SWAMP
Surface Water
Ambient Monitoring
Program

THE EFFECTS OF WILDFIRE ON BENTHIC MACROINVERTEBRATES IN SOUTHERN CALIFORNIA STREAMS

What is it?

Severe wildfires burned large portions of San Diego County and San Bernardino County in October 2003 and October 2007. After the 2003 wildfires, the San Diego Water Board funded a project to study the impacts of the wildfires on biological conditions in southern California streams. The study was conducted by the Department of Fish and Game Aquatic Bioassessment Laboratory. The study was designed to answer the following questions:

1. To what extent do wildfires affect biological conditions?
2. How long does it take for biological conditions to recover after a wildfire?
3. Does recovery in developed and undeveloped watersheds differ?
4. What are the primary mechanisms by which wildfires affect biological conditions?

Between 2004 and 2009, fifty sites in developed and undeveloped watersheds in San Diego and San Bernardino Counties were sampled once per year for benthic macroinvertebrates. Since the San Diego Water Board had already established a biological condition monitoring program before the 2003 wildfires, pre-wildfire data were available. The biological data were supplemented with a suite of physical habitat data. Biological data were analyzed using two bioassessment scoring tools, the Observed/Expected Index of taxonomic completeness (O/E) and the Southern California Index of Biological Integrity (SoCal IBI).

The results show that the biological condition scores decreased between 30% and 50% (i.e., biological conditions deteriorated substantially) for up to two years following the wildfires. In most cases, the biological conditions recovered by the third year. The same three year recovery time frame was found in developed and undeveloped watersheds. Based on the results, it appears that streambed alteration caused by catastrophic erosion was the primary mechanism leading to degraded biological conditions in the year after the fire. In addition, biological conditions were positively correlated with riparian canopy cover. Conclusions of this study are complicated by the

fact that several sites were in non-perennial streams (i.e., where there was not year-round stream flow). As a result, biological conditions at those sites may have been influenced by the flow regime as well as wildfire effects.

Why is it important to the State?

This project is important to the State because it can offer management recommendations after wildfires: (1) Allow three years of recovery time in cases where reference sites are sampled in order to set biological expectations; (2) Protect the riparian canopy cover because it has a positive influence on the recovery of biological conditions after wildfires;(3) Conduct more research on non-perennial streams and their biological conditions; and (4) Develop strong partnerships with other monitoring groups in order to build coordinated and effective monitoring programs for wildfire effects and non-perennial streams. Although this study was conducted in southern California, it is likely that the results are applicable to other regions in California.

Biological information of southern California streams provides a direct measure of stream health that can be easily communicated to the public. This allows citizens to gain a greater understanding of the local water resources, which generally leads to improved stewardship and better solutions for water quality problems.

How will this information be used?

The data collected by this project are SWAMP comparable and will be used in many ways:

- Regional Boards and State Water Board can use the data to decide what management decisions should be taken to protect streams from wildfires, and restore streams after wildfires.
- Stormwater and other regulated agencies can use the data to implement management strategies to protect southern California's streams from the impact of wildfires.
- The data will be uploaded to CEDEN (California Environmental Data Exchange Network) for use by public, private, and government organizations and individuals.
- Data from this project can also be used by the State Water Board to identify impaired waters under the Clean Water Act, 303(d) and 305(b) Integrated Reporting requirement.

The Technical Report and the Management Summary for this project can be found here.