



Bridge Creek Rehabilitation

FINAL REPORT

Caring For Our Country Community Action Grants 2009-10

A cooperative project between Lake Baroon Catchment Care Group, Commonwealth Government and the landowners Rob & Janice McLauchlan.



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LAKE BAROON CATCHMENT CARE GROUP INC. Final Report (CAG 2009-10)

1. PROJECT DETAILS

PROJECT TITLE: **Bridge Creek Rehabilitation**

PROJECT NUMBER: **CAG09-00259** (LBCCG 0910-004) **DATE:** **August 2011**

PROJECT SUMMARY:

Bridge Creek Rehabilitation is a whole property project, guided by a Property Management Plan completed by the landowner that aims to improve the water quality in Bridge Creek (a tributary of Obi Obi Creek) and improve the manageability of, and contribute to the sustainability of the property. By addressing riparian zone, hill-slope erosion, Weeds of National Significance and biodiversity on the property in a single project will demonstrate best practice management and the agricultural benefits of performing environmental activities. The project will be used as a demonstration site to encourage greater participation in environmental activities by farmers in the Lake Baroon catchment.

APPLICANT/LANDHOLDER DETAILS

Name/s	Rob & Janice McLauchlan
Postal Address	[REDACTED]
Phone Numbers	[REDACTED]
E-mail	[REDACTED]

PROJECT / SITE LOCATION

Property Address	Wells Rd, Maleny		
RP Numbers (Lot)	RP208215 (3)	SP118115 (5 & 6)	
Property Size (ha)	40 hectares		
Land-use & Stock No's	Beef cattle - 70		
Sub-Catchment & M.U.	Bridge Creek – BR3		
M.U. Priority (LBCCG IP)	Low	M.U. Priority (Pollution)	High

PROJECT PARTNERS/STAKEHOLDERS & ROLES

Lake Baroon Catchment Care Group	Administration, reporting, monitoring & evaluation
Commonwealth Government	Community Action Grants Funding
Seqwater	Funding
Barung Landcare	Materials, technical advice, labour & maintenance
Conservation Volunteers Australia	Labour (National Green Jobs Corps)
Sunshine Coast Council	Technical advice & funding
Rob & Janice McLauchlan	Landowners, labour, machine hire & maintenance

PROJECT DETAILS

Start Date	2009	Completion Date	August 2011
Fencing	340 metres		
Plant Numbers/Area	1,000/12,000 m ²		
Weed Management	10,000 m ² (WoNS - Lantana, blackberry)		

2. PROJECT RATIONALE

Adapted from: Department of Environment and Resource Management, *Development of a water quality metric for south east Queensland*, 2010

An estimated 80% of sediment and 35% of nitrogen in the waterways in South East Queensland come from non-urban diffuse loads. Reduction of these loads clearly represents a major target for action if significant improvements in water quality are to be achieved in South East Queensland.

Modern agricultural activities have been identified as a major source of diffuse pollutants into waterways. Land management practices, such as stocking rates, grazing pressures, land clearing and the application of fertilisers have significant impacts on pasture and land condition. These practices can result in erosion processes, decreased infiltration of soils, and excess nutrient and sediment run-off, all of which impact on local water quality.

Diffuse pollutants are:

- Aggregated within a catchment; but delivered from sources dispersed throughout the catchment;
- Random in nature with weather playing a critical role in the process of pollutant delivery;
- Difficult to monitor on a continuous basis for a reasonable cost.

Despite these barriers, evidence suggests there is an opportunity to reduce the contribution of non-urban diffuse source pollutants to prevent further water quality degradation throughout south east Queensland. Providing incentives for landholders to change management practices is one strategy to improve water quality.

Sediment generation identified from private agricultural land is considered to derive from 3 key sources of erosion:

- Hill-slope erosion is the wearing away of soil particles, chiefly by rain and water flows over the land instead of in channels. Although hill-slope erosion may occur on soil surfaces that are covered with vegetation, it is more prevalent on bare soil
- Gully erosion is the removal of soil along drainage lines by surface water run-off. It occurs when run-off concentrates and flows at a velocity sufficient to detach and transport soil particles, eroding channels (a concentrated flow path for water leaving a field or watershed) into a hill-slope
- Stream bank erosion is the detachment of soil particles by concentrated flow paths occurring along stream bank channels. Stream bank erosion is especially prevalent where riparian vegetation is degraded

These three sources of erosion deliver a high level of sediments and nutrients to the waterways of south east Queensland. The velocity and volume of water delivery to major channel erosion sites, poor soil structure and land use disturbances are all causes of channel erosion throughout south east Queensland. The channel origin of the sediment means that attention needs to be directed to stream and gully stability, and the prevention of hill-slope erosion.

