



## **The role of roads and trails as hydrological conduits contributing to gully erosion in the dry savannas: evidence from high resolution DEMs**

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Dry savannas of northern Queensland, Australia experience severe gully erosion, particularly areas that have been heavily grazed. Field surveys have also noted the influence of unpaved roads and cattle trails on concentrating storm runoff into gully systems. To better quantify the effect of these roads and trails we use high resolution digital elevation models (DEMs) based on drone surveys to develop detailed surface flow paths using a threshold contributing area of 50 m<sup>2</sup>. Pathways constructed in several gully catchments clearly show the influences of unpaved roads and cattle trails on concentrating runoff into the heads of gully systems. Indices of hydrological connectivity (IC) throughout drainage areas above and downstream of selected gully systems were calculated as the ratio of upslope to downslope sediment routing functions, based on upslope area, mean slope gradient, a weighting factor related to impedance to overland flow, and flow path distance (for the downstream function). Maps of IC within the heavily grazed Weany Creek catchment (13 km<sup>2</sup>) of northeast Queensland show that existing roads and cattle trails can increase hydrologic connectivity to gully systems. Our remote sensing findings support field observations of numerous cattle trails converging above gully heads as likely contributors to gully initiation or extension. These findings can also contribute to better management practices for grazing and road location.