

EGU21-3742

<https://doi.org/10.5194/egusphere-egu21-3742>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Effects of low-cost rehabilitation measures on gully sediment yields and vegetation in a savanna rangeland

Jack Koci^{1,2}, Scott Wilkinson³, Aaron Hawdon⁴, Anne Kinsey-Henderson⁴, Rebecca Bartley⁵, and Nicholas Goodwin⁶

¹James Cook University, School of Earth and Environmental Science, Townsville, Australia (jack.koci1@jcu.edu.au)

²University of the Sunshine Coast, Sustainability Research Centre, Sippy Downs, Australia

³Commonwealth Scientific and Industrial Research Organisation, Land and Water, Canberra, Australia

⁴Commonwealth Scientific and Industrial Research Organisation, Land and Water, Townsville, Australia

⁵Commonwealth Scientific and Industrial Research Organisation, Land and Water, Brisbane, Australia

⁶Queensland Department of Environment and Science, Remote Sensing Centre, Brisbane, Australia

Gully rehabilitation is often applied as part of catchment management aimed at reducing downstream sediment yields, yet the observed responses globally are variable. In the semi-arid tropics, there is limited data available to evaluate the performance of individual rehabilitation measures. This study investigated the effects of several low-cost gully rehabilitation strategies on sediment yields and vegetation establishment, in a savanna rangeland, north-east Queensland, Australia, over an eight-year period. Four gullies were monitored as untreated control gullies. Two gullies were subject to treatments aimed at: (i) reducing runoff to gully head cuts; (ii) increasing sediment trapping on gully floors; and (iii) increasing vegetation cover on gully walls and floors. Vegetation was monitored in nine gullies under long-term grazing enclosure as an additional reference to measure vegetation recovery. A runoff diversion structure reduced headcut erosion from $4.3 \text{ m}^2 \text{ y}^{-1}$ to $1.2 \text{ m}^2 \text{ y}^{-1}$. Total sediment yields were substantially lower in gullies treated with small porous check dams and cattle exclusion fencing, with mean total sediment yields reduced by 0.3-2.4 t ha y^{-1} . These treatments, however, had negligible effect on gully fine sediment (silt and clay) yields. While sediment deposited behind porous check dams was found to contain much less fine silt and clay than parent material, it contained several times that measured in untreated gullies. Organic matter and fine material deposited behind porous check dams were sufficient to trap seeds and initiate vegetation re-establishment on the gully floor, including native perennial tussock grasses and woody trees and shrubs. In this water-limited landscape, long-term rehabilitation will be strongly influenced by prevailing climatic conditions, with periods of recovery following wetter periods, and regression during extended dry periods. Understanding linkages between rehabilitation measures, their hydrologic, hydraulic and vegetation effects and gully sediment yields is important to defining the conditions for their success.