

## **Hydraulic Modeling of an Upstream Passage Barrier for Adult Spring-Run Chinook Salmon on Butte Creek**

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River2D was used to develop a hydraulic model of an upstream passage barrier for adult spring-run Chinook salmon on Butte Creek. Topographic data were collected using total station, survey-grade RTK GPS and terrestrial LIDAR. Stage-discharge relationships were developed at the upstream and downstream ends of the site to use as boundary conditions and to calibrate the 2D model. A pressure transducer was installed at the downstream boundary of the model to provide a time series of flow and water temperatures. Parameters of the hydraulic model that will be examined to assess upstream passage include minimum thalweg depth, depths, velocities and water surface elevations above and below a jump, and the flow split between the two main flow paths through the site. These hydraulic parameters for the time series of flows, together with recorded water temperatures, will be compared to passage data from a VAKI unit located just upstream of the site to evaluate how hydraulic conditions affect upstream passage of adult spring-run Chinook salmon, for the purpose of assessing what flows are needed for upstream passage. The topographic dataset can also be used to develop potential structural solutions for upstream fish passage.

**Keywords:** River2D, upstream, passage, Chinook salmon, hydraulic model

**Poster topic:** Water Supplies and Instream flows

## **Are Mid-Winter Droughts in Northern California Increasing?**

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The major portion of northern California annual precipitation comes during the winter. Mid-winter dry spells can lead to problems in snowpack and water supply. Recent decades have led to questions about a possible change in patterns leading to more drought years. In this paper two widely used mountain precipitation indexes are examined to see if a trend for increasing winter dry months is shown. There does seem to be evidence for some increased risk of a dry month in the past 30 years, more so in the northern Sierra than in the south. Results will be presented in the paper.

**Keywords:** Drought, precipitation patterns, possible climate change

**Poster topic:** Water Supplies and Instream flows

## **Development of a Quality Assurance System for the California Department of Fish and Wildlife Instream Flow Program**

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Instream flow measurements and data reports are vitally important to water management policies related to fish and wildlife habitat protection. This creates a challenge to agencies as instream flow reports may be highly variable in their approach to planning, study design, data collection, and reporting formats. The absence of established quality assurance (QA) systems has often left few mechanisms to assess if instream flow data were produced in a credible, comparable, coordinated, and scientifically-defensible manner.

In 2012, the California Department of Fish and Wildlife (CDFW) Water Branch's Instream Flow Program began a partnership with the QA Team from the Moss Landing Marine Laboratories to develop QA systems for instream flow measurements. The QA Team has decades of experience developing novel approaches to the design and implementation of quality management on large-scale applications, including the CalFED Bay-Delta Mercury Projects and the State Water Resource Control Board's (SWRCB) Surface Water Ambient Monitoring Program. Already, this partnership has developed peer-reviewed standard operating procedures, fact sheets, reporting templates, and guidance for instream flow studies. Proposed enhancements include a QA program plan, database structure, meta-data, electronic data capture, training, intercalibration exercises, and field audits.

The CDFW Instream Flow Program standard operating procedures are being used in tributaries of the Sacramento-San Joaquin River Delta to determine flow needs for fish and wildlife with ultimate consideration by the SWRCB. As the QA systems continue to grow within the CDFW, they are expected to become the basis for external partnerships with other agencies. A significant effort is underway to make connections through outreach to other agencies in the form of training, presentations, and maintenance of quality assurance web site. It is anticipated that these efforts will increase comparability between instream flow measurements within the State of California, extend limited resources, and boost efforts in production of scientifically-defensible reporting.

**Keywords:** Quality assurance, instream flow, methods, standard operating procedures, outreach, training

**Poster topic:** Water Supplies and Instream flows

## **Phase 4: Development and Implementation of Flow Objectives for Priority Bay-Delta Tributaries**

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The Public Trust Unit in the Division of Water Rights at the State Water Resources Control Board (State Water Board) is currently working on the development of policies and flow objectives for priority tributaries to the Bay-Delta, with a focus on the Sacramento River. Often referred to as Phase 4 of the Bay-Delta effort, this work includes: 1) development of non-binding flow criteria; 2) development of flow objectives with regulatory effect; 3) programs of implementation to achieve flow objectives, including use of adaptive management; and 4) implementation of flows through conditioning of water rights and other measures, as appropriate.

Flow objectives will consider all competing uses for water, and will be tailored to each individual tributary to address the unique hydraulic/geomorphic characteristics, public trust resource considerations, and beneficial uses of water. Adaptive management plans will be used to establish a flexible framework that can accommodate future conditions, including new information, watershed changes, stakeholder agreements, and climate change.

Flow criteria will provide the technical basis for the development of flow objectives, but do not have regulatory effect. In July 2013, the State Water Board submitted a document to the Delta Science Program (DSP) to request assistance in identifying scientifically defensible methods to develop flow criteria for priority tributaries to the Bay-Delta. In response, DSP convened an expert panel that evaluated a variety of methods, and provided recommendations to the State Water Board. The recommendation was a seven-step hybrid approach using stream classification, hydrologic analyses, site-specific information where available or essential, extrapolating the understanding of flow-ecology relationships from other sites to the study catchment or segment, development of an environmental flow regime, interaction between scientist and stakeholders, and adaptive management. These recommendations, as well as public comments received, will inform the Phase 4 process of developing flow criteria.

**Keywords:** Policy, flow objective, flow criteria, instream flows

**Poster topic:** Water Supplies and Instream flows