

BURDEKIN MAJOR INTEGRATED PROJECT GULLY MAINTENANCE AND MONITORING PROJECT



TWO MILE

SITE FEATURES AND RESTORATION EFFORTS

The Two Mile gully restoration site was the first of seven locations on the property visited by Bob Shepherd from the Department of Primary Industries (DPI) in November 2018. The site, about a kilometre from Pelican Creek in the sloping Scottville area (3-4 per cent gradient), is mostly in the Narrow-leaved ironbark land type. The gully, however, was in a pocket of Box country. Box country usually contains highly erodible subsoils (Sodosols). The soils of both land types feature a sandy-loam topsoil over a low-fertility clay subsoil, so in the gully where the topsoil has eroded, achieving high ground cover to initiate gully repair is difficult.

The restoration work involved reshaping the gully and rehabilitating the catchment to improve infiltration. Trees were removed to open tunnels, and all nick points in the gully were graded to a gentler slope to promote grass cover to help protect the soil from erosion. The catchment was ripped along the contour to reduce the speed and volume of runoff downslope and to increase grass cover.

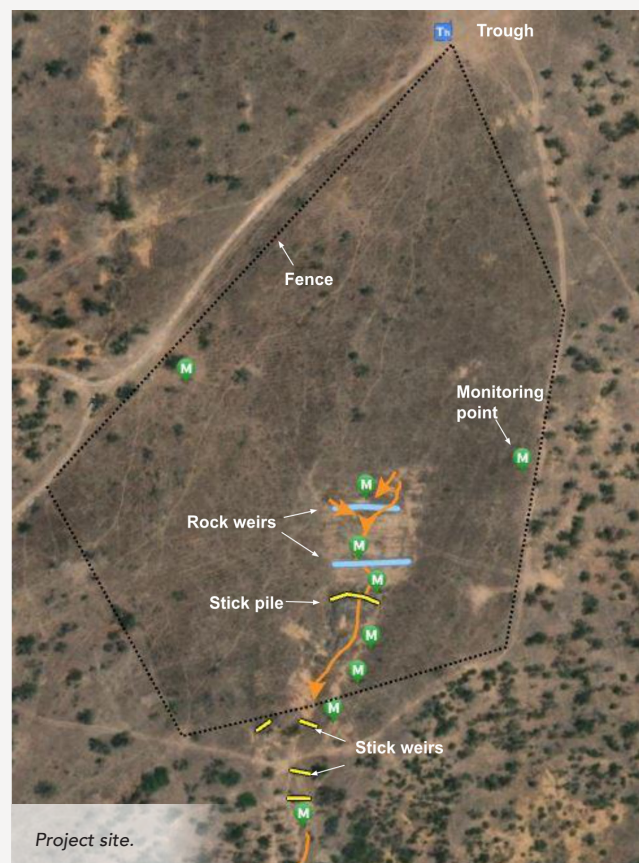
Landholder Graham Gordon applied gypsum (5t/ha) and grass seed (a pasture mix with American Buffel and *Stylosanthes* species) using a fertiliser spreader attached to his tractor. The treated area, covering 12.1 ha, was fenced off and excluded from grazing for two years. Graham also installed a water point to reduce livestock traffic on the slopes.

After the 2020-21 wet season, Graham was concerned about soil movement upslope from the log pile, where the upper gully head had been reshaped, and the earthworks had “fluffed up” the soil. In October 2021, he constructed two rock weirs (0.3m x 1.5m x ~30+m) above the logs and planted Rhodes grass around the weirs.

He also built four stick lines below the log pile to slow water flow and capture sediment and organic matter before it entered the lower drainage line. This additional work was designed in consultation with another grazier from the Scottville cluster group,

Barry Collett, who provided the machinery for the job. The work was carried out at the landholder's expense (as an ‘in kind’ contribution). It is believed these structures have played a key role in preventing sharp edges from reforming near the old gully.

The Scottville cluster group represented six neighbouring properties that had a common goal to understand the causes of their erosion hotspots, seek technical expertise to help design solutions to repair eroding gullies, and change grazing practices to allow vegetation cover to establish on remediated areas.



Project site.

REHABILITATION BENEFITS

- The landholder took advantage of accessing technical advice to help design and deliver the most appropriate treatments. There were no quick fixes or one-size-fits-all solutions.
- The design and construction have been successful, halting the progression of the gully head and protecting upslope grazing land.
- Sediment is being trapped by the leaky weirs and gully head works, preventing it from being carried off the paddock and entering local watercourses. This project is estimated to have prevented 9 tonnes per year of sediment from reaching the coast.
- Ripping the slope above the gully reduced surface water velocity, trapped fine sediment and nutrients, and promoted vegetation growth.
- The structure of the rip lines is holding up well, perhaps because of the clay soil present. It's acknowledged that rip lines don't exist in perpetuity in the landscape.
- Resting the paddock has enabled vegetation to be established, better supporting livestock by offering healthier, more palatable forage and more stable ground.