A survey examining barriers to the adoption of best land-use management practices by farmers concluded that economic barriers pose the biggest constraint. Investment in south east Queensland catchment management has historically been quite sporadic and not well targeted, especially in rural catchments. Cost effective investment, targeted at the most important non-urban diffuse pollutant sources throughout south east Queensland, is required to efficiently achieve a large reduction of sediment and nutrient loads with a limited budget.

3. MASS MOVEMENT & LANDSLIPS IN THE BAROON CATCHMENT

Mass movements (landslips) are a characteristic of the Lake Baroon catchment because of the catchment's specific attributes - very dry to drought conditions through winter and high rainfall (approximately 2,000 mm/year) through summer; steep slopes; shallow soils on impermeable sub-surfaces; cracking clays; and a lack of deep-rooted vegetation to bind the profile and manage soil moisture. These all contribute to the occurrence of mass movement and slips.

The majority and largest of the mass movements in the Lake Baroon catchment are associated with the Bridge Creek sub-catchment – a basalt cap overlaying a much older sandstone geology. Furthermore, landslips usually occur along the edges of the plateau where the basalt layers have suffered significant erosion and the sandstone layer is close to the surface.

The basalt derived soils in the Bridge Creek catchment contain large amounts of the clay mineral montmorillonite, which has a pronounced loss of strength on wetting. On drying, montmorillonite forms wide and deep cracks that permit rapid intake of moisture from rainfall runoff, which increases the risk of slope failure.

Furthermore the basalt-derived soils of the Baroon catchment are characterised by high concentrations (up to 0.22 % or 2,200 ppm) of exchangeable sodium ions. Sodium ions are naturally dispersive, and mixed with the characteristics of the montmorillonite clay mineral; accentuate their loss of strength on wetting.

4. LOCATION

The Bridge Creek sub-catchment is the second largest in the Lake Baroon catchment (behind the Obi Obi Creek catchment) consisting of 52 kilometres of waterways and covering an area of 2,134 hectares. The sub catchment has a moderate covering of vegetation (43%), although much of this is significantly disturbed and degraded by environmental weeds.

LBCCG has divided Bridge Creek into six management units that reflect boundaries, physiography, vegetation, land use, point and diffuse source impacts, and administrative convenience.



Figure 1: Bridge Creek near the River School on Bridge Creek Road. The waterways generally have good riparian vegetation, with good bed diversity and bank stability. The creek however is threatened by sediment loads entering the waterway through erosion in the catchment. Lake Baroon, the main potable water supply for the Sunshine Coast is less than 500 metres downstream from the project site.

