Tropical Water Quality Hub

National Environmental Science Programme



Shifting perceptions in the ecosystem from “too hard” to “do-able”

Image: Justine Stout

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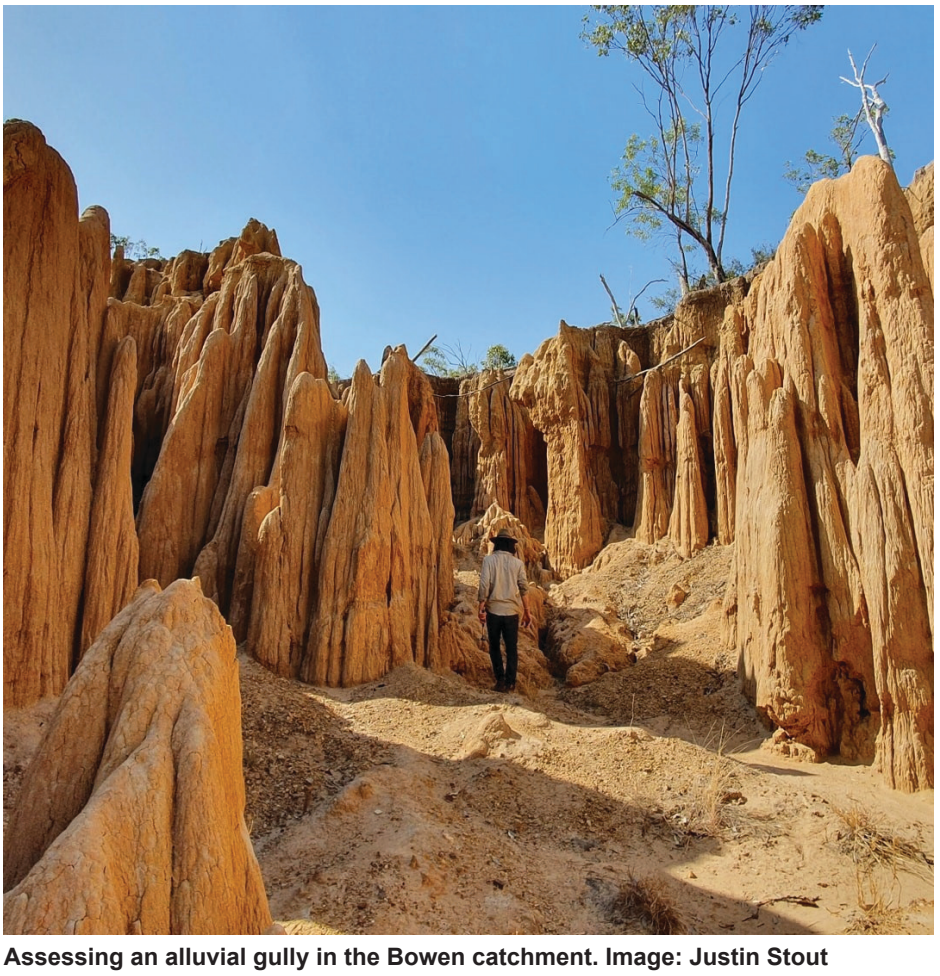
The issue

Many kinds of ecosystem repair or restoration activities that are now proving effective at fixing problems were once considered “too hard”. This case study describes important features of the decades-long research, engagement and implementation *process* that has successfully shifted the problem of fixing alluvial gully erosion in Great Barrier Reef (GBR) catchments firmly into the “do-able” category.

Alluvial gullies are a legacy of cattle grazing pressure and have long been suspected to be a significant contributor to sediment loss into waterways and the GBR lagoon, but the sheer scale on which it was occurring, and the perceived costs of remediation, made it seem an intractable problem. Even complete de-stocking did not stop these gullies eroding. The lack of good monitoring data across the scale of the GBR catchments meant that managing agencies were heavily dependent on modelled predictions of catchment sediment loads. This information is critical for guiding funding priorities and informing reporting outcomes. The underlying assumptions and conclusions within the modelling were often not trusted by landholders, which caused conflict with the managing agencies. Scientists were debating the scale of the problem and possible solutions.

