyed using the Habitat Retention Method, and a total of 59 discharge measurements were taken over the span of four months. In addition, 13 pressure transducers were installed with accompanying barologgers to measure water levels and atmospheric pressure. Data collected in the South Fork Eel River were supplemental to the CWAP study.

Mattole River

Humboldt & Mendocino Counties

7 streams

18 HRM sites

36 discharge measurements

Data were collected in Blue Slide Creek, Eubank Creek, Lost River, Mattole River, McKee Creek, Mill Creek, and Van Arken Creek between May and August 2018.



South Fork Eel River

Humboldt & Mendocino Counties

4 streams

10 HRM sites

23 discharge measurements

Data were collected in Canoe Creek, Hollow Tree Creek, Indian Creek, and Squaw Creek between May and August 2018.



Environmental Flows Framework

The California Environmental Flows Framework (CEFF) is a statewide tiered approach for determining environmental flow criteria. A primary goal of CEFF is to provide a consistent and defensible approach to identifying ecological flow needs for California's rivers and streams.

Ecological flows are defined as the flows necessary to sustain aquatic and riparian ecosystems throughout the entire river corridor. Ecological flows are an important component of a flow regime prescription for fish and wildlife and the habitats upon which they depend.

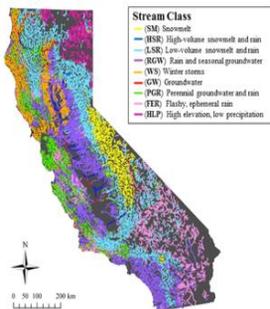
Tier 1: Development of ecological flow criteria for all streams in California. Tier 1 flow criteria are calculated from natural stream classes and flow metrics based on functional flows (Yarnell et al. 2015).

Tier 2: Guidelines for refining flow criteria to regional and/or site-specific conditions. Tier 2 is a tailored approach that incorporates specific environmental and water management factors and priorities.

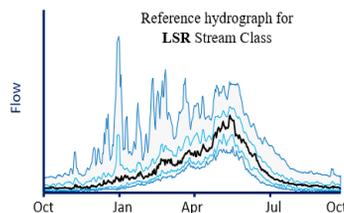
The CEFF is being developed by the Environmental Flows Technical Workgroup (Eflows TWG), a subgroup of the California Water Quality Monitoring Council. The Eflows TWG is co-chaired by Robert Holmes of the Department's Instream Flow Program, and Daniel Schultz of the State Water Board's Cannabis Program.

A central focus of the Eflows TWG is to improve coordination, collaboration, and data sharing among agencies, non-profits, and other parties interested in instream flows. The Eflows TWG meets quarterly in Sacramento, California.

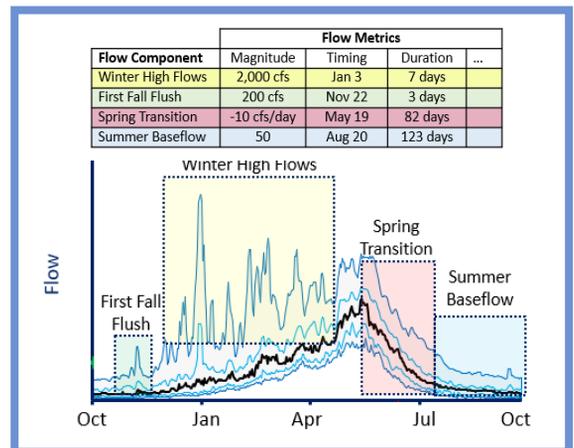
Close-up look at Tier 1:



