

# **Causal Assessment in Region 8 (Santa Ana Regional Water Quality Control Board)**

## **Background**

Biologically-based assessments (bioassessment) of stream health are becoming the foremost approach to evaluate the condition of California's perennial stream ecosystems. For example, the Santa Ana Regional Water Quality Control Board (Regional Board) has been implementing a bioassessment program for the past six years. If in this process the biology of a stream is found to be degraded in some fashion, the cause(s) of the problem will need to be identified so as to inform corrective measures or other management actions. Causal assessment is the sequence of steps taken to diagnose the stressor(s) leading to that degraded biology. The US EPA has developed the only fully realized causal assessment framework/tool – CADDIS (Causal Assessment Diagnosis and Decision Information System) – for use in-stream environments.

To test the applicability of the CADDIS framework in California's perennial streams, SCCWRP organized four causal assessment case studies that were conducted in streams around the State with differing types of stressors and quality/quantity of data. The overall conclusion from each case study was that the CADDIS framework worked well and represents the best option for causal assessment going forward in California. From the results and experiences that came out these case studies, SCCWRP staff have produced a guidance document outlining the application of the CADDIS framework in California's perennial streams. In addition to guidance on application of the framework, a number of improvements to the framework were proposed; focusing on streamlining the assessment process, increasing the diagnostic power of the assessment, and providing measures of certainty on the results. One of the most pressing needs identified in the guidance document, was improving the ability to address chronic, non-point source stressors to streams.

## **Problem Statement**

As noted above, four causal assessment case studies have been conducted and a guidance manual created to help facilitate implementation of the CADDIS approach. However, these cases studies were all conducted by teams of local experts with US EPA assistance and therefore most regulatory and regulated parties in the State have no practical experience with coordinating or conducting a causal assessment. Though not technically difficult, the long-term implementation of CADDIS will require that local entities gain familiarity and expertise in the causal assessment approach.

A major concept of CADDIS is contrasting biotic and abiotic conditions at the degraded site (test site) to conditions with those at ecologically similar but less degraded sites (comparator sites). A consistent problem that was encountered in the case studies, and likely most causal assessments to be done in California, was the use of comparator sites located upstream and downstream of the test site (the approach traditionally used in CADDIS) when the whole stream was likely exposed to the same chronic, landscape-scale stressors. As a consequence, these in-stream comparator sites did not present enough contrast with the test case site to provide a clear,

comprehensive diagnosis of the problematic stressors affecting the streams. A potential solution to this problem is to change the focus of the assessment from a single site to multiple, contiguous sites within a stream that have the same biological impacts and presumably the same stressor exposure [*Note*: within the context of stream bioassessment in California, a site is a 150-m reach of a stream where samples are collected, not a single point]. However, integrating multiple sites within a stream that traditionally would have served as comparator sites for a single reach assessment, creates the need to identify comparator sites from outside of the stream. Ideally, these comparator sites will be from environmentally similar streams within the region (i.e., regional comparator sites). In order to deal with this change from single-site to multi-site causal assessments, an approach to select environmentally similar comparator sites from outside the test site's immediate watershed will be needed, as well as series of analytical tools for dealing with the larger volume of data this approach will bring into the assessment.

## **Approach**

The first goal of this effort is to build local capacity and expertise in causal assessment through implementation of the CADDIS framework in the San Diego Creek Watershed. In partnership with Regional Board staff, SCCWRP staff will help facilitate a causal assessment of lower San Diego Creek (Orange County/Irvine) using the US EPA CADDIS framework ([www.epa.gov/caddis](http://www.epa.gov/caddis)) and the California causal assessment guidance document. This assessment will serve as a technology transfer from SCCWRP staff experienced with CADDIS to Regional Board staff, interested stakeholders, and other appropriate parties. Secondarily, this work should provide insight into the degraded biological conditions observed in San Diego Creek.

The second goal of this effort will be to develop technical improvements to the CADDIS framework (following recommendations in the causal assessment guidance document) to produce more diagnostic and streamlined assessments in California. Specifically, we will test the diagnostic capabilities of a multi-site assessment approach using regional, environmentally similar comparator sites selected from California's state-wide bioassessment database versus the traditional in-stream comparator sites.

Given the proposed funding structure for this work, we have broken the work up into two phases: the tasks in Phase 1 will be to set up the assessment, identify candidate causes, aggregate all of the data, and analyze the causes: the tasks in Phase 2 will be to score the analyses, evaluate the candidate causes as likely, unlikely, or indeterminate, and complete comparison of multi-site vs. single site causal assessments. Both phases will need to be completed to finish the causal assessment. The separation of the work into the two phases provides a clear delineation of when the work will be done and approximate costs of that work.

## ***Phase 1***

### **Tasks**

1. *Setting up the Causal Assessment* – SCCWRP staff will collaborate with (Regional Board) staff to develop the scope of the assessment and determine whom the vested parties that should participate are.

- a. Scoping the spatial temporal constraints of the case by identifying what part(s) of San Diego Creek we want to focus the assessment on and what time frames we want to consider.
  - b. Identify who among regulatory and regulated parties want to participate. Partners should consist of those willing and capable of data compilation and analysis that comprises the assessment, as well as writing up and reviewing a report
2. *Conducting the Assessment (Parts 1&2)* – SCCWRP staff will lead a series of workshops focused on how to better understand and actually use the CADDIS framework for causal assessment. There will be two levels of workshops: Broader informative workshops open to all interested parties, where SCCWRP staff will provide education on the different parts of the CADDIS framework – the philosophy, the options available, how to interpret results, etc; and focused interactive workshops for case study participants, where SCCWRP staff will provide instruction on how to do the different parts of the assessment and participants will share their work products. Participants in the assessment will be expected to do some of the work (building conceptual models, analyzing/scoring data, etc) on their own, but SCCWRP staff will provide one-on-one coaching and support to all participants during the process. These workshops will focus on setting up the case and analyzing/scoring the data.
    - a. Defining the case and candidate causes – Identifying biological endpoints, comparator sites, and the potential causes to be investigated
    - b. Data Analysis – aggregating all available and relevant biotic/abiotic data, working through the different lines of evidence for each candidate cause, and scoring of those data.
  3. *Identification of Regional Comparator Sites* – SCCWRP staff will develop a potential approach(s) for identifying environmentally similar comparator sites than can be used in the multi-site causal assessment, in lieu of the traditional in-stream comparator sites.

## **Phase 2**

### **Tasks**

4. *Conducting the Assessment (Part 3)* – SCCWRP staff will lead informative workshops and interactive workshops focused on how to interpret the results of the causal assessment and assign evaluations for each of the potential candidate causes identified in Task 2.
  - a. Identifying the Cause(s) – Interpretation of the scoring for each line of evidence, summarization of scores for each candidate cause, and evaluation of each cause as likely, unlikely, or indeterminate.
5. *Completing Tools for Regional Comparators* – Using the data assembled in Task 3, SCCWRP staff will develop a series of tools to interpret the biotic and abiotic patterns from the test sites and the regional comparator sites-. This multi-site-