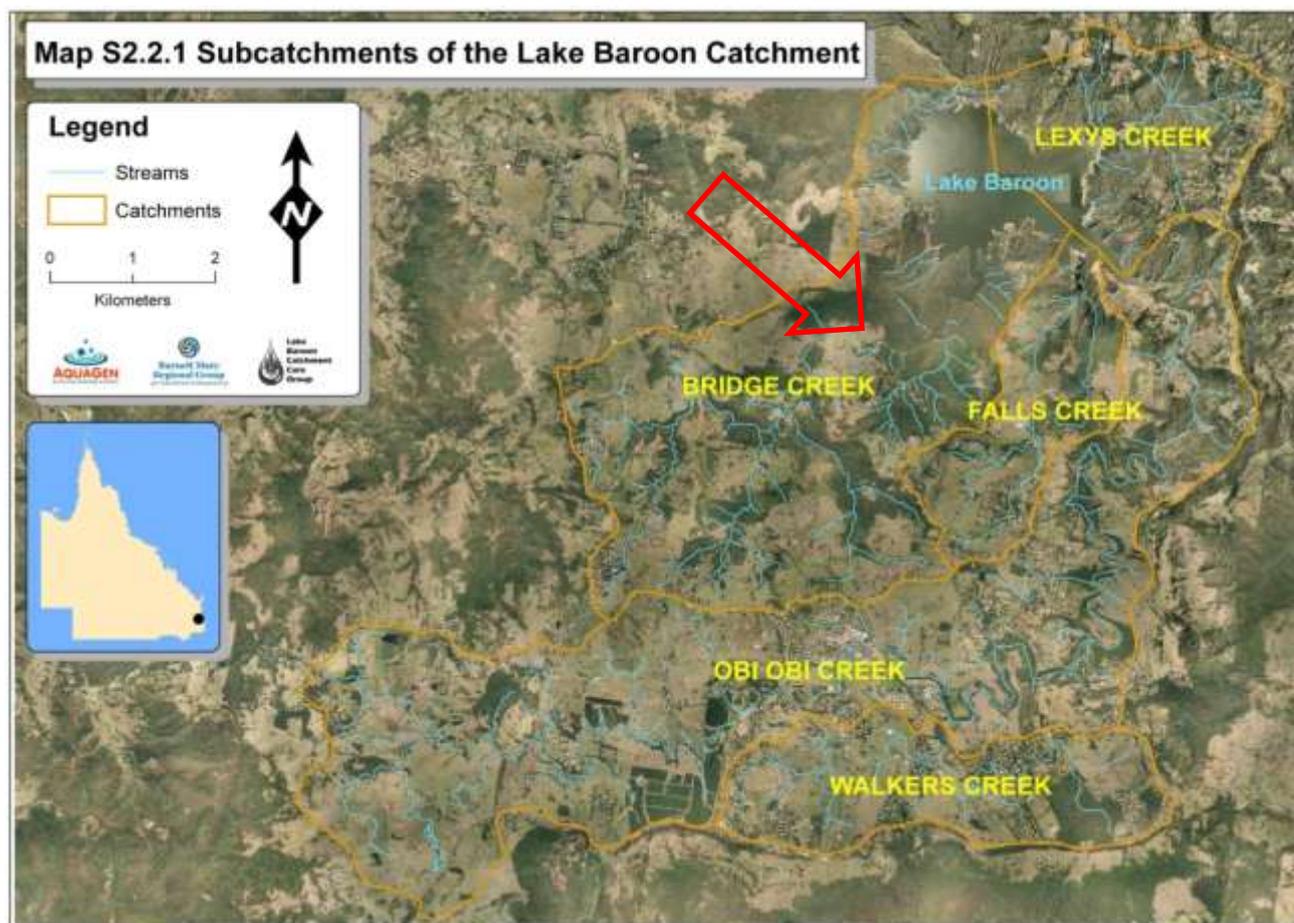
Bridge Creek Rehabilitation

The project is located within Management Unit BR3 which adjoins Lake Baroon; the property is immediately upstream of the Dam and shares fence lines with Seqwater managed lands. The MU is 518 ha in size and has 14km of significant waterways. The dominant land use in the MU is beef production. Riparian vegetation is present alongside 40% of the waterway lengths, a significant proportion of which has been landholder revegetation.¹

The relatively steep nature of the land, moderate instability (63% of land unstable), lack of natural cover and unimproved pasture in areas of the catchment means that there is high erosion potential, and minimal filtering of run-off, therefore inputs of nutrients are significant (70% of samples exceeding guideline levels)⁽¹⁾.