Statewide Stream Classification



Reference Hydrographs



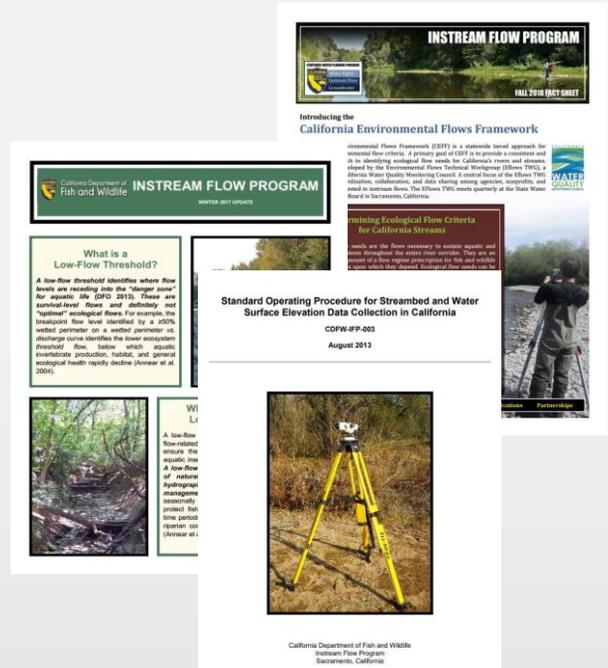
Ecological Flow Criteria

For more information or to receive updates by email, please visit:

https://mywaterquality.ca.gov/monitoring_council/environmental_flows_workgroup/index.html

Quality Assurance

The Instream Flow Program is committed to quality assurance (QA) to ensure instream flow data collection, analysis, and reporting is robust, credible, transparent, and relevant. To maintain a high-quality program, the Instream Flow Program has continued to partner with the QA Team at the Marine Pollution Studies Laboratory (MPSL) at Moss Landing Marine Laboratories. In 2018, MPSL provided technical services to support efforts related to instream flow, water rights, and water quality. Development of fact sheets, templates, and guidance documents improves information sharing and provides standardized guidelines that may be used by staff and other interested instream flow practitioners. MPSL assisted with fact sheet development, standard operating procedure revision, and technical review of study plans and reports. QA guidance technical documents are currently being developed to support the cannabis cultivation regulatory program.



FLOW 2018

The Instream Flow Program participated in planning the Instream Flow Council's 20th anniversary Flow 2018 Workshop, "Managing Rivers, Reservoirs, and Lakes in the Face of Drought." The biennial workshop was held in Fort Collins, Colorado, from April 24-26, 2018. The workshop provided attendees with training, practical tools, and strategies to effectively manage flowing and standing water ecosystems in the face of drought. Flow 2018 attracted a wide range of participants including universities, agencies, NGOs, and industry, many of whom are actively involved in instream flow studies and water/resource management. Nationally recognized experts provided lecture-style presentations highlighting proven approaches to effectively balance traditionally recognized water needs with the ecological vitality of river systems during drought conditions.

<https://www.instreamflowcouncil.org/>



Instream Flow Program Training

It is important that Instream Flow Program staff are current on instream flow data collection methodologies, data analysis techniques and modeling programs, as well as health and safety practices. In 2018, the Instream Flow Program undertook the following group trainings:

- Wilderness First Aid and CPR: Staff often perform field work in remote locations throughout the state. Staff completed a 16-hour course developed by Sierra Rescue International to ensure staff are prepared and able to respond to emergencies while working in the field.
- Habitat Suitability Criteria Development: Mark Allen of Normandeau Associates presented an introduction to HSC development to Instream Flow Program staff. Following the introduction, Mark assisted select Instream Flow Program staff with development of HSC for Hollow Tree Creek.
- Quality Assurance and Quality Control Considerations for Final Reports: Beverly van Buuren and Will Hagan from the MPSL Quality Assurance Program provided a 1-hour training presentation, with a focus on Instream Flow Program technical reports, and a question and answer session.
- Method Refreshers: Instream Flow Program staff participate in method and sampling/survey technique refreshers each year to ensure accuracy and constancy in data collection and analysis. This year, training included: surveying refreshers in Real-time Kinematic (RTK) and Total Station data collection; Pressure Transducer site selection and installation; Discharge and Stage of Zero Flow measurement; and Habitat Retention Methodology sampling technique review.



