CALIFORNIA Water Boards

SURFACE WATER AMBIENT MONITORING PROGRAM (SWAMP)

BIOASSESSMENT

CALIFORNIA'S STATEWIDE PROGRAM

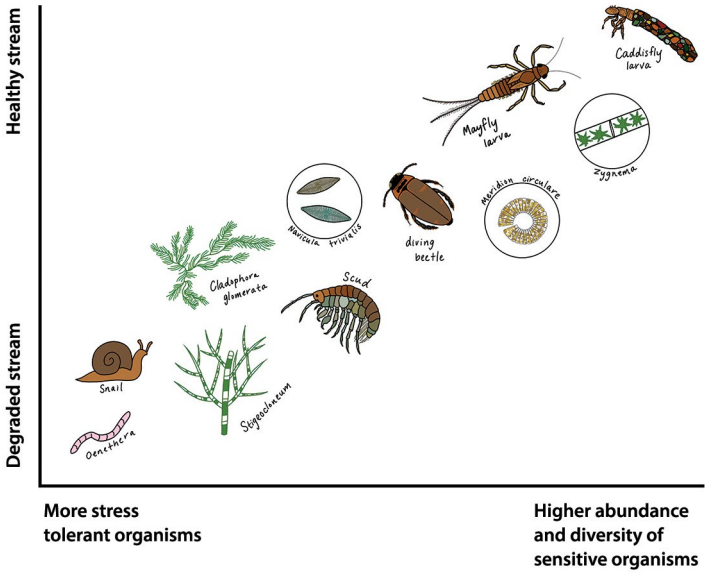
What is the Bioassessment Program?

The Bioassessment Program uses biological data to understand stream health and inform management decisions. Organisms like benthic macroinvertebrates and algae respond to stressors like pollution in predictable ways, so scientists can use this information to evaluate the impacts of environmental stressors on surface waters, such as streams. The Bioassessment Program was established in 2002 to monitor waterbodies statewide and support the State Water Resources Control Board (State Water Board) in its mission to protect and restore the ecological integrity of California's unique and biodiverse waterbodies.

What does the Program do?

First, trained crews collect organisms in the field and take them back to the lab for taxonomists to identify and count. Next, data managers check the results for quality and upload the data to our centralized database. Then, data analysts compare the ecological diversity and composition of the organisms that were collected with what we expect to see in healthy streams to evaluate the condition of the waterbody. Scientists use this information to calculate numerical indices of biological health which can be used to classify waterbodies as healthy or degraded. Finally, we communicate our findings to water quality managers who use these classifications to make decisions regarding whether and how to protect healthy waterbodies and improve the health of degraded waterbodies.

Stream Biology Along a Stress Gradient



This diagram shows examples of algae and animal species that are more prevalent in degraded versus healthy streams. Benthic macroinvertebrates (BMIs) are a group of small but visible animals that live at the bottom of rivers and streams. They are comprised mostly of aquatic insects, crustaceans, mollusks, and worms. BMIs are found in most waterbodies and are reliable indicators of stream health because they are relatively stationary and reflect the combined impact of stressors affecting a waterbody, allowing us to gain an overall understanding of stream conditions. Similarly, algae respond rapidly to nutrient inputs like nitrogen and phosphorus, so changes in their composition may indicate increases or decreases in nutrient runoff.

Illustrations by Elena Suglia

What do we use bioassessment data for?

Calculating biological indices

We synthesize data into biological indices that tell us about stream health, such as the California Stream Condition Index (*see example on next page*) and Algal Stream Condition Index. Some of the ways we use biological indices include evaluating effectiveness of restoration projects and stream protection actions as well as detecting trends in stream health over time. The State Water Board also reports these scores in an Integrated Report that is submitted to the U.S. EPA every two years to identify high quality or impaired waterbodies throughout the state.

Informing statewide policy

Historically, the State Water Board's regulatory policy has focused on reducing chemical pollution, but recently scientists have begun to find innovative ways to use bioassessment data to improve biological health in watersheds.

For example, scientists are developing **Biological Objectives** to include in the Water Quality Control Plan for the San Diego Region. In addition, we are working to incorporate bioassessment data into formal statewide policies such as the **Biostimulation, Cyanotoxins, and Biological Condition Provisions**. This policy aims to regulate the effects of harmful algal blooms and nutrient inputs on waterbody health and ultimately protect the biological integrity of California's waters.

Biological Programs at the Water Boards

Bioassessment is just one of the Water Board programs that uses ecology to understand water quality and its impacts on human health and wildlife. The following programs complement our use of bioassessment data and enable a holistic approach to understanding and improving watershed health throughout California.

SeMMAP
SWAMP eDNA Metabarcoding Monitoring and Analysis Project

Environmental DNA Monitoring

The **SWAMP eDNA Metabarcoding Monitoring and Analysis Project (SeMMAP)** uses cutting-edge technology to assess biodiversity in water-bodies from DNA fragments in the water column.

Healthy Watersheds Protection

SWAMP has led efforts to use biological data to identify and protect high quality and healthy watersheds statewide. This effort has been closely coordinated with the California Water Quality Monitoring Council and the **Healthy Watersheds Workgroup**. The goal is to create a data layer and dashboard that can be used to identify high quality streams, their vulnerabilities to stressors, and help prioritize areas for protection or management intervention.

Case Study: Using the California Stream Condition Index (CSCI)

Field Work

Collect critters

Cache Creek

Taxonomy

Identify critters at lab

Dragonfly...
Caddisfly...
Beetle...

Insects like dragonflies have a larval stage during which they live at the bottom of streams

Assess species present at site

Cache Creek

How many native critters are there? How stress tolerant are the species present?

Calculate CA Stream Condition Index

Cache Creek VS *Healthy site*

Compare the critters found at the site of interest (here, Cache Creek) with the diversity and composition of species expected from similar healthy sites. Healthy streams have more diverse, native species that tend to be more sensitive to environmental stress

Index Score

degraded — *healthy*

Cache Creek

Illustrations by Elena Suglia

Photo credit: Regions 6 and 9 SWAMP Coordinators

Accessing bioassessment data

Data collected by the SWAMP program is summarized in the **SWAMP Data Dashboard**. To use the Dashboard, apply the filters on the left side of the webpage to refine your search. The map on the right will update to display monitoring sites that match your criteria. Click on a site to view or download data for that location. For broader downloads, use the "Data" tab above the map to access data for multiple sites statewide or regionally. All data is pulled from the **California Environmental Data Exchange Network** (CEDEN) database.

Additional Resources

Questions?

Please contact **swamp@waterboards.ca.gov**

- SWAMP Bioassessment Program webpage: **https://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/**
- Bioassessment field work and taxonomy resources: **https://www.waterboards.ca.gov/water_issues/programs/swamp/bioassessment/taxonomic_resources.html**
- SWAMP home webpage: **https://www.waterboards.ca.gov/water_issues/programs/swamp/**

Our partners

The Bioassessment Program continues to work closely with the California Department of Fish and Wildlife's (CDFW) Aquatic Bioassessment Laboratory, which has been the primary producer of this technical work. SWAMP also collaborates with the following partners to achieve the program's objectives: