



**LANDHOLDERS
DRIVING CHANGE**
BURDEKIN MAJOR INTEGRATED PROJECT

**LANDHOLDERS DRIVING CHANGE
LANDSCAPE REMEDIATION
HALFWAY UPDATE**



Landholders Driving Change is a Burdekin Major Integrated Project funded by the Queensland Government through the Queensland Reef Water Quality Program.



**Queensland
Government**

WATER QUALITY ON THE GREAT BARRIER REEF THE REASON FOR LANDHOLDERS DRIVING CHANGE

The Queensland and Australian Governments’ Reef 2050 Plan sets out ambitious targets to reduce pollutants in key reef catchments by 2025.

To help achieve these targets, the Great Barrier Reef (GBR) Water Science Taskforce recommended the implementation of two Major Integrated Projects (MIPs) – one in the Burdekin Dry Tropics, the other in the Wet Tropics.

The MIPs aim to deliver a suite of interventions and management efforts at a catchment scale, and evaluate

their effectiveness in improving water quality and long-term sustainable land management. They are piloting land management and repair approaches, with the Burdekin MIP, known as Landholders Driving Change (LDC), concentrating efforts in the Bowen, Broken, Bogie (BBB) catchment, near Bowen and Collinsville.

LDC is working across five program areas – BBB Grazier Support, Landscape Remediation, Influencing Other Land Managers, Exploring New Incentives and Policy Engagement.



TACKLING GULLIES IN THE BBB

The BBB produces almost a quarter of the total fine sediment load that ends up in the GBR lagoon.

About 65 per cent of fine sediment comes from gully erosion, which makes gully management a high priority for investment, and is why gully remediation is a key component of the LDC project.

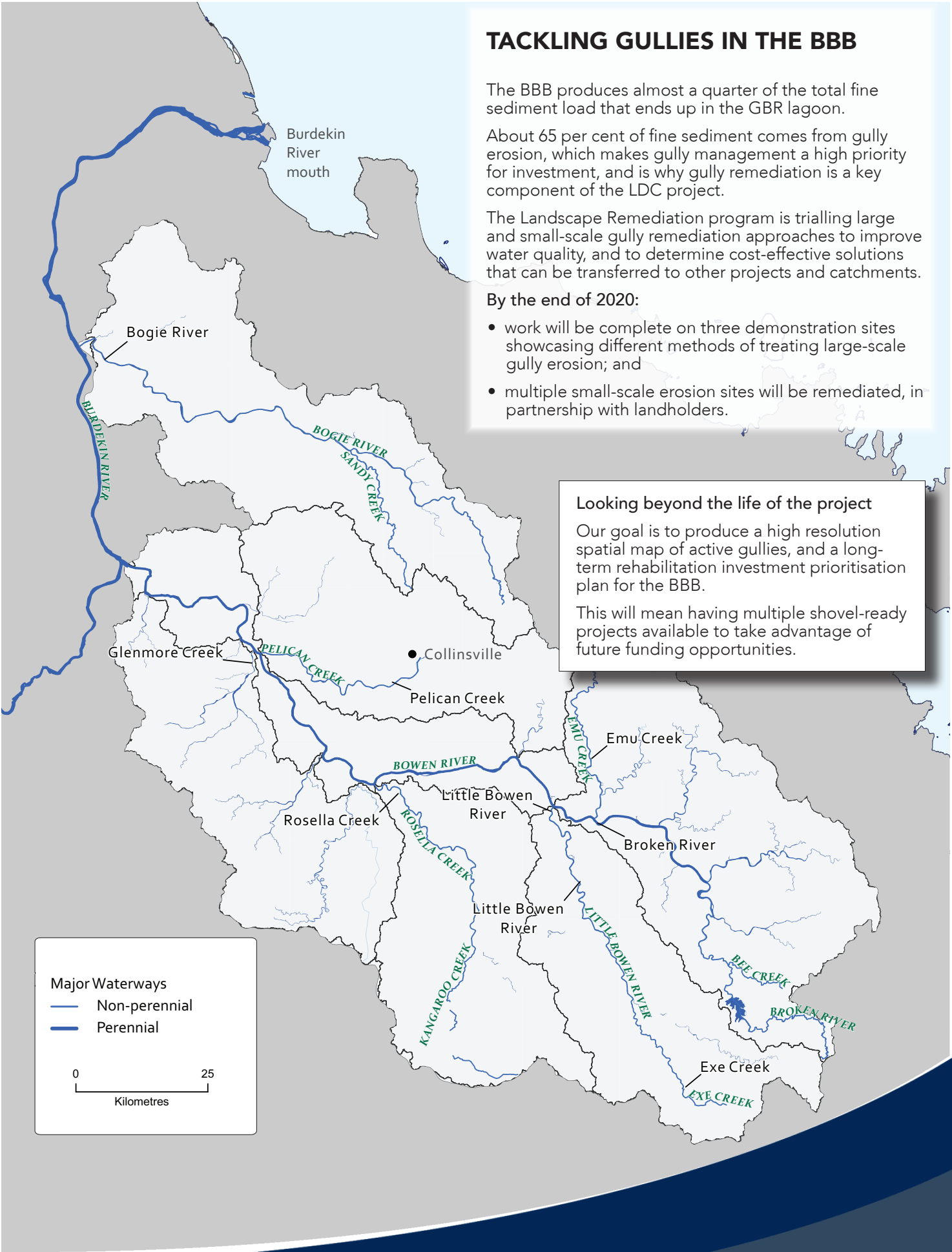
The Landscape Remediation program is trialling large and small-scale gully remediation approaches to improve water quality, and to determine cost-effective solutions that can be transferred to other projects and catchments.