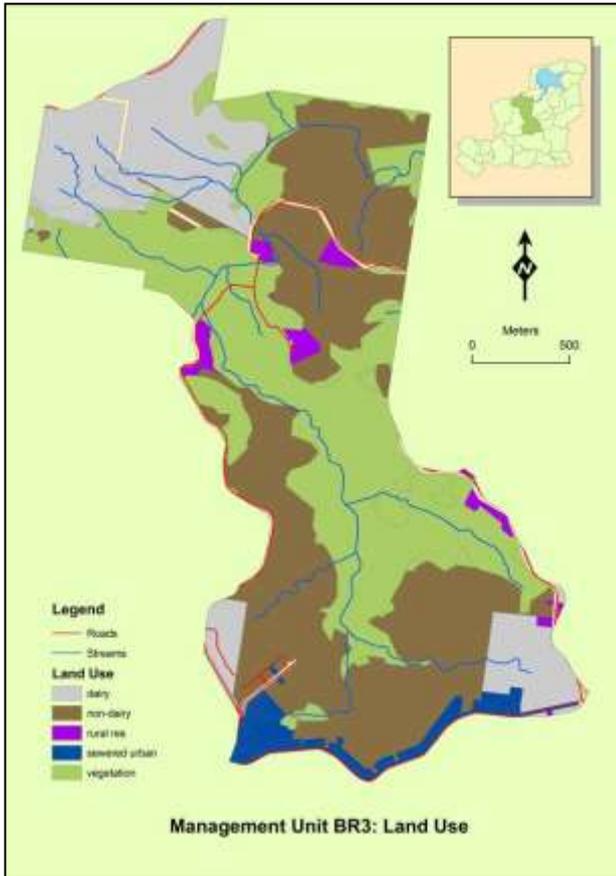
The Lake Baroon Catchment Implementation Plan (2007) rates BR3 a LOW priority for rehabilitation works. However, when assessing the Management Unit using a modified version of the Prioritisation Process, which prioritises MU's on pollution input levels and land instability parameters, BR3 rates as a HIGH priority (fourth highest of all MU's in the Baroon catchment).

The McLauchlan property has historically been used for grazing (dairy, with beef production in the last two decades), although the owners have carried less livestock than the property could realistically support resulting in good property management.

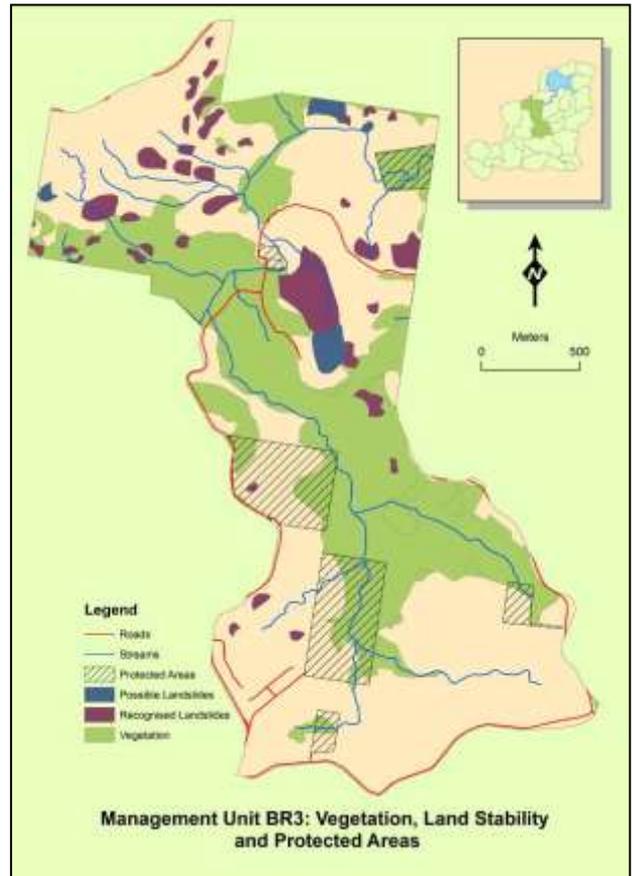


*Figure 2: Bridge Creek forms the western sub-catchment of Lake Baroon.
The McLauchlan property is situated on Bridge Creek immediately upstream of Lake Baroon.*

¹ Dunstan, M. 2007, Lake Baroon Catchment Implementation Plan, AquaGen Water & Renewable Energy, Palmwoods



Beef production is the dominant land use in the Management Unit with a significant proportion of the catchment covered with vegetation. The McLauchlan property is shown as the brown shading at the top of the map.



This map shows BR3's instability and likelihood of suffering mass movement (landslides & slips).

5. BACKGROUND



The McLauchlan's have been active in 'landcare' activities over the last ten years with major revegetation activities with Barung Landcare and partners. The "Corridors of Green" project fenced 220 metres of lower Bridge Creek and revegetated 3.5 hectares of waterway and steep, eroding hill-slope.

The Corridors of Green project in 2009

The Bridge Creek catchment is recognised as being very unstable and prone to mass movement; and although the heavy rainfall in early to mid-2009 resulted in some minor movement; generally this particular property is sufficiently stable for revegetation. The geology of the property (and most of the Bridge Creek catchment) however, is dotted with numerous springs that continually contribute to waterlogged areas, which tend to be frequented by livestock resulting in over-grazing and 'pugging' of the soils, and consequently significant sediment and nutrient run-off during heavy rainfall events.