These before-and-after photos were taken near the eastern branch of the gully, looking upslope from within the gully.



GRAZING LAND MANAGEMENT

Graham leases other blocks of land in the district, which allows him to spell the remediated area (a 201ha paddock) more frequently, including during the wet season. He rotates cattle through these blocks, giving the land time to recover. Graham keeps his stocking rate conservative so the land is never over-grazed and in the wetter years, the country responds well to the extra soil moisture.

Resting paddocks during the growing season supports pasture health and grazing management by promoting pasture recovery and growth, improving soil health, preventing erosion, and increasing grazing efficiency. This practice allows grasses to strengthen their roots and increase biomass, improving resilience against drought and grazing pressure.

More resilient roots boost soil structure by creating more pores for air and water, increasing water infiltration and retention. This greater soil stability reduces erosion. It also improves forage quality for livestock and encourages plant diversity, benefiting the overall ecosystem.

Before the remediation works, the pasture in and around the gully was dominated by Indian couch, a shallow-rooted species with low drought tolerance. Post-project land condition assessments at the site, conducted from 2022 to 2024, recorded five to six grass species.

These before-and-after photos are looking downslope from the western branch of the gully.



LANDHOLDER OBSERVATIONS

Graham Gordon Grazier, Scottville

"We started this work by ripping the slope above the gully and reshaping the gully. There was a lot of timber around, so we had to clear that out first. After ripping, I used my tractor and a fertiliser spreader to apply gypsum. I didn't have quite enough to cover the whole slope, but I managed to cover about three-quarters of the area. Then, I seeded it with buffel grass — about 7kg of seed.

It turned out pretty good overall. The ripping has really helped — when it rains, the water soaks into the soil nicely. The ground is still a bit rough, even after four years, so I don't ride my motorbike over it, but the hollows help with water absorption. The clay soil up there means the ridges and furrows are still holding up.

Fencing was another thing that worked out well. We rested the area for two wet seasons, plus a dry season in between, which was about 18 months all up. We don't need the fence anymore, and now the site is managed with the rest of the paddock. When I first put the cattle back in, they went straight for the grass. It must've tasted better, probably because the ripping brought up some minerals that made the grass more palatable.

When it rains, I move the cattle to another block and give this paddock a rest. I usually try to give it 5–6 months of rest, as long as I can. I like to graze it down, but then give it a good break.

The project has made a big difference in keeping water in the paddock, stopping runoff, and improving pasture.

There's a lot more grass than there was before. The area used to be pretty bare, with not much topsoil around the gully, and the sodic clay was exposed. Now, there's at least double the amount of grass, maybe more.

After the works were done, there was a lot of loose soil, and after the first big rainfall, it started to wash out. There was just too much rain. We built two rock weirs to hold up the soil. We used some rock we had on the farm and brought in some more. The weirs, each spanning about 30–40 metres, have been very effective. I've also built a few smaller stick weirs further down and they have successfully slowed runoff and captured sediment.

One thing that didn't go well was the Buffel seed — only about a quarter of it took. It was coated Buffel, and I don't think the seed was good quality. An environmental guy from the nearby mine gave me some Rhodes grass seed to try and that has worked out much better.

Eventually, I'll get a machine to move some of the logs in the paddock and make more stick weirs in the bare spots. The local contractor left a pile of timber that could be put to good use for that.

When it comes to maintenance, you need to be on it and address it immediately. Otherwise, it'll get away, especially after the first rains. Maintenance is ongoing and has to be factored into any remediation work you undertake, big or small."



Scottville grazer Graham Gordon, pictured with NQ Dry Tropics Soil Conservation Officer Bernie Claussen, has implemented small-scale gully projects on his property to slow water flow, enhance soil and pasture health, and minimise sediment loss.

