

Farm Business Resilience Program

GrazingFutures LBR Case Study

Cubbaroo Station — Addressing erosion issues in the Southern Gulf after dry years and a 1-in-100-year flood

Overview

Years of drought followed by the unprecedented 2019 flood event resulted in areas of severe erosion within the Southern Gulf region.

The Southern Gulf region, located in north west Queensland, incorporates five catchments that drain into the southern part of the Gulf of Carpentaria. The 19,479,540-hectare area is comprised of many different land types but can be broadly categorized into three major bioregions: Gulf plains, Mitchell grass downs, and Mount Isa inlier. Gulf plains range from coastal salt flats and mangroves to large expanses of bluegrass plains and woodlands. Mitchell grass downs, with its largely undulating plains dominated by Mitchell Grass, are highly fertile. The soils are self-mulching, deep, heavy grey or brown clays. Further towards the Northern Territory border is rough spinifex hills with mostly red skeletal soils that are dominated by snappy gum.

The types of erosion evident were extensive scalding and floodplain sheet erosion as well as gully and streambank erosion. Erosion occurred across much of the region and will have a long-term impact on land condition recovery, pasture yield and quality, as well as scouring out many new drainage lines.

Andrew “Drew” and Annie Hacon of Cubbaroo Station, Cloncurry, are conscious of the environmental and productivity impacts erosion is having on their business resilience.

Drew’s approach to this major erosion remediation project stemmed from an erosion control and remediation workshop at Boomara Station he attended with Darryl Hill in 2019.

Darryl, from Soil Save, has been actively engaged by Southern Gulf NRM for many years, providing advice to landholders on how best to deal with their erosion issues in an economical manner. Over the years, Darryl has provided many workshops, property site inspections and recommendations.

Funding through the GrazingFutures initiative allowed Department of Agriculture and Fisheries Principal Extension Officer, Bob Shepherd who specializes in soil conservation and grazing land management, to travel with Darryl and contribute to the 2019 workshops. These days showcased the GrazingFutures approach to increasing grazing business resilience; providing services and education on themes related to livestock businesses, partnering with non-government agencies such as Southern Gulf NRM to better integrate extension, upskilling extension staff and providing legacy documents.

Darryl Hill’s regular erosion control trips to the Southern Gulf were primarily funded by the Australian Government’s National Landcare Program’s Profitable Producers Creating Healthy Landscapes Across Southern Gulf project. The 2020 visit was co-funded by the joint Australian and

Queensland Governments' Disaster Recovery Funding Arrangements' Resilience through Recovery in Southern Gulf Project.



North QLD Livestock Recovery Agency staff visit the erosion site at Cubbaroo in June 2019. The proliferating gully that was formed from an old cattle pad stems across 55 hectares but has had a direct effect on the land condition of 168 hectares.

Introduction to Cubbaroo

“Our commitment to preserving our grazing land is something we have always felt passionate about. We have had a long-held program of resting country and avoiding overgrazing which we believe has been beneficial financially and environmentally.” - Drew Hacon

Drew and Annie Hacon run up to 2000 head of cattle on Cubbaroo, which consists of open Mitchell grass on cracking clays, blue grass and silky brown top plains, river frontage, open red country and pebbly gidgyea ridges.

During the 2019 flood, parts of Cubbaroo suffered severe erosion. One area that Drew and Annie were extremely concerned about was a large channel that had formed from an old, well-worn cattle pad that came off a Mitchell grass ridge, into a dam. The top section of the ridge was in A to B land condition, with strong grey-brown clays with a prolific body of Mitchell grass. The land type closer to

the watering point evolved into more fragile, ashy black soil. This area experienced pasture and soil damage while submerged during the 2019 flood.

Erosion site

“In the last 10 years we have experienced more than one severe weather event, which has accelerated the erosion in some areas, and we felt it was imperative to prevent these areas deteriorating before it was too late to intervene. While we appreciate some erosion is historically acceptable and a natural progression of land type, most erosion can be managed and prevented by simple practices.” — Annie Hacon

The mild erosion started as fingers of minor gullies branching down the undulation. By the end of the 2019 flood, a significant channel and broad snaking gullies had formed due to the depth of flooding, the amount of time under water, and the velocity of overland flow. The area directly affected by erosion spanned approximately 168 hectares. Drew and Annie were dismayed that such extensive erosion could occur despite their conscious efforts of maintaining good land condition in the past, to ensure they had maximum resilience to future droughts. The Hacons’ soon realised the potential impact this erosion site could have on the productivity of the paddock if they did not make some serious moves before the upcoming wet season. Drew remarked:

“If we continued to let the eroded channel go without intervention, it wouldn’t be too long before it continued right up the ridge and took half the paddock with it”.