The proximity of the property to Lake Baroon effectively means that any run-off from the property enters the storage with minimal filtering of sediments, nutrients or pollutants. An opportunity to remove livestock and establish large areas of vegetation would be beneficial to improving the quality of run-off entering Lake Baroon.



Left: Bridge Creek where it enters Lake Baroon immediately downstream of the McLauchlan property. Note the large amounts of sediment in the bed of the creek; sediment 'drops' out as the flow dissipates at this point where it enters the Dam.

6. OBJECTIVES

In 2008-09 Rob & Janice McLauchlan completed a Property Management Planning program with Lake Baroon Catchment Care Group. The main outcome of the PMP program was the potential to improve water quality in Bridge Creek and its tributaries (and ultimately Lake Baroon) by identifying and completing on-ground works that would also improve the management and sustainability of the farm business.

The main issue identified by the McLauchlan's were difficulties associated with the numerous springs and resulting water-logging. Erosion from the steeper areas of the property deposits sediment onto less steep areas and with groundwater springs contributing moisture, results in the formation of water-logged zones. Furthermore during heavy rainfall events loosened sediment, caused by livestock overgrazing, runs off and enters Bridge Creek and ultimately Lake Baroon.

The resulting project aimed to minimise sediment and nutrient run-off from the property by fencing and revegetating springs, rehabilitating high livestock traffic areas (dam over-flows and a laneway) and enhance the filtering and buffering ability of the properties' waterways. Furthermore farm productivity will be improved by reducing nutrient, sediment and chemical export.



Above: The project site from Tesch Road, Witta (December 2009- pre-work).

7. OUTCOMES

The project addressed the wider catchment priorities of:²

1. Prevent erosion and sediment run-off to waterways;
2. Contribute to landscape scale protection, monitoring and rehabilitation of biodiversity;
3. Strengthen vegetation and riparian corridors and linkages; and
4. Build community capacity, engagement and participation.

LBCCG Priorities

The project addressed the following Lake Baroon Catchment Care Group priorities³ of:

1. Water Quality Improvements

A primary aim of the project was to improve the water quality of the Bridge Creek Catchment. This was achieved by repairing the damage caused by the landslip, minimising the amount of sediment (and associated nutrients) entering Bridge Creek. Ultimately, this improves the quality of raw water entering Lake Baroon, reducing potable water production costs.

2. Extension of habitat.

The project expanded the vegetation in the local area and will provide valuable habitat for fauna. Species selection was based on hardiness and suitability to a landslip site however subsequent plantings will be consistent with the local Regional Ecosystems and will include rare and threatened flora species of these RE's so that the site will also assist in the long term preservation of species.

3. Reducing impacts of Weeds of National Significance

The project has cleared approximately 1.2 hectares of WoNS lantana (and a small area of blackberry) improving biodiversity and reducing seed sources. This will assist in protecting neighbouring areas of remnant vegetation, revegetation sites and high quality regrowth vegetation.

4. Community Education

The property is located in a high visibility area. The project will serve as a demonstration site in best practice management of landslips, and provide the opportunity for LBCCG and stakeholders to monitor and evaluate on-ground works and techniques. The works enhance the properties demonstration value, and assists in improving understanding and technical capacity of the local community.

5. Improvements in farm productivity

Farm sustainability has been enhanced by improving the manageability of the property, while contributing to productivity by reducing nutrient and soil loss through erosion and chemical export through run-off.

6 Whole farm approach to property planning.

The McLauchlan property was assessed through the Property Management Planning program initiated by LBCCG, which evaluated the property from both an environmental and a productive agricultural perspective. A series of prioritised actions and works are currently being implemented. The works program addresses priorities that deliver benefits to the Sunshine Coast (and beyond) by improving the water quality in Lake Baroon.

² 2011 Waterways and Coastal Strategy, Sunshine Coast Council

³ Dunstan, M. 2007, Lake Baroon Catchment Implementation Plan, AquaGen Water & Renewable Energy, Palmwoods

8. PROJECT EVALUATION



Project site (September 2009)



WoNS Lantana



Skid-steer mounted mulcher clearing site

The project site is located on a steep hill-slope and colluvium flats. A spring is located on the western end of the site with a small area of waterlogged soils.

