

Stream Bioassessment

A Fact Sheet from the Southern California Coastal Water Research Project



March 2014

What Is Bioassessment?

Biological assessment, or “bioassessment,” is a way to measure ecosystem health based on the living organisms at a given location. To achieve this, scientists examine communities of organisms such as invertebrates (e.g., insects, crustaceans), fish, algae, and plants to quantify their numbers and species. Summarized community data provides key information about the condition of aquatic ecosystems, such as streams, wetlands, and oceans.



(left to right) Scientists sample a stream for benthic (bottom-dwelling) invertebrates using nets. A dragonfly nymph represents one type of sensitive species used to help interpret a stream’s biological condition. Communities of algae scraped from rocks or other stream surfaces also offer insight about biological condition.

Why Use Bioassessment in Streams?

Traditional stream monitoring measures levels of individual chemicals at a specific point in time. Living organisms, in contrast, are exposed over time to multiple chemicals and other sources of stress, such as flow or habitat alteration (e.g., from stream bank or bed erosion). The community’s cumulative response to all stressors offers an integrated measure of stream condition. Biological community health also directly relates to some important stream benefits, such as provision of endangered species habitat and support of fisheries.

What Is Needed to Perform Stream Bioassessment?

In practice, bioassessment requires an understanding of when biological communities show natural variation versus a response to human impacts. Interpreting subtle differences in biological data can become complex, as samples may contain hundreds of species and thousands of individuals. Scientists must develop methods to translate complicated biological community data into comparable, easy-to-understand results.

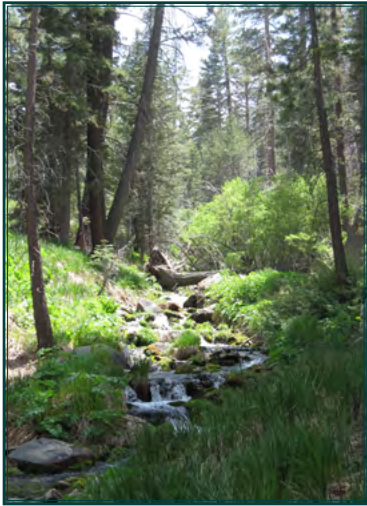
Regulatory Application: Biological Integrity Policy

The State of California is developing a policy for assessing biological integrity and using this information in regulatory programs and decision-making. It will set forth consistent methods for conducting surface water bioassessment and interpreting data. The current policy focuses on invertebrates living in shallow streams with year-round flow, owing to greater data availability. In the future, the State intends to expand the policy to other types of stream habitats and/or incorporate additional biological indicators, such as algae or fish.

SCCWRP produces science to 1) help determine appropriate expectations for biological condition, 2) score and compare condition across sites, and 3) diagnose the cause(s) of degraded condition.

1) Set Expectations

Scientists begin by developing expectations for what is considered “good” biological condition. The dramatic range of California habitats, from steep mountain to flat coastal streams, leads to many natural differences in biological communities. To account for this, SCCWRP and partners gather data from a representative network of **reference sites** (pristine areas with little human impact) across diverse ecological regions and habitat types.



*Scientists consider the South Fork of the Santa Ana River a reference site, since its watershed in the San Bernardino mountains has minimal human activity. The California Stream Condition Index gives it a score of **1.00**, the best possible score on a scale of zero to one.*

2) Score and Compare Sites

To interpret and summarize complicated biological information, SCCWRP develops simplified **scoring tools** that calculate the difference between actual and expected conditions. SCCWRP recently developed the California Stream Condition Index (CSCI) to enable direct comparison across sites and meaningful translation to non-scientists.



*The Hahamongna Creek watershed in the San Gabriel foothills exhibits some forms of human influence. The California Stream Condition Index score for this site is **0.61**, signifying a difference from reference condition.*

3) Investigate Cause(s) of Degradation

For streams found to be in poor condition, the next step is to **diagnose the cause(s)** of the problem. SCCWRP is actively developing tools and case studies that will enable investigators in California to identify key stressors and better target potential stream remediation and restoration activities.



An SMC training exercise helps participants standardize their monitoring approaches.

Regional Monitoring: Bioassessment in Action

In 2009, the Southern California Stormwater Monitoring Coalition (SMC), made up of SCCWRP, city and county watershed managers, regional regulatory boards, and state agencies, developed a regional program to coordinate stream monitoring efforts by more than a dozen different organizations. The program summarizes information about overall stream health, major stressors, and regional trends in watersheds that drain to the Southern California coast. The first year of the program, for example, found that 47% of all stream-miles across Southern California had biological integrity similar to reference sites.