Nutrient rich topsoil carrying a vibrant seedbank was being washed down the creek, not only silting up the downstream dam, but eating away at productive pastures that were now barely growing annual grasses, let alone the thick Mitchell grass tussocks that surrounded the erosion site.



The erosion site from above, prior to remediation works. The main channel is 2km+ in length, and directly affects approximately 168ha of the 2590ha paddock. Source: QLD Globe

Based on figures from [Best-bet practices for managing the Mitchell grasslands of Queensland](#) written by David Phelps (DAF), the affected eroded area that had declined to a land condition of D, was now rated at 25% of its long-term carrying capacity, and pasture growth and response to rain had been reduced by 75%.

Climate modelling has predicted weather and climate events in north west Queensland, such as rain or heatwaves, to trend towards 'more extreme' in years to come. With this in mind, without intervention, the eroded gully could potentially double in size over the next 10 years (13% of the 2590-hectare paddock).

Remediation effort

A minor attempt at repairing the issue was made at the end of 2019 but was unsuccessful. The attempt entailed erecting piles of rocks at the head of the newly formed gully and again at intervals downstream. The idea of this was to use the rocks as a porous weir, to slow water down rather than block it, as it flowed down the creek. Despite the mediocre wet season that followed, the rocks washed downstream, and the eroded gully snaked higher and wider.

Projects like Profitable Producers Creating Healthy Landscapes Across Southern Gulf and GrazingFutures Livestock Business Resilience meant the Hacons' were provided with one-on-one access to soil conservation professionals. Darryl Hill and Bob Shepherd shared their experience and knowledge, to which the Hacons' combined with their own extensive research, to construct a second remediation plan.

"Having access to expert advice before undertaking erosion remediation projects can be the difference between success and an environmental disaster." - Bob Shepherd

Step 1. Battering the land

In October 2020 a D9 Bulldozer was brought in to batter the top section of the erosion site out. The area affected by erosion totaled 168 hectares but the site that was directly worked on was approximately 55 hectares. 'Battering' means to smooth the land over to be as flat as possible to reduce the opportunity for water to break over any sharp soil edges and cause further erosion. A 40-foot spreader bar, towed behind a loader, put the finishing touches on battering the ground to iron out any imperfections left behind by the dozer. Drew commented:

"The spreader bar was particularly valuable to the process as it removed rough edges which would limit water breakover, and the ground could be smoothed as close to the original ground level as possible".

Step 2. Contour banks and drains

The next step was to plan and peg out start and finish points for the contour banks and construct them with the scraper. Contour banks, also known as check banks or bunds, are low earthen banks used for diverting and collecting moving water. The soil for the contour bank is taken from the flat bottom, wide drain that is created at the lower end of the contour bank, pooling and taking the energy out of fast-moving water. The water then spreads out onto the landscape at a much slower pace than what it entered.

“The intention of the erosion remediation was to not alter the natural flow direction of the fast-moving water, but to catch it, slow it down and focus it in a large, wide area where it can spread out and flow away slower and with less energy than what it entered”. - Georgia Glasson

When planning contour banks, it is best to use a dumpy level to accurately survey the ground to find the natural flow direction of water. Flat, open downs country can be especially deceiving. Having grown up and spent much of his adult life on Cubbaroo, Drew had a fair idea of the natural flow direction of the water, so planned most of the contour banks by eye.



*Contour
long flat bottom drains (September 2021)*

banks with

When asked if he would have done anything differently throughout the project, Drew said:

“Next time I will use a dumpy level to plan the contour banks to make sure they are aligned with the natural flow direction. After the check banks and flat bottoms drains were built, Darryl came back to Cubbaroo, and we surveyed the banks using a dumpy level. We were spot on with most of them, but a few needed some adjustments”.



October

2020 -

Branches of erosion coming out of the main channel towards a road. A levy bank redirects the water from flowing down the gullies and making the erosion worse. Once the water flows into the flat bottom drain, it pools, settles and seeps slowly out of the drain back onto the natural flow direction. The land colour change on either side of the road indicates lack of ground cover of the eroded land in comparison to unaffected soils.

Step 3. Natural leaky barriers

'Bush filters', or 'beaver walls' as the Halcons' labeled them, were next in the pipeline for the erosion site. These bush filters consisted of piles of Gidyea logs placed across the main gully, that act as a leaky barrier, slowing water down for a prolonged period but not blocking it up all together. As the water flows through, sediment gets trapped on the top side of the logs and builds up, slowly filling in behind the log pile – natural remediation of erosion at its finest! Piles of stick raked Gidyea logs were carted from paddocks to the erosion site via two hired tip trucks. The Cubbaroo team had engineered a set of forks that attached to the loader bucket to pick up piles of logs. At each site where log piles were placed across the erosion site, the loader dug out a small pit for the log piles to sit in, as an extra measure to slow the water down and reduce erosion by creating an area for fast water to pool in, slow down and then seep downstream.



