

**Fact Sheet**

# Pilot Study Monitoring Results Suggest 67% to 78% of California's Wadeable Perennial Streams in "Good" Condition Based on Selected Indicators

## Overview

**Waterbody Type: Wadeable Perennial Streams and Rivers | Beneficial Use: Aquatic Life**

One of the first steps in managing our environmental resources is to determine their current condition by answering the key question, "What is the overall condition of California's surface waters?" Often-raised questions relating to the condition of our waters include, "Is the water safe to drink?" "Are the waters safe to swim?" "Are the fish safe to eat?" and "Is aquatic life healthy?" The assessments summarized in this fact sheet focus on the question "Is aquatic life healthy?" in our wadeable perennial streams.

Streams and rivers support aquatic life by providing habitat, spawning grounds, food and shelter for fish, birds and other wildlife. "Wadeable" streams refer to streams, creeks and small rivers that are shallow enough to sample without boats. "Perennial" streams are those that contain water year-round. California has about 55,000 kilometers of wadeable perennial streams.

The biological condition of wadeable perennial streams was estimated using benthic macroinvertebrates, which live on the bottom of streams. Examples include the aquatic stages of insects such as dragonflies, crustaceans such as crayfish, and worms and snails. Since some benthic macroinvertebrates are more sensitive to pollution than others, we can determine a great deal about stream health from the organisms that live there.

There are well-established methods for assessing the biological condition of wadeable perennial streams based on benthic macroinvertebrate communities. An equally important subset of streams and rivers in California are non-perennial; however, this subset is not included in the assessment because suitable indicators are still being developed. Modified streams, which make up a large proportion of streams in agricultural areas such as the Central Valley, are also excluded because they were not part of population of sites sampled.

**Table 1: Statewide Assessments**

Indicator Type	Condition Category	
	Good Condition (% area)	Poor Condition (% area)
California Macroinvertebrate Observed/Expected Index (O/E Index)	67	33
Western EMAP Macroinvertebrate Index of Biotic Integrity (IBI)	78	22



## Findings

Using benthic macroinvertebrate indices, 67 to 78 percent of wadeable perennial streams are in “good” condition when compared to the best available reference, or least disturbed sites in California.<sup>1</sup>

The two benthic macroinvertebrate indices used are the California observed/expected index (O/E index) and the Western-Environmental Monitoring and Assessment Program (Western-EMAP) index of biotic integrity (IBI). The O/E index compares the number of organism types expected to exist at a site (E) to the number that are actually observed (O). The expected types of organisms are based on models developed from data collected at reference sites. The IBI is the sum of a number of individual measures of biological condition, such as richness of species and pollution tolerance. In both cases, the ability to recognize ecological degradation relies on understanding conditions expected in the absence of human disturbance. (See Table 1.)

The findings<sup>2</sup> represent the state’s initial attempt to make broad statistical estimates of the biological condition of wadeable perennial streams statewide. It establishes a baseline that we can use to compare against future assessments. The assessments focus on one beneficial use—aquatic life use—and are based only on aquatic invertebrate data collected in California as part of U.S. Environmental Protection Agency’s Environmental Monitoring and Assessment Program-Western Pilot study (EMAP). The survey design generates statistically defensible, unbiased condition assessments. As such, it did not specifically focus on areas of high impact. Other sampling, which has targeted such areas, has shown toxicity and elevated chemical levels in some areas.

## Frequently Asked Questions

### What data were used for the assessment?

From 1999 through 2003, field crews sampled more than 190 randomly selected sites across the state and in three study areas in the northern, central and southern coastal watersheds as part of the Environmental Monitoring and Assessment Program. Sites were chosen through a statistical sampling technique in which every stream segment has a known probability of being selected. Standardized field methods and laboratory protocols were used to ensure comparability. Field crews sampled each site during the summer. The sampling sites are shown in Figure 1.

**Figure 1: California Sites Sampled for EMAP-Inland Surface Waters, 1999–2003**



### What assessment thresholds were used to evaluate the data?

The statewide assessments<sup>3</sup> based on biotic indices use statistically established threshold values. (See Table 2.) These thresholds do not reflect water quality standards for California. California is currently working toward specific statewide threshold values for indices of biotic integrity.

1. *Probabilistic Assessment of the Biotic Condition of Perennial Streams and Rivers in California*. Final report, 2005. Posted at [[www.waterboards.ca.gov/swamp/reports.html](http://www.waterboards.ca.gov/swamp/reports.html)].

2. *Water Quality Assessment of the Condition of California Coastal Waters and Wadeable Streams*. State Water Resources Control Board. 2006.

3. *Ibid.*

**Table 2: Indicators and Threshold Values Used for Assessment**

Indicator Type	Threshold Value between Good and Poor
California Macroinvertebrate Observed/Expected Index (O/E Index)	O/E score of <0.77
Western EMAP Macroinvertebrate Index of Biotic Integrity (IBI)	IBI score of <57 for mountain sites; IBI score of <47 for very dry habitat sites

### What are the results of national and major regional assessments of wadeable streams?

A recently released U.S. Environmental Protection Agency (U.S. EPA) draft assessment<sup>4</sup> reports that some 53 percent of the nation's stream miles are in "fair" to "good" condition based on a national macroinvertebrate IBI. This national assessment applies to the lower 48 states. The draft report also includes assessment of three major regions of the United States: the Eastern Highlands, the Plains and Lowlands and the West. Of these three regions, the West is in the best condition, with 71 percent of the length of wadeable waters in "fair" to "good" condition.

Based on the thresholds developed for western streams (the Western-EMAP IBI results), the condition of California streams appears to be comparable to the condition of western streams and better than the condition of the nation's

streams. However, this result should be interpreted with caution because of differences in thresholds used. Also, modified channels were not included in the monitoring design. Modified channels comprise a larger proportion of stream length in California than in most other western states.

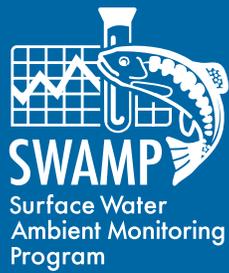
### How will California continue to provide statewide assessments of wadeable streams?

Periodic statewide assessments of wadeable streams will be possible through the California Monitoring and Assessment Program (CMAP). CMAP is a collaboration with the U.S. EPA, the State Water Quality Control Board's Nonpoint Source Program and Surface Water Ambient Monitoring Program, the California Coastal Commission and the Department of Fish and Game.

CMAP builds on the EMAP-Inland Surface Waters program and follows a similar sampling design except that it is stratified by land cover classes such as agriculture, urban and forest. Approximately 50 sites are sampled per year statewide. CMAP also includes modified channels. The program will allow for biennial statewide condition assessments. It will also enable researchers to begin evaluating associations between observed biotic effects and nonpoint source land use categories.



4. *Wadeable Streams Assessment: A Collaborative Survey of the Nation's Streams*. U.S. Environmental Protection Agency document 841-B-06-002. Posted at [[www.epa.gov/owow/streamsurvey/](http://www.epa.gov/owow/streamsurvey/)].



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