Preface

I became interested in the issue of landscape response to fire in a very direct and personal way. My wife, Blythe Mickelson, and I were victims of the Oakland Firestorm. We lost our home, our neighborhood, and all of our belongings when our community burned to the ground. On Saturday October 1991, a small brush fire occurred on the hillslope between Marlborough Terrace and Buckingham in the Oakland Hills. The fire was supposedly extinguished that afternoon in a joint effort between firefighters and helicopter crews dropping water from large buckets. The next morning, October 20, I was in my back yard watering and pruning my garden. The day was extremely hot and a strong dry wind was blowing from the Northeast. I was thinking to myself that we were extremely lucky that the fire had been put out the day before. Within a few minutes of that thought, I started to smell smoke. In another minute or so, tongues of smoke appeared in the sky. I left the house and walked along the street to the north, hoping to get an idea of the origin of the smoke. Within five minutes the spirals of smoke grew larger and darker. I went home and told my wife to get her important stuff together and be prepared to leave. I left the house and again walked down the street, hoping to interact with neighbors, but saw few people. Just then, a grove of Eucalyptus trees less than 300 meters to the north of me burst into flames. There had been no fire front or hints of the fire other than the smoke behind the ridge to suggest that we were in imminent danger. I raced home, yelling along the way for my neighbors to leave their homes immediately. When I got inside, Blythe was on the phone with her cousin Jennifer Gurney, remarking that the last time they had talked (almost a month previously) there had been a fire on the hill just to the south of us. What a coincidence that it should be happening again. She had not yet thought it necessary for us to leave, as the fire department would surely take care of the situation (as it had been the month before). Outside, the day was turning to night as smoke, ash, and burning embers descended on our neighborhood. Blythe now began to understand what was happening. She dressed, making sure to wear only natural fibers (synthetics melt and can easily be ignited), and we left our home carrying nothing but the clothes on our backs. As we walked out the door, the Monterey pine not more than 30 feet away was a ball of flame. This all occurred within 20 minutes from the time I first started smelling smoke. As we drove down the hill in the direction of the Warren freeway (Highway 13), spot fires were breaking out to the south, the fire having jumped Highway 24 (certainly one of the largest fire breaks ever constructed).

Within a few days following the fire, media predictions of a second disaster began to appear in local newspapers (Oakland Tribune: October 23, 25, 26, 1991; San Francisco Chronicle: October 23, 1991; Los Angeles Times: October 26, 1991) and a national news magazine (Witteman, 1991). The National Landslide Information Center in Golden, Colorado, was quoted as comparing the Oakland Hills fire to big fires in Southern California, while others predicted “massive mud and landslides” due to fire developed hydrophobicity (San Francisco Chronicle, October 23, 1991, page A-15). The Natural Resources Conservation Service (formerly the Soil Conservation Service - SCS) and some local geologists predicted that the loss of vegetation would result in shallow earth and debris flows even under normal rainfall conditions (Oakland Tribune, October 23, 1991, page A-13). Experts said that because flames destroyed roots as well as brush and trees, tons of rocks and mud could easily be loosened by heavy rain and pour onto homes at lower elevations (Los Angeles Times, October 26, 1991, page A-24).

What followed was a massive application of erosion control measures, many of which had not previously been applied to wildland fire areas. I decided to develop a masters thesis around two central questions: 1) what controls the magnitude of erosional and runoff response following a fire; and 2) what are appropriate and effective measures to use for erosion control after a fire?

To analyze these two questions, I intensively examined the response to the Oakland Firestorm and made extensive observations following the 1993 Laguna Beach, Malibu, and Kinneloa fires in Southern California, the 1994 Highway 41 fire in San Luis Obispo County, and the 1994 fire in Sydney, Australia. I also visited burn areas following the 1995 Mount Vision fire at Point Reyes National Seashore, and the 1996 Calabasas fire a few miles north of Malibu in Southern California. In 1995, I also visited the 1994 Boise River wildfire in Idaho, shortly after several large debris flows occurred that summer.

The thesis is structured as follows: Chapter 1 consists of an overview of the current model of post-fire response common to Southern California burn areas and a review of the literature on effects of fire. I report my observations in Chapters 2-4. In Chapter 2, I present my analysis of the runoff and erosion response and mitigation effectiveness in the Oakland Firestorm area. I review the perception of hazard after the fire and the mitigation effort employed and then present my winter monitoring and summer experimental observations. This chapter includes the basic observations and data that were summarized in Booker et al. (1993, 1995). In Chapter 3, I report field observations of erosion processes at the other study locations. In Chapter 4, I report field observations from several locations in Southern California concerning the effectiveness of various post-fire erosion control measures. Finally, in Chapter 5, I draw together these various efforts to propose some general conclusions about post-fire landscape controls on runoff and erosion and the appropriate measures to use to mitigate post-fire hazards.

A note to the reader, I take every opportunity to convert sediment yield data to an equivalent soil loss in millimeters. I do this conversion because, while I can visualize 1 mm of soil loss, I find the significance of 1000 m^3 km^{-2} somewhat elusive. For all equivalent soil loss conversions, I use for convenience a soil bulk density of 1 g cm^{-2} for eroded materials.

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I started out in the environmental planning program with Matt Kondolf in 1991 before moving over to Geology and Geophysics. Following the fire, the faculty, staff and students in the Landscape Architecture Department were a great source of comfort and support: they raised money to replace my lost books and supplies; Fran Stateler gave me her 1971 Volvo sedan which carried me through my fieldwork following the Oakland fire; and my students in the Environmental Geology for Planners course (LA 220) replaced all my lost field gear. To all of you, again, thank you very much.

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