By the time Prof Andrew Brooks from Griffith University arrived on the scene in 2009 the seemingly intractable landscape-scale problem also had major issues involving distrust and conflict among stakeholders. Managing agencies knew a new approach was needed to meet their commitments to improve water quality by reducing sediment loads delivered to the GBR and began investing in targeted applied research that was focused on practical solutions.



Assessing an alluvial gully in the Bowen catchment. Image: Justin Stout

The process

Given the complexity of the problem, a deliberately strategic process was adopted by management agencies and scientists to address the alignment of many moving parts in this complex management landscape. However, large scale erosion from gully features was no longer just a concern of science and management agencies, and everyone including landholders had to be brought along on the journey. Multidisciplinary teams were engaged and managed to work collaboratively to develop new tools and methods in relatively short timeframes. This approach initially commenced in 2009 through Australian Government funding in the Reef Rescue R&D program and Reef Trust, and was continued through NESP Tropical Water Quality (TWQ) Hub research.

As Prof Brooks reflected, "Working with the landholders was the least difficult part." The landholders wanted hard data, so the team set about the huge task of mapping and measuring alluvial gullies, first in the Normanby Catchment, and then in the Burdekin Catchment, which contributes a large proportion of the gully-related sediment to the GBR lagoon. This required developing respectful and trusting relationships with landholders, which took regular visits over years. It also required developing new tools and technologies to help estimate rates of sediment loss.

"Mapping and measuring gullies and sediment movement was powerful because it led to better understanding of the real problem," explained Prof Brooks. "We also realised that actually only a very small percentage of gullies were contributing most of the sediment, which enables management responses to be targeted at very defined locations."

In other words, the new tools had delivered data that provided greater insight to the problem – allowing solutions to be further progressed and the problem had become tractable.



Gully restoration works at Crocodile Station. Image: Robyn May (CYNRM)

The outcome

Working with Cape York NRM, Greening Australia and the Queensland Government through the NESP TWQ Hub research, the team trialled and evaluated a variety of rehabilitation methods including earthworks to reshape the gullies, and different soil stabilisation strategies, such as gypsum application, mulching, rock capping, and revegetation, to dramatically reduce the sediment delivered from highly active gullies. Initial results from the first experimental sites at Crocodile Station, near Laura in Cape York, demonstrated that a 0.6-hectare gully system with a total erosion rate of around 260 tonnes per year could be effectively 'turned off' in terms of sediment generation after two years. Check out **this video of the works in progress**. The project's success has prompted the Indigenous Land and Sea Corporation (ILSC), who are the owners of Crocodile Station, to expand gully rehabilitation works on the station beyond the trial sites. With the support of the Australian Government's Reef Trust, the ILSC has employed a crew of local Traditional Owners, along with local contractors, to undertake the remediation project, and through separate funding purchased an excavator to assist in the works.

Gullies on Strathalbyn Station, west of Bowen in the Burdekin, have also been a target of this research. The site has a combined treated area of 16.2 hectares (up to the 2018-19 wet season) and previously total sediment erosion rates in the order of 4,600 tonnes per year. The rehabilitation works have reduced sediment losses by an average of 98% after 2-3 years. Rehabilitation costs for these treatments range from $300 to $900 per ton of sediment per year (based on up-front costs) depending on various factors including soil type, location and consultation.

Local landholders visiting the trial sites on field demonstration days saw first-hand how the various treatments were working, and as a result larger-scale trials are now underway at prioritised gullies in the Burdekin. Management agencies are now using the team's findings to develop a standardised framework and guidelines for collecting data on erosion gullies within Queensland.[1]

"We now know that we could get halfway to the Reef 2050 Water Quality Improvement Plan sediment reduction targets by identifying and treating the most sediment-intensive and cost-effective area of gullies, which covers just 2% of the mapped gully areas," concluded Prof Brooks. The team's persistence and contributions to water quality improvements for the GBR were recognised in 2017 with the awarding of a Eureka Prize.

[1] https://science.des.qld.gov.au/government/science-division/water-modelling-network/projects



Image: Damon Telfer

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