By the end of 2020:

- work will be complete on three demonstration sites showcasing different methods of treating large-scale gully erosion; and
- multiple small-scale erosion sites will be remediated, in partnership with landholders.

Looking beyond the life of the project

Our goal is to produce a high resolution spatial map of active gullies, and a long-term rehabilitation investment prioritisation plan for the BBB. This will mean having multiple shovel-ready projects available to take advantage of future funding opportunities.



WHY CHOOSE MT WICKHAM AS A DEMONSTRATION SITE?

The LDC project contracted gully remediation experts to develop a range of criteria to help locate a 'typical' large-scale sodic gully rehabilitation study site in the BBB. Criteria included biophysical traits such as the size of the gully, soil type, and ability to demonstrate a range of gully remediation techniques and solutions. Mt Wickham ticked all the boxes.

Ecological engineering firms Alluvium and Verterra, a principal partner on the project, developed the gully remediation technical design. All on-ground work was completed by local contractors. The remediation plan involved a combination of grade control rock chutes, re-contouring of the rehabilitation area, soil amelioration using a range of chemical treatments, and revegetation using a range of pasture and legume species.

Further works will include remediating the untreated gullies on the western side of the main gully channel, through excavating, reshaping, and constructing rock chutes. This work is expected to be completed in 2020.

FACT FILE

- Local contractors and machinery delivered 100 per cent of on-ground works.
- Gully catchment size: treatment (3.03 ha) and control (14.14 ha).
- Gully type: linear hillslope gullies, scalds and major alluvial gullies, including tunnel erosion on highly sodic soils that drain into Sandalwood Creek and then into the Bowen River.
- Engineering firms Verterra and Alluvium, contracted to design and construct the on ground works, collected data in the field to inform the design, including soil sampling and electromagnetic soil (EM) mapping. EM sends signals into the soil and measures moisture, texture and salinity to help determine catchment treatment zones.
- Rock chutes were designed in conjunction with LiDAR (Light Detection and Ranging) data maps, and earth works and initial ground works carried out in October and November 2018.
- 400 tonnes of top soil was removed and stockpiled.
- 100 tonnes of gypsum and 374 tonnes of compost were blended with stockpiled topsoil for final dressing.
- 40 round hay bales (sorghum hay) were rolled out manually at distances of 20-30m.
- Hay bales were placed in rows across the basin to slow water and add organic matter.
- 538kg seed planted, including deep-rooted legumes, canopy species, pasture grasses, legumes and cover crops.
- Average annual rainfall is 600mm. The site was tested in Jan-Feb 2019 with more than 1100mm of rain recorded.



2017

31 Sep

Mt Wickham chosen by LDC project panel as initial landscape remediation site.

18 Oct

Mt Wickham landholder agreement signed.

2018

16 Feb

Delivery of LiDAR (Light Detection and Ranging) data maps for Mt Wickham

20 Feb

CSIRO water quality monitoring equipment installed at treatment and control sites.

28 Feb

Design and construct contract awarded to joint venture Verterra and Alluvium, Verterra being the principle.