September 2021 - One of the natural leaky barriers



October 2020 – Another leaky barrier further upstream

Step 4. Seeding for ground cover

It is evident from the consistent good land condition on Cubbaroo that the Hacon's realise the value of ground cover, especially considering the effort they had gone to with mechanical erosion remediation. The erosion site held very little ground cover as much of the nutrient rich seedbed had been washed downstream. That area was now part of a vicious cycle, where minimal ground cover offered no protective cover for the soil in the form of grass, plants, litter, or mulch, to slow the water down for infiltration, and no root structures to keep the soil stable.

Three hundred kilograms of a 40% Mitchell grass, 40% Signal grass and 20% Jap Millet seed mix was flown onto the erosion site with a helicopter after the earthworks were completed.

Project expenditure

NB: Dry hire equivalents have been included in this cost listing to replicate project cost for someone that owns no machinery. The grader, scraper and loader were owned by the Hacons. The table below lists all the Halcon's costs involved in this erosion project, excluding some machinery hire costs.

All the on-ground erosion remediation work completed in the project was undertaken at the Halon's own expense. In Annie's judgment:

"It was a significant cost but in terms of future productivity of that particular parcel of land, the work we have done has been invaluable".

Table 1: Project Costs

Description	Qty	Unit Price	Total Price
Machinery (hrs)			
Dozer hire	25	\$150.00	\$4,125.00
Tip truck hire x 2	69	\$120.00	\$9,130.00
Grader (dry hire equivalent estimates used)	42.5	\$180.00	\$8,415.00
Scraper (dry hire equivalent estimates used)	107.5	\$210.00	\$24,832.50
Loader (dry hire equivalent estimates used)	62.5	\$220.00	\$15,125.00
Helicopter	1.3	\$400.00	\$572.00
Fuel (litres)			
Loader diesel @ 15L/hr usage	937.5	\$0.96	\$900.00
Dozer diesel @ 65L/hr usage	1625	\$0.96	\$1,560.00
Grader diesel @ 15L/hr usage	637.5	\$0.96	\$612.00
Scraper diesel @ 20L/hr usage	2150	\$0.96	\$2,064.00
Tip truck diesel x 2	450	\$0.96	\$432.00
Labour (hrs)			
3 x fulltime employees	281.5	\$20.00	\$5,630.00
Contract dozer operator			\$3,960.00
Other			
Seed	300	.65	\$4,504.50
Total Cost			\$ 81, 862
\$/ha			\$487.27
\$81, 862/168ha			

12 months on

The 2020-21 wet season played out in favour of the erosion site with early falls to stimulate some pasture growth and no severe rainfall events.

Contour banks and flat bottom drains prevented further gully erosion. Rainfall (40 mm) in a short, sharp storm in early September 2021 indicated that the leaky barriers were effective in slowing the water. Ground cover has increased where the eroded gully has been battered and seeded. The decelerated pace of the water now allows for water infiltration into the soil, rather than just gushing across the surface. Intertwined throughout the log piles are tussocks that have sprouted. Annie added:

“The seed mix was expensive, but we are extremely happy with the response we have seen after the last wet season”.

Pasture recovery will take many years and requires ongoing maintenance of the manmade remediation structures and careful grazing management of the fragile land type. Drew and Annie plan to fence off the area, so they have full control over livestock grazing pressure, to lessen the risk of inhibiting landscape recovery while still lightly utilizing the grass for beef production.

Good grazing land management is imperative for ongoing success of the remediation site, and an essential pillar of viable and sustainable grazing enterprises. The Halcons’ intend to use remotely sensed monitoring of ground cover to identify future trends and measure the success of their efforts. The Hacons’ stated:

“While it is still early, we believe the time and expense of the project has been essential. The site seems to have responded in the way we had hoped, and we will continue to monitor it in the hope that in the long term, we can return the country into stable soils with a strong mix of native vegetation suitable for grazing”.

“We have been progressively fencing off dams and installing water points to avoid the dust bowl erosion hotspots that can cause significant erosion. Our long-term goal is that eventually every dam will be fenced off, preserving water quality, preventing erosion and removing the risk of cattle bogging when dams become low. We are confident this will preserve the viability of our country and its grazing capabilities for future generations”.

This erosion project is one of the many examples of the commitment and passion that Drew and Annie display towards adopting sustainable land management practices to achieve healthy land condition and native pastures, that flows onto outstanding beef production and profitability. They were awarded Southern Gulf NRM’s Sarus Crane award on Australia Day 2021 to recognize their leadership, innovation and commitment to the region’s sustainable future.



*Grass has started to recover on eroded areas, with tussocks also sprouting in the “beaver walls”.
(August 2021)*

Created by: Georgia Glasson, Southern Gulf NRM

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