

Effects of wildfires on biological conditions in southern California streams (Lilian Busse)

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? and (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), so biological conditions at those sites may have been influenced by the flow regime as well as wildfire effects.

The study authors offer several management recommendations: (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.

The results of this study support the preliminary findings from the regional bioassessment monitoring program of the Stormwater Monitoring Coalition (“SMC study”) that the alteration of physical habitat is one of the major causes of poor biological conditions. Relative risk analysis of the SMC study data showed that three of the four highest risk stressors for poor biological conditions were related to physical habitat (percent sand and fines, channel alteration, and riparian disturbance). This post-wildfire study demonstrated that channel alteration and the disturbance of the riparian canopy cover have a significant influence on biological conditions.

Together, the two studies support San Diego Water Board efforts to prevent further degradation of physical habitat (e.g. sediment discharge and/or riparian disturbance) and restore streams with disturbed physical habitat.

The results of this study are presented in a technical report and a 6-page management summary, both of which can be found at the San Diego Water Board Surface Water Ambient Monitoring Program (SWAMP) website:

http://www.waterboards.ca.gov/sandiego/water_issues/programs/swamp/