

A channel evolution model in response to urbanization in southern California

Robert J. Hawley¹, Brian P. Bledsoe², and Eric Stein³
Department of Civil and Environmental Engineering, Colorado State University

Abstract. The conversion of land from undeveloped to urban is ubiquitous in southern California. If left unmitigated, the increase in impervious surface area results in decreased infiltration and increased surface runoff. As a result, receiving streams experience larger flows relative to the undeveloped setting for equivalent rainfalls. The altered delivery of water and sediment from the watershed causes changes in the hydraulic and sediment transport regimes within channels. In many cases, this has led to significant changes in channel form. Some of the primary drivers and boundary conditions in the region include a semi-arid climate, erodible soils, high relief, flashy flow regime, and high sediment loads relative to coarser, wetter, and/or flatter regions of the U.S. A mechanistic model of morphologic adjustments in response to urbanization is presented. In some cases, responses follow the trajectory of the original Channel Evolution Model (CEM) of Schumm *et al.* (1984) for single-thread incision-driven responses. Departures from the original CEM are also presented, including an incipient response of widening rather than incising. Evolutionary endpoints of braided planform, opposed to a return to quasi-equilibrium meandering form, are also central to this model.

¹ Ph.D. Candidate, Hydraulic Engineering, Stream Restoration, and River Mechanics Division
Dept. of Civil and Environmental Engineering
Colorado State University
Fort Collins, CO. 80523-1372
Tel: (502) 718-2912
e-mail: bhawley@engr.colostate.edu

² Associate Professor, Hydraulic Engineering, Stream Restoration, and River Mechanics Division
Dept. of Civil and Environmental Engineering
Colorado State University
Fort Collins, CO. 80523-1372
Tel: (502) 718-2912
e-mail: brian.bledsoe@engr.colostate.edu

³ Principal Scientist, Watershed Department
Southern California Coastal Water Research Project
3535 Harbor Blvd. Suite 110
Costa Mesa, CA. 92626-1437
Tel: (714) 755-3233
e-mail: erics@sccwrp.org