Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08303, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08303
EGU General Assembly 2008

Geomorphic response to extreme change in a Mediterranean ecosystem: Holocene alluvial history of Santa Catalina Island, California, U.S.A.

Eric V. MCDONALD and Thomas F. Bullard

Division of Earth & Ecosystem Sciences, Desert Research Institute, Reno, NV, USA (emcdonal@dri.edu)

Holocene alluvial stratigraphy combined with a history of extensive vegetation disturbance caused by more than 100 years of intense grazing on Santa Catalina Island provides a contrasting record of soil degradation and hillslope stability of typical Mediterranean ecosystems. Knowledge of landscape stability is derived from extensive characterization of axial channel alluvium, tributary alluvial deposits, and soils found along principal ephemeral drainage basins. Soil-stratigraphy associated with surficial deposits, ranging in thickness from 2 to 8 meters, provides an excellent record of periodic hillslope instability during the Holocene and associated aggradation along ephemeral channels. Fluvial deposits (axial and tributary) contain multiple buried soils having strong A horizons, many with weakly developed Bw horizons, that record multiple episodes of pronounced incision and deposition. Radiocarbon dates indicate that a pronounced period of channel aggradation, primarily consisting of pebble-gravel deposits overlying a bedrock channel began about 6940 to 5300 Cal yr BP. Radiocarbon dates and soil stratigraphy of axial and a few 2^{nd} order tributaries along the main valley washes also indicate that widespread deposition continued episodically, with the last two periods of widespread aggradation occurring between about 920 to 1180 Cal yr BP and between about 780 to 300 Cal yr BP. Deep ($>$75 cm), moderately developed soils examined along steep hillslopes also indicate relative slope stability over the past several centuries to several thousand years, although, scattered but localized areas of historic erosion are observed. Whereas the pre-grazing Holocene depositional and erosional record is well represented in the valley bottoms, there is little stratigraphic

evidence for widespread historic hillslope erosion and fluvial deposition in tributaries or trunk streams. The relation implies that considerable and extensive decrease in vegetation by itself appears to be insufficient for triggering a cycle of historic hillslope erosion and valley aggradation. This means that historic hillslope erosion, channel incision, and sedimentation are considerably less extensive than what previously occurred in the Holocene. Limited geomorphic response to overgrazing suggests that other response processes such as complex geomorphic response, extensive fires, or an increase in frequency and intensity of extreme storms may be required to mobilize sediment and initiate transport through stream networks leading to extensive arroyo filling and incision.