

# Soil Erosion Solutions

Helping North Coast landholders reduce soil erosion



Soil erosion projects completed  
in the Northern Rivers, NSW 2007/2008

Funded by Northern Rivers Catchment Management Authority





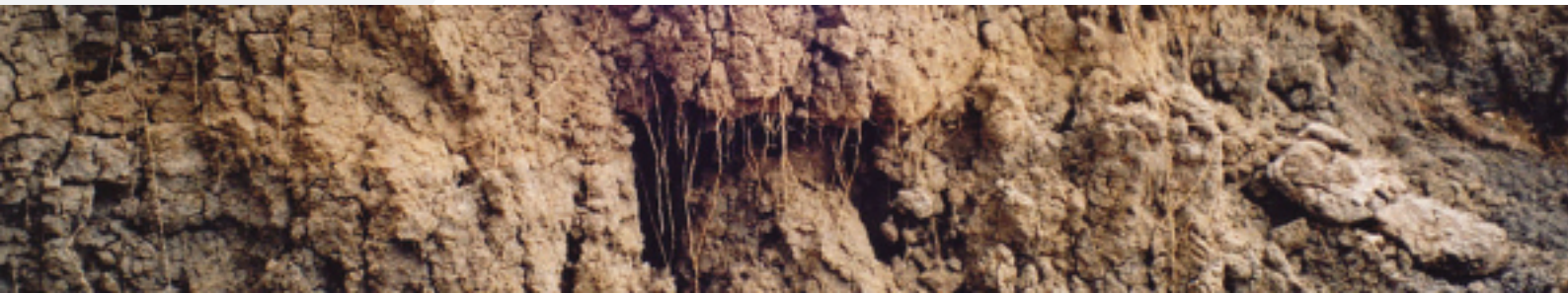


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# Soil Erosion Solutions supported work to repair, reduce and prevent soil erosion on agricultural land in the northern rivers region.

From 2005 to 2008 the Soil Erosion Solutions (SES) program was funded by the Northern Rivers CMA, and run by NSW DPI in partnership with Landcare community support officers in the region.

This program provided funding to landholders for onground works to control soil erosion on their properties.

We asked for expressions of interest from landholders with soil erosion problems they wanted to address, then worked with them to develop plans for their projects, providing advice and technical support. The landholders then carried out their own projects with the support of funding from SES.



In the first year of the project, 15 landholders completed works on their properties. These were described in a previous booklet, available on the web at [www.dpi.nsw.gov.au/agriculture/resources/soils/erosion/soil-erosion-solutions](http://www.dpi.nsw.gov.au/agriculture/resources/soils/erosion/soil-erosion-solutions).

After our third year more landholders have completed erosion control works with assistance from SES. Funds were targeted towards responding to a high level of interest received from landholders in the Richmond Catchment, and addressing the specific issues of steep lands in the Byron and Coffs Harbour areas, and gullies in the Clarence Catchment and Casino region.

In November 2006 we took a group on a bus tour of mass movement sites in the Upper Richmond around Barkers Vale to examine the causes and options for dealing with landslips.

In May 2007 we piloted a soil erosion management course, developed with the North Coast Institute TAFE at Wollongbar. Taught by horticultural consultant, Alan Coates and soil conservationist, Gerry Ryan, the course was targeted specifically to macadamia growers. Morning sessions were held in the classroom and afternoons were spent looking at real erosion control works and strategies on farms. The 3 day course was fully enrolled, and feedback from the growers who attended was very positive.

A field day held at the Brooklet project described in this booklet (page 9) was attended by 72 people, mostly fellow macadamia growers who showed a keen interest in improving their farm infrastructure and introducing practices to reduce soil erosion.

As well as this publication which documents our onground works projects, the Soil Erosion Solutions team has compiled a technical manual for landholders to provide more detailed information on soil erosion management and rehabilitation.

We encourage landholders interested in developing a soil erosion project for their property to contact the Northern Rivers Catchment Management Authority for assistance.

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## rock lining of a gully

**Landholder** Vic and Lynette Walters

**Map reference** 1

**Land use** Grazing and rainforest plantings

**Soil Erosion Solutions Grant** \$1,770 (electric fencing, energiser and materials, trees, fertiliser, herbicide, diesel)

**Landholder's in-kind contribution** \$4,320 (tractor work, labour, trees, monitoring)

### The site

Gully erosion of the toe of a large landslip threatened to destabilise the slip area. The landslip encroached on a natural watercourse, and the floor of the watercourse was also eroding.



