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Management of stream channel erosion due to urbanization in Southern California (USA): science, policy and research challenges

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Changes in stormwater runoff characteristics and in-stream processes caused by changes in land use are termed "hydromodification." Urbanization can result in hydromodification by increasing runoff volumes, frequencies, durations, and peak flows, as well as by reducing sediment supply to streams and by changing the overall water balance affecting groundwater recharge and baseflows. Unless prevented or controlled, hydromodification can cause geomorphic and biological impacts to stream systems, including severe erosion, damage to property and infrastructure, reductions in water quality, impairment of stream biota, and excessive sediment delivery to coastal waters. This paper assesses the existing and emerging approaches to managing hydromodification impacts due to urbanization in Southern California, a Mediterranean climate region. The paper begins with a review and synthesis of the current scientific literature with respect to causes and controls of hydromodification impacts due to urbanization, with particular interest in studies from Mediterranean regions and ephemeral stream systems. A review of regulations governing new developments within Southern California compares the technical basis and scope of these regulations against the literature findings, and makes recommendations for revised management approaches and critical areas for further scientific research. Key challenges include: simplifying the hydrologic analyses required to size stormwater controls for proposed developments; addressing reductions in sediment supply; and understanding how to quantify potential impacts to aggrading streams, or large sediment-dominated river systems.

Although this study focuses on urban development controls, the underlying findings and technical questions have broad applicability to management efforts for other types of human-induced land use changes.