The site is in close proximity to several significant stands of remnant vegetation. Less than one kilometre to the north west is a large (40 hectares) gallery rainforest (12.8.3) remnant, two hundred metres to the north fringing the Bridge Creek arm of Lake Baroon is a stand of wet sclerophyll (12.12.15 Open forest on coastal hills) remnant and three hundred metres to the north east wet sclerophyll (12.9-10.17 Open forest complex) remnant. The proximity to these remnants and the fruit producing species selected for revegetation should mean that natural regeneration should occur.

The site is approximately 13,000 m² in size with scattered native vegetation (Blackwood Wattle, Guioa, Macaranga, Sandpaper Fig, exotic Camphor Laurel) with the understorey dominated by Weeds of National Significance lantana and blackberry, devil's fig and minor infestations of environmental weeds. Along the top of the site good stands of native blady grass provides good erosion stability and weed suppression.

8.1 Fencing

The fencing was designed to have few changes of direction as possible to ensure a strong and cost-effective fence.

Fencing was completed by a local contractor (Langdale Fencing) measuring approximately 350 metres with two access gates. Despite difficult access (steep slopes and active spring) fencing was completed within budget.

As the property runs beef cattle, the fencing consists of four strand barb with timber split posts and steel posts. This type of fencing is standard for the area.



Site fencing in progress (August 2010)



Fencing completed (August 2010)



Revegetation (October 2010)

8.2 Weed management

Initial weed management involved spraying by the landholder to control the lantana and other environmental weeds. Spraying killed approximately fifty percent of the infestation.

A skid-steer mulcher was used to mulch the standing weeds resulting in a fine mulch layer spread evenly over the site. This method was fast, effective and cost-effective.

Follow up weed management was performed by Barung Landcare, treating areas that could not be reached by the mechanical mulcher.

Several moderate sized Camphor laurels have been retained at this stage to provide stability. These will be stem-injected and allowed to decompose naturally once the revegetation has established.

Dead Blackwood wattles that were identified as dangerous and likely to drop limbs were felled and burnt along with rubbish that would restrict revegetation and maintenance access.

8.3 Revegetation

Site preparation was dictated by the fact that the site is historically unstable and prone to erosion. Therefore one metre rings were sprayed approximately two metres apart retaining as much pasture groundcover as possible. This spacing results in 1,000 plants per 4,000 m² – usually providing a shade canopy in approximately two to three years.

Plant species were selected on several criteria. As there is a sparse native species canopy and the near proximity of remnant and regrowth vegetation it is expected the site will naturally regenerate if environmental weeds are managed and a protective canopy can be established.

To assist the expected natural regeneration species selected were primarily fast-growing pioneers that will rapidly establish a canopy providing favourable conditions for slower



Revegetation completed (October 2010)



Project site (September 2010)



Wallaby predation (September 2010)

growing rainforest and wet sclerophyll species. Hardy plants – particularly species suitable for landslip plantings such as Hoop and Bunya Pines were planted to provide long-term stability to the site although these species can be a little slow to establish.

Additionally species on the edges are those that tend to be smaller and bushy to the ground so that impacts on fencing are minimised and form a protective seal around the site.

The waterlogged spring area was planted with *Melaleuca quinquenervia*, although not an endemic species to the property will provide a useful role in establishing vegetation in difficult conditions. This species will provide a canopy and assist in drying out the area allowing other less tolerant species to establish in the future.

Planting was completed by Barung Landcare with locally sourced tube-stock. Think-pink tree guards and jute weed mats were used to protect seedlings until established. The corflute guards provide a highly visible guard from chemical overspray, weeds, frost and predation from hares and wallabies.

Initially 1,000 tube-stock were planned however 1,300 tube-stock were planted. This was due to the site being slightly larger than expected, trees planted closer to established trees than necessary and spacings closer than designed.

Despite the soils on the site having been highly disturbed in the past from land slips and waterlogging, plant establishment has been excellent. The pioneer species (particularly Brown Kurrajong, Eucalypt species and Green Wattle) have attained heights of over one metre with few losses.

To compromise plant survival and growth has been the prevalence of wallabies – particularly when the grass was allowed to provide dense cover and the wallabies would remain on site day and night. Fortunately the guards have protected the establishing trees and the wallabies have merely pruned them.



