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**DEEP-SEATED BEDROCK LANDSLIDING
IN GRAND CANYON'S SURPRISE VALLEY AREA**

by

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ABSTRACT

The effects of large-scale landsliding on the continental-scale Colorado River system in Grand Canyon remain poorly understood. This paper describes deep-seated bedrock landslides in the Surprise Valley area by combining detailed mapping, volume-balanced cross-sections, strath terrace heights, and cosmogenic burial dating of river deposits buried by landslides. Mapping shows failures involving ~1000 m Paleozoic section localized within basal shale detachments, dammed and diverted the Colorado River and local tributaries, and forced the creation of epigenetic gorges. Restored cross-sections show pre-existing paleotopography in Surprise Valley possibly created by an older, through-flowing Colorado River. Two individual landslide segments dated to ~1 Ma with large errors via cosmogenic burial age dating. Detachment height, long-term bedrock incision rates, and structural relationships suggest major failures events occurred at 3 Ma, 1 Ma, <<1 Ma. Paleotopography, groundwater, and bedrock incision likely drove landsliding rather than lava-dammed lakes downstream based on geochronology.

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