

Effects of post-fire runoff on surface water quality: Development of a southern California regional monitoring program with management questions and implementation recommendations

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EXECUTIVE SUMMARY

Periodic wildfires are a natural component of southern California's forest and scrubland and essential to maintaining overall ecological health of these systems. However, the frequency and intensity of wildfires has increased in association with human activities in and near natural forest and foothill areas. The effects of fire on hydrologic response and sediment loads in southern California have been noted for over 80 years, yet no coordinated monitoring of water quality following fires currently occurs. The lack of coordinated monitoring is particularly problematic in southern California because watersheds affected by fire often drain to waterbodies that support sensitive resources or that have been designated as impaired under Section 303(d) of the Clean Water Act, often for the same constituents found in post-fire runoff. Consequently, the contribution of metals, nutrients, and organic contaminants from post-fire runoff to receiving waters is poorly understood in terms of both the magnitude and persistence of potential effects.

The lack of a coordinated post-fire monitoring program results from several factors. First, there is no procedure for post-fire water quality monitoring that identifies a standard set of constituents and monitoring protocols appropriate for assessing water quality following fires. Second, resources are often scarce following fires making it difficult for various entities to coordinate. Third, there is no regional entity responsible for coordinating post-fire sampling, compiling the resultant data, and disseminating the information back to managers at the local and regional levels. Fourth, because fires occur unexpectedly, there is often insufficient available funding for conducting post-fire sampling.

This document describes a regional post-fire water quality monitoring program. The goal of the program is to help address the current information gaps by providing agreed upon regional post-fire water quality sampling procedures, including an implementation plan and a funding strategy. This plan was developed by a team of technical experts, stormwater managers, and regulators from academia, government, and the private sector. The plan provides a ready "off-the-shelf" response plan that can be quickly implemented after fires.

The post-fire monitoring program is organized around three priority management questions:

1. How does post-fire runoff affect contaminant flux?
2. What is the effect of post-fire runoff on downstream receiving waters?
3. What are the factors that influence how long post-fire runoff effects persist?

The general sampling design, site selection process, sampling approach, and recommended indicators for each of these questions are summarized in Table ES-1. Although they are related, monitoring to address each of the questions is not interdependent. The three major monitoring elements are separable and can be implemented as distinct units or as an integrated program.

Table ES-1: Summary of monitoring design for each priority monitoring question.

Management Question	MQ1: How does post-fire runoff affect contaminant flux?	MQ2: What is the likely effect of post-fire runoff on downstream receiving waters?	MQ3: What are the factors that influence how long post-fire runoff effects persist?
General Design	Comparison of runoff from burn areas to reference or control sites	Pre- vs. post-fire monitoring	Comparison of post-fire condition to regional ambient condition
Flow Conditions to Target	Stormwater runoff	Non-storm, dry weather flow	Non-storm, dry weather flow
Selection of Burned Sites	Terminus of burned catchment using established criteria	Bottom of watershed at confluence with receiving water of interest - after fire, before and after first runoff event	Overlay SCRMP* bioassessment sites and burn maps to select burn locations
Selection of Comparison Sites	Natural sites, urban sites, existing MS4 monitoring sites		Use existing pre-burn SCRMP ambient bioassessment data
Indicators	Water chemistry, constituent concentrations	Water chemistry, sediment toxicity (optional benthic response indicators)	IBI, CRAM, basic water chemistry
Period and Duration of Monitoring	At least three storms during first and/or second winter following fire	Before 1 st storm and annually until measures return to baseline (pre-fire levels)	During spring index periods - annual visits over time

*SCRMP = Stormwater Monitoring Coalition's Southern California Regional Monitoring Plan

The regional plan includes site selection criteria that allow for pre-selection and prioritization of potential sampling sites based on the sensitivity of potentially affected resources, presence of previous and available monitoring data, feasibility, accessibility, and ability to coordinate with other monitoring programs. Pre-selection of sites and up-front coordination will allow for more rapid and effective response following fires. Finally, the plan includes preliminary recommendations for quality assurance procedures, data management, and communication that will facilitate information sharing and ongoing coordination.

Ongoing program development and coordination will be accomplished through a post-fire runoff working group that consists of the U.S. Forest Service, U.S. Geological Survey, CAL FIRE, the regional water quality control boards, major municipalities, key landowners, and local researchers. Those interested in participating in the working group should feel free to contact Eric Stein (erics@sccwrp.org, 714/755-3233) or Jeff Brown (jeffb@sccwrp.org, 714/755-3226).

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/598_SoCalRegionalFireMonitoringPlan.pdf