Flood hazards: Vermont and Colorado as case studies

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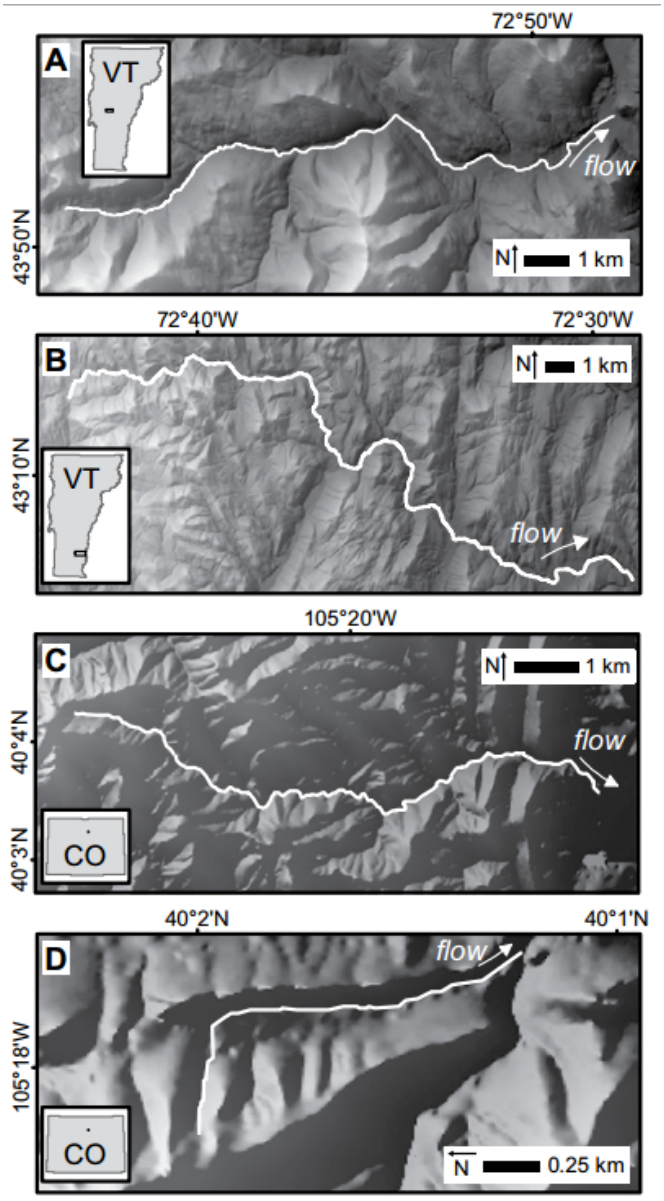

Stream locations (white lines) and topography (shaded relief from 10 m DEM, US Geological Survey [USGS] National Map). A: West Branch of White River, Vermont, USA, watershed area 112 km2, channel relief 632 to 232 m asl (above sea level). B: Saxtons River, Vermont, USA, watershed area 180 km2, channel relief 550 to 120 m asl. C: Fourmile Canyon Creek, Colorado, USA, watershed area 19 km2, channel relief 2419 to 1687 m asl. D: Mount Sanitas, Colorado, USA, watershed area 0.7 km2, channel relief 1953 to 1694 m asl. Credit: Gartner et al. and *Geology*

Catastrophic floods in 2011 in Vermont and 2013 in Colorado devastated many communities. While flood waters were the highest in recorded history, much of the damage done by these floods was not related to inundation by flood water, but instead caused by abundant erosion and sedimentation. These floods provided a rare opportunity to better understand controls on the locations of these different hazards.

In their study for Geology, John D. Gartner and colleagues explore the effects of downstream increases and decreases in stream power, which are linked in part to variations in river slope constrained by underlying geology. A physics-based relationship indicates that river reaches are susceptible to erosion, such as landslides and bank failures, where stream power increases in the downstream direction. Conversely, river reaches are prone to floodplain sedimentation where stream power decreases in the downstream direction, because the river cannot carry the load delivered from upstream.

These predictions are compared with observed locations of erosion and sedimentation along four rivers severely affected by these floods. Gartner and colleagues' analysis successfully predicts river channel and floodplain responses in almost 90% of cases studied. This direct field evidence highlights the potential role of downstream changes in stream power in connections between river channels and laterally-adjacent banks, slopes, and floodplains.

More information: Gradients in stream power influence lateral and down-stream sediment flux in floodsJohn D. Gartner et al., Department of Earth Science, Dartmouth College, Hanover, New Hampshire 03755, USA.

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