Mark West Creek, Sonoma County

Presentations and Publications

Presentations

- January 17, 2018: P. Uttley and D. Haas presented *Instream Flow Activities for Mill Creek, Tehama County*, including draft flow recommendations, at a public meeting in Los Molinos, CA.
- June 7, 2018: B. Drescher and A. Villalobos presented *Instream Flow Evaluation for the Lower San Gabriel River* to Region 5 staff via Skype in Sacramento, CA.
- August 10, 2018: B. Seapy, S. Windell, B. Drescher, and R. Holmes presented *Water Branch and Region 3 Coordination* to Region 3 managers via Skype in Sacramento, CA.
- September 25-26, 2018: B. Drescher presented on the *San Antonio Creek Instream Flow Study* during the State Water Board Division of Water Rights two day field tour of the Ventura River in Ventura, CA.
- November 6, 2018: B. Drescher presented an overview of the Instream Flow Program at an Environmental Flows Workshop at the Region 5 office in Los Alamitos, CA.
- November 14, 2018: B. Drescher presented *Instream Flow Program Update* to the Fisheries Management Committee in Sacramento, CA.

Publications

- CDFW. 2018. Draft Instream Flow Criteria for Mill Creek, Tehama County. California Department of Fish and Wildlife, Water Branch Instream Flow Program. 38 pp.
- CDFW. 2018. Standard Operating Procedure for the Habitat Retention Method in California. California Department of Fish and Wildlife Instream Flow Program Standard Operating Procedure CDFW-IFP-006, 33 pp.
- CDFW. 2018. Study Plan: Habitat and Instream Flow Evaluation for Anadromous Steelhead and Coho Salmon in Upper Mark West Creek, Sonoma County. California Department of Fish and Wildlife, Water Branch Instream Flow Program. 46 pp.
- Cowan, W. 2018. Flow Monitoring and Unimpaired Flow Estimation Report for Redwood Creek, Humboldt County. Stream Evaluation Report 18-1. California Department of Fish and Wildlife, Water Branch Instream Flow Program. 33 pp.



* Logo created by Lillian McDougall of the Instream Flow Program

2019 Performance Objectives

Instream Flow Program activities in 2019 will focus on finishing technical aspects of California Water Action Plan and Public Resource Code studies already underway. Additionally, efforts to develop flow criteria for watersheds impacted by cannabis will occur. Continued coordination with regional staff, stakeholders, and other project collaborators will be critical to completing ongoing projects.

- Instream Flow Program activities for the CWAP priority stream studies will continue.
 - South Fork Eel Watershed:
 - Habitat Suitability Criteria will be developed for juvenile Coho Salmon and steelhead in Hollow Tree Creek.
 - Hydraulic models developed for ten reaches within the Redwood Creek watershed will be combined with Habitat Suitability Criteria to evaluate habitat-flow relationships.
 - Ventura River:
 - 2D models will be developed to evaluate adult steelhead passage conditions through the complex, intermittently flowing stream channel of the mainstem Ventura River.
 - 1D hydraulic habitat models will be developed using habitat retention and wetted perimeter methods within the lower Ventura River.
 - 1D hydraulic habitat models will be developed using physical habitat simulation and habitat retention methods in San Antonio Creek.
 - Mark West Creek:
 - Data collection will continue for the development of 2D models to assess juvenile rearing conditions in the upper watershed.
- Instream flow assessments will be completed to support watersheds impacted by cannabis, including the South Fork Eel River and Mattole River.
- The development of quality assurance activities, document generation, and training will continue in support of consistent, comparable, and defensible flow studies and information development.
- The Instream Flow Program will continue to participate in the Environmental Flows Technical Workgroup and assist in development of tools for statewide instream flows.
- Coordination and outreach efforts will continue with the State Water Board, National Marine Fisheries Service, US Fish and Wildlife Service, the Regional Water Quality Control Boards and other agencies. Public and stakeholder engagement will be supported by continuing outreach efforts.
- The Instream Flow Program will continue to participate in and present instream flow study findings at seminars and workshops across the state.





“To the extent that we can modify our world by the decisions we make, it is important to act as responsible stewards of the resources entrusted to us and to leave the world at least no worse for wear and maybe better than we found it. “

- Thomas Annear

California Department of Fish and Wildlife

Instream Flow Program

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