CAUSAL ASSESSMENT SCREENING TOOL

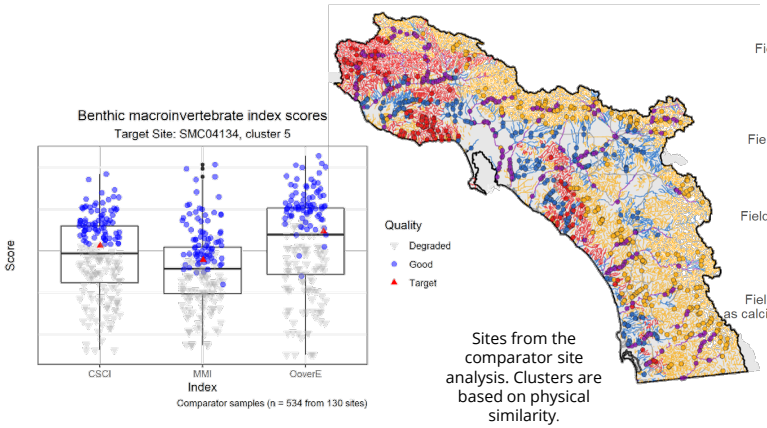
The City of SAN DIEGO

Background

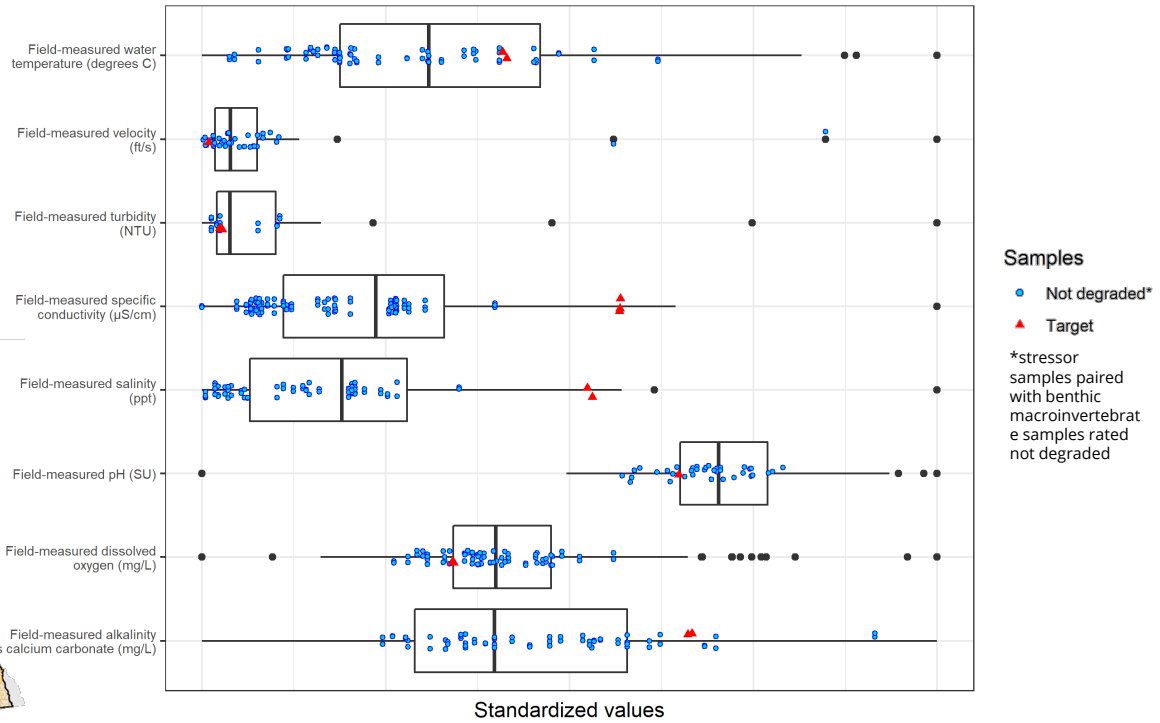
Water resource managers in California have a continuing need to identify stressors and rule out pollutants causing or contributing to biological impairment in waterbodies. The Causal Assessment Screening Tool (CASTool) developed for the City of San Diego by Tetra Tech in association with San Diego Regional Water Quality Control Board and with support from the Southern California Coastal Water Research Project, is a rapid screening tool to help identify likely causes of biological impairment for a given stream reach or waterbody.

