

Weathering, exhumation, and sediment production in granite steeplands

S. P. ANDERSON^{1*}, M. A. FOSTER², R. S. ANDERSON²
AND S. W. ANDERSON³

¹INSTAAR and Dept. of Geography, Univ. of Colorado,
Boulder, CO 80309, USA (*correspondence:
suzanne.anderson@colorado.edu)

²INSTAAR and Dept. of Geological Sciences, University of
Colorado, Boulder, CO 80309, USA

³US Geological Survey, Tacoma, WA 98402, USA

Transient adjustment of hillslopes in response to fluvial incision provides an opportunity to examine the evolution of the weathering-sediment delivery system. In the Colorado Front Range, upstream propagating knickzones have cut bedrock canyons into a low-relief crystalline rock surface (Fig. 1). Below the knickzone, the canyons widen and the walls are etched by steep debris flow channels.

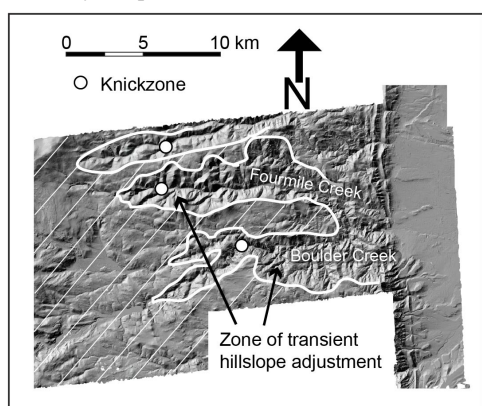


Fig. 1 Front Range canyons in low relief surface (after [1]).

Debris flows triggered by an extreme storm in 2013 stripped ~15 mm from steep basins lining Boulder Creek [2]. Based on lowering rates deduced from ¹⁰Be concentrations, this represents ~400 years of mobile regolith production by weathering in the basins that failed. This suggests that canyon rock walls evolve into steep, mobile regolith mantled basins. In these basins, a two-step sediment delivery system operates. Weathering of debris from bedrock slowly loads low order channels, which are then evacuated by debris flows triggered by rare storms. The evolution from rock to soil-mantled slopes implies that weathering proceeds faster than stripping.

[1] Anderson, SP *et al.* (2012) *CR Geoscience* **344**: 586-596.

[2] Anderson *et al.* (2015), *Geology* doi:10.1130/G36507.1.