13 Mar

Whitsunday Regional Council site inspection of Blue Valley Road. Permitted road drainage alteration to limit concentrated water flow.

24 Apr

Draft functional design supplied and presented to LDC's Landscape Remediation Working Group for review.

11 May

Advice on relevant legislation to the State Assessment and Referral Agency (SARA), starting the development application process.

23 Jul

Final functional design delivered and approved.

24 Aug

Field day to familiarise local contractors with scope of works.



MONITORING

Results from 2018-2019 wet season

The Mt Wickham site is being monitored and evaluated using a range of practices, vegetation, runoff and water quality measures. CSIRO has installed monitoring stations at two gullies – the treatment site that is undergoing remediation and a control site for reference and has provided results.

VEGETATION

Following remediation we expect:

- improvements in vegetation, cover and biomass, and soil condition;
- reductions in erosion and gully retreat rates; and
- improvements in water quality (sediment concentrations) because less material is being removed and more sediment is being trapped.

Longer term, we would expect improvements in runoff and sediment loads, however this is also influenced by rainfall, so trends will take longer to detect.

In only three months, following a good wet season, the treatment hillslope and gully wall now have significantly greater percentage cover and biomass than the control hillslope and gully, with positive early indicators for the first year.

Land condition at the treatment site improved from 100 per cent of land in D condition pre-wet season, to 78 per cent of land in C condition post-wet season.

2018

2019

24 Sep

Procurement for local contractors to deliver on-ground works.

27 Sep

LDC project panel site visit and discussion on approach to works prior to implementation.

22 Oct

On-ground works start, using local contractors.

11 Nov

Phase 1 works completed, including rock chute, rock checks, diversion banks, ripping, amelioration, rolling out hay bales and spreading seed.

22 Nov

28.4mm of rainfall at treatment site, resulting in the first water quality monitoring trigger post earthworks.

13 and 15 Dec

Rainfall triggered water monitoring stations, 90.2mm total.

18 Dec

Minor repair works undertaken.

23 Dec

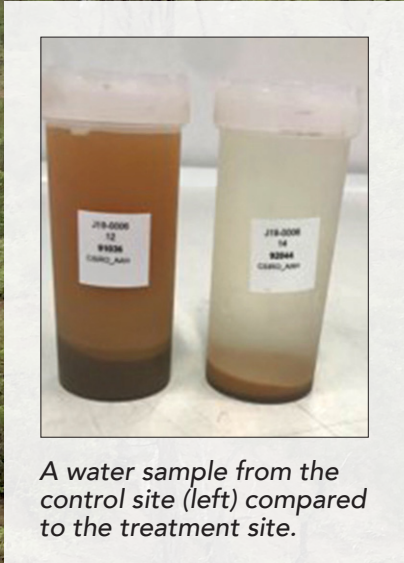
65mm of rainfall at treatment site, water monitoring stations triggered.

9-10 Jan

312mm rainfall, at its peak water was flowing 1.8m above the treatment site.

23 Jan

Site maintenance included repair of tunnels, and construction of temporary wing banks on rock chute walls.



A water sample from the control site (left) compared to the treatment site.



CSIRO water monitoring instrumentation installed at Mt Wickham.

WATER QUALITY MONITORING

In time, we can expect to see a reduction in the rate of erosion and the concentration of the sediments leaving remediated sites. Water quality and quantity monitoring equipment (installed by CSIRO) are in place at both the treatment and control sites.

This equipment measures water level, runoff volume, turbidity, sediment and nutrient concentration as well as particle size.

Pre-treatment water samples were also collected. Early results indicate a reduction in the concentration of Total Suspended Sediments (TSS) at the treatment site, however, additional data will be required from next wet

season to assess whether TSS levels reduce further. In the 2018-19 wet season there was more than 1100mm of rainfall at Mt Wickham, considerably higher than the long-term average for the BBB region.

Changes in water quality take time
In the longer term, as catchment vegetation condition improves, we expect to see a change in percentage runoff. Analysing water quality and quantity data over a series of rain events and multiple years allows these longer term results to become evident. The results at this stage are considered to be early indicators.



BBB WATER MONITORING GROUP

With substantial investment and action underway to improve land practices, water quality and reef health, the Queensland Government's Paddock to Reef (P2R) program tracks the work of many stakeholders by monitoring progress towards reef targets.