Overview

CASTool integrates biological assessment data into watershed management and planning. With innovative automated site analyses and presenting the weight of evidence for or against each potential stressor to identify causes of biological impairment, the tool provides a powerful approach for achieving meaningful improvements in aquatic biological condition.



Sites from the comparator site analysis. Clusters are based on physical similarity.



Example of a selection of detected stressors for evaluation as causes of impairment at a target site compared to a cluster of comparator sites

CASTool provides a rapid method for water resource managers to determine the stressors leading to ecological degradation of streams

This project is being undertaken as part of a settlement of a San Diego Water Board enforcement action.

RAPID IDENTIFICATION OF THE LIKELY CAUSES OF BIOLOGICAL IMPAIRMENT

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How it Works

Data

CASTool uses stressor data such as water quality, physical habitat metrics/indices, and flow metrics. Biological response data include the California Stream Condition Index (CSCI) for benthic macroinvertebrates, the Algal Stream Condition Index (ASCI) and their respective subindices and metrics.

Candidate Causes (Stressors)

The likelihood of potential stressors as causes of observed biological impairment at a site are ranked. This allows for determination of the relative importance of each candidate cause using a weight of evidence approach.

User Interface

CASTool is available via a user-friendly web-application framework built using Shiny. A more advanced application and enhancements to allow for additional user flexibility may be pursued in the future.

CASTool incorporates both algal and macroinvertebrate data and identifies likely stressors

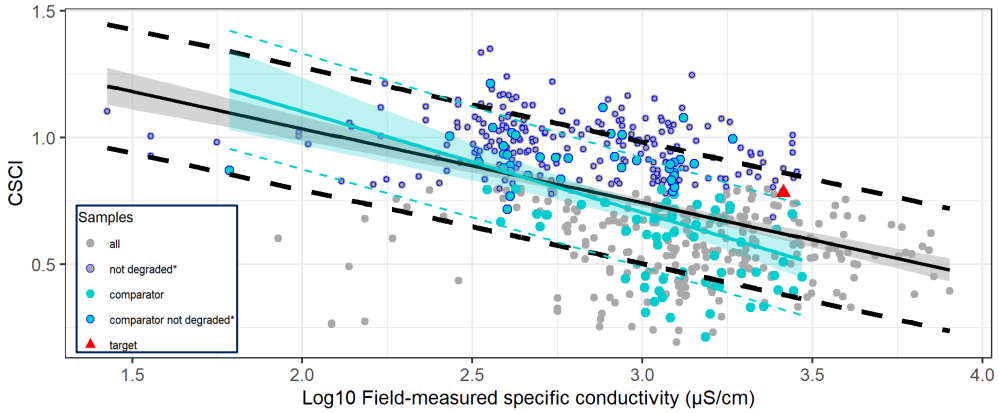
Lines and Weight of Evidence

CASTool evaluates specific lines of evidence that are frequently used in traditional causal assessments (e.g., EPA's CADDIS) and provide the strongest evidence as to whether a stressor is likely to be a cause of concern at a site. Graphical results along with displays of the input data are produced.

Scores from each line of evidence are incorporated in a Weight of Evidence analysis. Transparent criteria are used within the tool to determine whether results support or refute a stressor as a likely cause of the observed biological condition.

Example of a Stressor-Response line of evidence

Is there evidence of a biological gradient from inside or outside the case?
Linear regression with 75th percentile prediction interval



Regression (all, outside the case): y = -0.293 x + 1.62 ~ r2 = 0.220 ~ p-value = 2.6e-32 ~ n = 566 ~ score = 1
Regression (comparators, inside the case): y = -0.399 x + 1.9 ~ r2 = 0.274 ~ p-value = 1.4e-08 ~ n = 103 ~ score = 1

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