LESSONS LEARNT

- **Seek technical expertise:** Accessing technical advice was crucial in designing and delivering the most suitable treatments, reinforcing the value of tailored approaches. There are no quick fixes or one-size-fits-all solutions in landscape rehabilitation.
- **Sediment trapping success:** Leaky weirs (check dams) made of gabion-sized rock or small-diameter timber above and below gully heads effectively trap sediment, preventing it from being carried off into local watercourses and helping to reduce environmental impact.
- **Slope ripping benefits:** Ripping along the contour above the gully reduced surface water velocity, trapped fine sediment and nutrients, and encouraged vegetation growth, proving to be an erosion control measure.
- **Revegetation is key:** Revegetation is crucial to reduce erosion across all slopes and surfaces. Its contribution to soil stabilisation and erosion control cannot be overstated.
- **Fencing and stock exclusion:** Fencing a remediated gully site and excluding stock for a couple of wet seasons allowed vegetation to establish, and helped stabilise the soil and improved water infiltration, contributing to the site's overall recovery.
- **Long-term grazing benefits:** Once the area was rested and vegetation was well-established, it offered healthier, more palatable forage for livestock, contributing to more stable and productive grazing land. Giving the site time to regenerate without pressure from grazing each year ensures the area becomes more resilient, improving the chances of long-term success for the remediation efforts.

Ripping the slope above the gully reduced surface water velocity, trapped fine sediment, and promoted vegetation growth. The structure of the rip lines is holding up well.



August 2020.



October 2022.



An adjacent smaller gully was treated with rock weirs to reduce water velocity and prevent further erosion by slowing and spreading the flow of water.

MONITORING TOOLBOX AND FINDINGS

The site was monitored each year after the wet season to evaluate the effectiveness of treatment.

Site monitoring applies industry standard tools Land Condition Assessment Tool Advanced (LCAT) and Gully Maintenance Tool (GMT). These tools enable finer-scale changes to be measured over time.

1. Land Condition Assessment Tool Advanced (LCAT).
This is a science-based method for determining ABCD land condition in grazing land in the northern half of Australia. In addition, a score out of 100 is generated using key features such as the dominant pasture species, the presence of weeds, and erosion.

LCATs indicate many biophysical aspects demonstrating the process of gully stabilisation. The advanced version of the LCAT was used for monitoring to capture details that would help inform of the site's progress or otherwise towards attaining stable soil and resilient, diverse vegetation. Three LCATs were done each monitoring year; one immediately upslope of the main gully head, one in the base of the rehabilitated gully, and the third in the treated catchment.

2. Gully Maintenance Tool (GMT).
The GMT application was developed by the Department of Agriculture and Fisheries following the Gully and Stream Bank Toolbox recommendations for monitoring gullies. Information captured in this app includes photographs, rainfall, grazing of the site, a rating of the integrity of structures, as well as ground cover and plant species immediately upslope of structures.

Findings from the monitoring

In December 2024, after three years of monitoring, the Two Mile site received a 'Mostly stable' rating. Given the poor structure and low fertility of the subsoil, the long-term effectiveness of ripping the soil is uncertain. While the rips on the contour would reduce the speed of runoff for several years, it also disturbs the valuable, fertile topsoil (breaking up its structure, the air and water pores that are crucial for plant growth and soil stability). Further monitoring for several more years would give a clearer picture.

Tropical deluges in the Bowen, Broken, Bogie catchments should be expected and planned for, as these heavy rainfall events will lead to limited infiltration, increased runoff, and potential soil loss. Therefore, when disturbing soil through earthworks, installing leaky weirs (check dams) or fully covering the area with organic matter should be standard practice.

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In response to the 2016 recommendations of the Great Barrier Reef Water Science Taskforce, the Queensland Government, in partnership with NQ Dry Tropics, implemented the Burdekin Major Integrated Project (BMIP), also known as Landholders Driving Change (LDC), from 2017 to 2021. The project focused on the Bowen, Broken, Bogie (BBB) catchment, and worked with graziers to reduce sediment and nutrient runoff affecting the Great Barrier Reef.

Key achievements included 25 gully remediation projects – five large-scale and 20 small-scale – treating over 11,000 linear metres of eroding gullies and preventing an estimated 10,600 tonnes of fine sediment per year from entering the Reef.

Following the completion of the BMIP, the Queensland Government reinvested in the monitoring and maintenance of the remediated gullies through the Burdekin Major Integrated Project Gully Maintenance and Monitoring project.

Running across three wet seasons from June 2022 to April 2025, this project evaluated erosion control strategies, cost-effectiveness, and sediment reduction. The results will inform future gully remediation efforts, with a focus on treatment durability and ongoing maintenance needs.



The landholder built four stick lines to slow water flow and capture sediment and organic matter before it entered the lower drainage line. This work was carried out at the landholder's expense (as an 'in kind' contribution).

The Burdekin Major Integrated Project Gully Maintenance and Monitoring project is part of the Landholders Driving Change project funded by the Queensland Government through the Queensland Reef Water Quality Program.