

Catena, 70, 49-67.

Buffers, barriers and blankets: The (dis)connectivity of catchment-scale sediment cascades

Kirstie A. Fryirs a, Gary J. Brierley b, Nicholas J. Preston c, Mio Kasai a

a Department of Physical Geography, Division of Environmental and Life Sciences, Macquarie University, North Ryde, NSW 2109, Australia

b School of Geography and Environmental Science, University of Auckland, Box 92019, Auckland New Zealand

c Institute of Geography, School of Earth Sciences, Victoria University of Wellington, Box 600, Wellington, New Zealand

Received 9 September 2004; received in revised form 10 July 2006; accepted 31 July 2006

Abstract

Catchment configuration and the nature of connectivity within and between landscape compartments affect the operation of sediment cascades and geomorphic responses to disturbance events of differing magnitude and frequency. This paper introduces the concept of landform impediments, termed buffers, barriers and blankets, that impede sediment conveyance by limiting the connectivity between landscape compartments. Buffers restrict sediment delivery to channels, barriers inhibit sediment movement along channels, and blankets drape channel or floodplain surfaces affecting the accessibility of sediment to entrainment. These features operate as a series of switches which turn on/off processes of sediment delivery, determining the effective catchment area at any given time. Using previously documented examples, the role of these features in affecting the operation of sediment cascades in a low relief, passive landscape setting such as the Australian landmass is contrasted to examples from high relief, uplifting settings in New Zealand. The Australian examples are further explored by examining how changes to landscape connectivity brought about by human disturbance since European settlement have impacted upon landscape sensitivity and prospects for river recovery. This approach to analysis of impediments to sediment conveyance is generic and can be applied in any environmental setting.

© 2006 Elsevier B.V. All rights reserved.

Keywords: Disconnectivity; Decoupling; Sediment cascades; Sediment budgets; Sensitivity; River recovery; Switches