Nine properties in the BBB make up the LDC Community Water Quality Monitoring Group. Trained by TropWATER, landholders collect and record water samples during each wet season which TropWATER then analyses. Samples taken by automatic samplers in the BBB are analysed by CSIRO.

This data, along with the data collected from Mt Wickham (and all LDC Landscape Remediation program sites) will help strengthen the modelling for the P2R program. This ensures landholders' decisions and actions about land management practices are based on best available knowledge.

2019

2020

2021

- 27 Jan - 9 Feb

291.6mm of rainfall on the treatment site. At this time there was significant ground cover on most of the site.
- 5 Mar

Phase 2 works start, including rock checks and rehabilitation of Gully 10.
- Apr - Sep

Site visits organised for landholders, community, scientists and landscape remediation practitioners.
- Water quality samples will be collected for monitoring during the wet season.
- Remediation of untreated gullies on the western side of the main gully channel will be completed.

Jan

LDC project ends.

LDC IS ALSO TACKLING SMALL-SCALE EROSION FEATURES



Principal Extension Officer, Grazing Land Management DAF Bob Shepherd, (left), with grazier Stan Fordham.



Emu Ridge Technical Designer John Day (left) with NQ Dry Tropics' Sheyanne Frisby and Rod Kerr.

LDC is helping landholders develop cost-effective designs to remediate gullies and other property erosion features to reduce soil erosion.

Technical experts have been visiting properties and conducting assessments to determine the most appropriate on-ground solutions.

They have then worked alongside graziers to design and deliver the treatments, using local contractors where possible and sharing resources to help reduce costs.

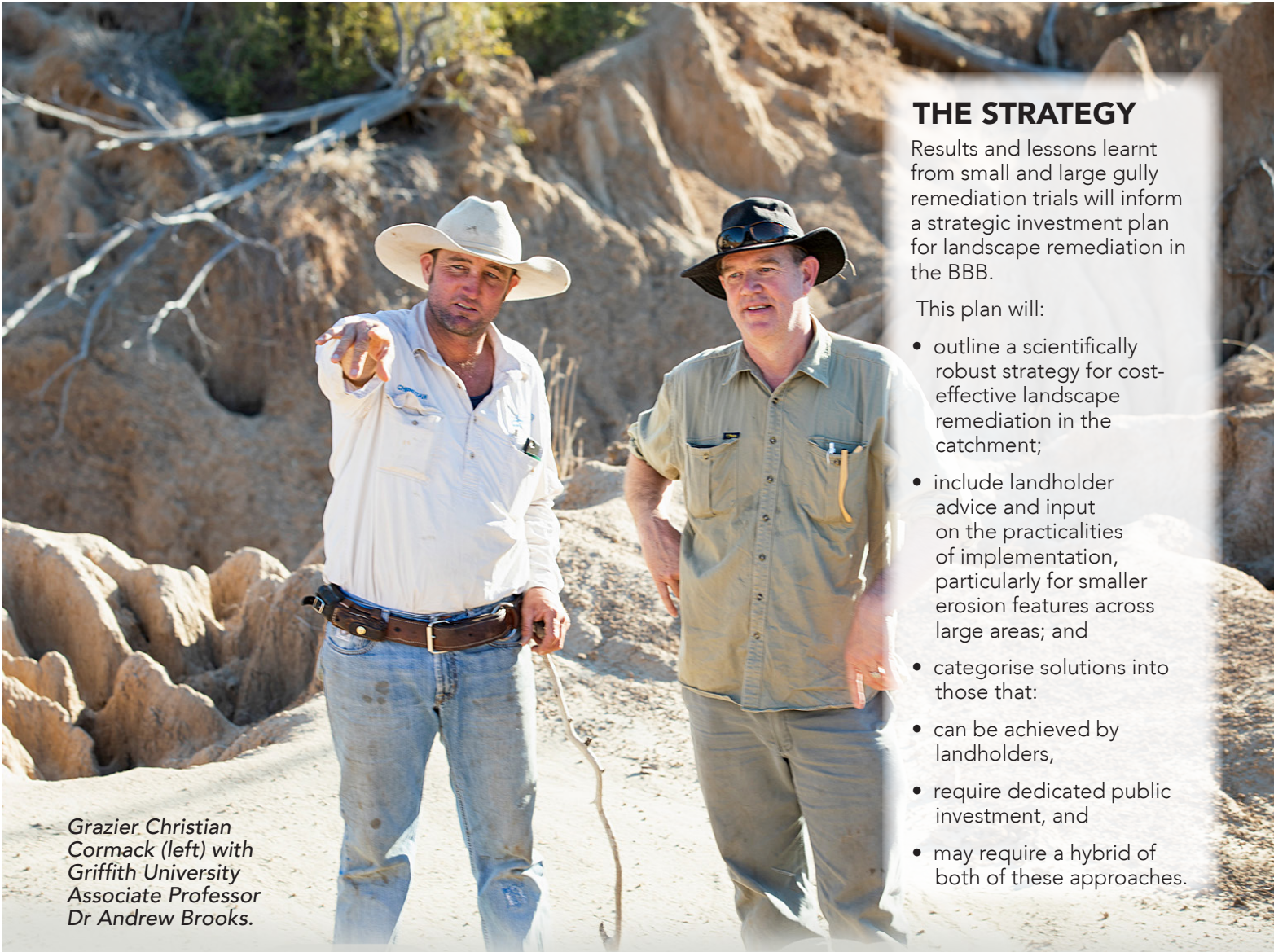
Some of the remediation options that are being trialled on the small-scale erosion features include:

- diversion banks and water spreading structures – to control and manage water flow across paddocks at, before, or after, erosion features i.e. grassed or ungrassed diversion banks;
- sediment or silt traps – to slow water flow and collect sediment.
- direct on-ground rehabilitation – earthworks, grade control, soil stabilisation, revegetation;
- within-gully management structures such as rock chutes, rock armouring, using mulching products, spray-on batters, bio-layering, gully reshaping;

- road and farm trail works – constructing cross banks (whoa boys), rehabilitating or re-siting roads;
- contour ripping – to enhance pasture and water-holding ability of the soil;
- re-seeding pasture – to improve pasture productivity, repair degraded areas, or repair preferentially-grazed areas (i.e. can also require fencing or ripping);
- water distribution infrastructure and water points – to control grazing pressure and enable grazing land management change that takes pressure off natural water features;
- permanent paddock fencing – to manage pastures or specific erosion features;
- permanent riparian fencing – to protect high value wetland and waterway areas; and
- temporary fencing – with, or without cattle exclusion, to improve land condition.

These sites will be monitored and feedback passed back to participating graziers.

DEVELOPING A CATCHMENT-WIDE INVESTMENT PLAN



Grazier Christian Cormack (left) with Griffith University Associate Professor Dr Andrew Brooks.

THE STRATEGY

Results and lessons learnt from small and large gully remediation trials will inform a strategic investment plan for landscape remediation in the BBB.

This plan will:

- outline a scientifically robust strategy for cost-effective landscape remediation in the catchment;
- include landholder advice and input on the practicalities of implementation, particularly for smaller erosion features across large areas; and
- categorise solutions into those that:
 - can be achieved by landholders,
 - require dedicated public investment, and
 - may require a hybrid of both of these approaches.

Mapping gully hotspots

The LDC project, in conjunction with Griffith University, is mapping gullies in the BBB to help prioritise gully rehabilitation projects.

Seventeen major gully clusters have been identified. Some of these clusters are located on a single property while others cross property boundaries. Where the clusters cross property boundaries cost-efficiencies can be achieved by working with clusters of landowners to rehabilitate gullies.

Prioritising work is important because it links to improvement in water quality leaving properties. Remediation of erosion features, along with improvements in grazing land management and surface water management on-property, will reduce erosion and sediment entering local waterways.

Cost discovery and analysis

Measuring cost-effectiveness of gully rehabilitation is difficult because there are so many rehabilitation methods, and many different gullies, that include a range of soil and erosion types.

Existing guidance on how to measure cost effectiveness doesn't adequately cover the full range of rehabilitation methods. LDC and the Landscape Remediation Working Group, which is made up of scientists and remediation experts from across Queensland, contributed to a cost-effectiveness framework completed by Central Queensland University in June.

It will be reviewed, and the final product is expected to be available at the end of the project.



ACKNOWLEDGEMENTS

NQ Dry Tropics advises that the information contained in this publication comprises general statements based on scientific research.

The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation.

NQ Dry Tropics' Landholders Driving Change team thanks all BBB landholders, project delivery partners and local businesses for participating in the LDC project.