Project site (December 2010)



Flooding damage (January 2011)



Project site (June 2011)

8.4 Maintenance

Maintenance has been performed by Barung Landcare and the landowner. Plants are ring sprayed with the grass in between rows slashed (although there does not appear to be any negative effect on tree growth if grass is allowed to grow providing it is controlled immediately around the establishing tree). Environmental weeds are spot-sprayed.

Natural regeneration at this stage has been slow, however is expected to increase as the planted pioneers provide a protective canopy reducing weed competition and improves soil conditions.

The site had suffered minor damage during high rainfall events experienced in December 2010 with the minor planting and fence damage.

The project site suffered significant damage during the floods experienced in January 2011. Approximately 900 millimetres of rain fell over a three day period.

The spring area at the western end of the site slipped with a debris flow moving downhill washing out approximately 40 trees and damaging around 40 metres of fencing. With access to the site to repair the fencing impossible due to the extremely wet conditions, temporary electric fencing was installed to cover the damaged area. This work was completed by National Green Jobs Corps participants who also collected the tree guards that had been damaged by the debris flow.

At the eastern end of the site water flow from Wells Road washed out a further 40 metres of fencing (cutting a one metre deep gully), including a gate, and approximately 25 trees.

The resultant sediment was deposited on the revegetated flat engulfing a further 100 trees – although many of these plants were not immediately washed away or killed, they succumbed to suffocation.



Field Walk (May 2011)

8.5 Field Day

In early May 2011, LBCCG conducted two Field Days at the project site (including National Green Jobs Corps participants as part of their Land Management Certificate).

Attendees viewed the various methods of dealing with landslips and particularly their prevention. The Field walk looked at nearby Bridge Creek and Lake Baroon – particularly the impact of sediments on waterways and the storage.

There were sixteen attendees at the two Field Days.

9. FOLLOW UP

Fencing repairs and re-planting of tube-stock that were killed by the January floods will be completed in September 2011 by the Lake Baroon Catchment Care Group and the landowner. There are plans to extend the area and continue revegetation in an effort to increase the size of the site and stabilise further areas.

Maintenance has now been assumed by LBCCG and will continue for a further two years to ensure revegetation is established and environmental weeds (including lantana and blackberry) do not return.

10. WHAT HAVE WE LEARNED

The project has performed well despite suffering from the flooding experienced by south east Queensland in January 2011. Remediation works on land slip sites is difficult and any experience gained is invaluable.

We have reduced the impact of lantana and rather than just control this WoNS weed we have replaced it with native vegetation which is predominantly consistent with neighbouring Regional Ecosystems. We have also controlled a small infestation of WoNS blackberry which was previously unknown on the site.

This site, along with a further two sites planted nearby funded by LBCCG/Seqwater, and a further site to be planted in 2011/12 will complete a vegetation corridor linking pockets of vegetation and riparian vegetation.

The site is in a highly visible area and provides a demonstration site, not only for land slip management but also implementing biodiversity projects on agricultural land. Its proximity to Lake Baroon provides the opportunity to show the links between erosion and the impacts on water quality and potable water treatment.

11. EXPENDITURE

Community Action Grants 2009-10 Final Report/Acquittal

All figures exclusive of GST



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Project Budget (CAG Funding)			Actual Expenditure	Other		
				LBCCG	CVA	Landowner
Activity to be funded	Eligible item	\$	\$			
Invasive species control	Materials	-				1,000
	Equipment hire	-	1,200.00			1,000
	Labour	1,800.00	600.00		600	1,000
Fencing	Materials	3,000.00		600		
	Equipment hire	-				
	Labour	1,975.00	4,880.00	300	600	1,000
Educational activities, community awareness	Materials	1,000.00	279.00			
	Equipment hire	-				
	Venue hire	-				
	Labour	-		600	600	
	Advertising costs	-		100		
Revegetation	Materials	5,000.00	5,504.00			
	Equipment hire	-				1,000
	Labour	6,000.00	7,568.00		1,000	2,000
Administration support	Phone/internet/electricity	-				
	Coordination costs	500.00	504.00	2,000		
	Printing/photocopying	500.00	456.00			
	Insurance	-				
	Legally required documents	-		200		
Total		\$ 19,775.00	\$ 20,991.00	\$ 3,800	\$ 2,800	\$ 7,000