Monitoring Monday – Let's look at benthic macroinvertebrates.

Join us each Monday as the Clean Water Team shares resources on water quality monitoring. Today we will take a look at benthic macroinvertebrates.

Benthic (meaning "bottom-dwelling") macroinvertebrates (BMIs) are small aquatic animals and the aquatic larval stages of insects. They include dragonfly and stonefly larvae, snails, worms, and beetles. They lack a backbone, are visible without the aid of a microscope, and are found in and around water bodies during some period of their lives. Benthic macroinvertebrates are often found attached to rocks, vegetation, logs and sticks or burrowed into the bottom sand and sediments.

Benthic macroinvertebrates are commonly used as indicators of the biological condition of waterbodies. They are reliable indicators because they spend all or most of their lives in water, are easy to collect, can be found in all but the most severely polluted or disturbed habitats, and because they have a wide range of pollution tolerances amongst various species.

Macroinvertebrates respond to human disturbance in predictable ways, are relatively easy to identify in the laboratory, often live for more than a year and, unlike fish, have limited mobility. In fact, because they cannot escape pollution, macroinvertebrates have the capacity to integrate the effects of the stressors to which they are exposed, in combination and over time.

Evaluating the abundance and variety of benthic macroinvertebrates in a waterbody gives us an indication of the biological condition of that waterbody. Generally, waterbodies in healthy biological condition support a wide variety and high number of macroinvertebrate taxa, including many that are intolerant of pollution. Samples yielding only pollution–tolerant species or very little diversity or abundance may indicate a less healthy waterbody. Biological condition is the most comprehensive indicator of waterbody health. When the biology of a waterbody is healthy, the chemical and physical components of the waterbody are also typically in good condition. In addition to benthic macroinvertebrates, scientists also evaluate algae and fish populations to come up with robust estimates of biological condition.

Individually, macroinvertebrates can also be used to indicate sublethal effects Chironomids in, are used as bioindicators for environmental stress in aquatic ecosystems at different levels, including morphological deformities. Deformities of invertebrates are used frequently as ecotoxicological endpoints in cases of legacy environmental issues

Bugs to Go: California Digital Reference Collection (Interactive PDF)

Bugs of the Underworld (Intro to DVD)

Clean Water Team's Guidance Compendium for Watershed Monitoring and Assessment
3.5 Biological Communities Indicators (Some documents are available in Spanish.)

Indicators: Benthic Macroinvertebrates

Migratory Dragonfly Partnership

Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish

Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT)
SWAMP IQ Bioassessment

- College of Bioassessment

- SWAMP Field Methods Course
- Standard Operating Procedures for Field Data Collection
    - Supplemental Guidance Document for SWAMP Bioassessment Field Protocol

The Bug Book: A Guide to the Identification of Common Aquatic Benthic Macroinvertebrate Families of California and Western North America

Scientific Collecting Permits

Fish and Game Code (FGC) sections 1002, 1002.5 and 1003 authorize the California Department of Fish and Wildlife (Department) to issue permits for the take or possession of wildlife, including mammals, birds and the nests and eggs thereof, reptiles, amphibians, fish, certain plants, and invertebrates for scientific, educational, and propagation purposes. The Department currently implements this authority through Section 650, Title 14, California Code of Regulations (CCR), by issuing Scientific Collecting Permits (SCP) to take or possess wildlife for such purposes.

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