The stream in flood

### The project

- The site was fenced to exclude cattle.
- The gully floor and toe of the bank were armoured with rock.
- Native trees were planted along the banks.



The toe of the old slip starting to erode



After the flood, rock work has protected the gully

### The benefits

- The watercourse is now stable, and handled the January 2008 flood well.
- Less sediment is entering Fawcetts Creek below.
- Tree plantings will link up with existing significant remnant vegetation.

### Landholder's experience

What was the **best thing** about this project?

"In the torrential rain in January 227mm in one night, 819mm for the month, the works all held together, and no more washouts. Watching the rate the trees are growing at is very rewarding."

What was the **most difficult** aspect of the project?

"Collecting all the rocks and placing them in the most beneficial spot."



## gully management

<b>Landholder</b>	Kevin and Leeanne Coonan
<b>Map reference</b>	2
<b>Land use</b>	Beef cattle grazing and dairy farming
<b>Soil Erosion Solutions Grant</b>	\$9,800 (earthworks)
<b>Landholder's in-kind contribution</b>	\$10,260 (earthworks, labour, fencing materials)
<b>West of the Ranges Landcare Inc. (WORLI)</b>	\$500 (trees, labour and administration support)

### The site

A failing dam within a gully line in remnant bushland had increased erosion. Access by cattle to the gully had contributed to the erosion and the failure of the dam.

### The project

- The failing dam in the gully line has been decommissioned.
- An existing larger dam upstream of the gully was extended to increase water storage capacity, and so reduce water flows downstream.
- New fences were constructed and existing fencing repaired to exclude cattle from the watercourse, protecting the works area and existing remnant bushland.
- 50 local native trees were planted by the local Landcare group to improve soil stability and biodiversity.
- Weeds are being managed in the rehabilitation area.



Erosion in the gully

### The benefits

- The risk of a major failure of the dam has been averted; well planned decommission works removed the dam wall safely.
- Soil loss from the gully has been reduced.
- The stabilised and fenced gully will offer better habitat value for wildlife in and around the stream.
- Tree planting has enhanced the existing remnant bushland.

### Landholder's experience

What was the **best thing** about this project?

"We have water – the dam is full and overflowing – it has provided peace of mind to have an additional supply of water."

What was the **most difficult** aspect of the project?

"Getting the contractor to complete the work on time, and timing the works with favourable weather conditions."



Kevin Coonan inspects the new dam

# Iron Pot Creek

## stabilising a gully head

<b>Landholder</b>	Margaret Duffield and Peter Stackhouse
<b>Map reference</b>	3
<b>Land use</b>	Grazing
<b>Soil Erosion Solutions Grant</b>	\$3,900 (earthworks, pipes)
<b>Landholder's in-kind contribution</b>	\$4,050 (labour tractor, mulch, technical consultant)

### The site

A deep gully had formed, running from highly erodible land into Iron Pot Creek. The head of the gully was dangerously undercut. A constantly wet track and stock access at the gully head encouraged further erosion and threatened productive cropping paddocks.



The gully head before works

### The project

- The area was fenced to exclude stock.
- A large concrete pipe was installed to deliver water from a collection sump behind the gully head to a concrete-lined 'stilling basin' on the bottom of the gully floor.
- The area around the stilling basin in the base of the gully was lined with concrete cores to protect the soil from turbulent water and to roughen the surface, reducing the speed of the water flowing from the basin.



Installing the concrete pipe



Flood waters leaving the stilling basin

- Groundcovers were grown between the cores to further stabilise the soil.
- The sides of the gully were reshaped and planted with trees to halt further erosion.



The reshaped gully head area

### The benefits

- The gully head is now stabilised.
- The collection sump and stilling basin have reduced the erosive potential of the water coming through the gully.
- Less soil is washing into Iron Pot creek.
- The revegetated areas will help to link local vegetation corridors.

### Landholder's experience

What was the **best thing** about this project?

"Peter developed a plan that he invented – it worked – he used recycled goods, the old septic tank and concrete cores that we had on the farm. Now the dam (at the pipe inlet) has developed a little micro-ecosystem developed with fish, lilies, water dragons etc."

What was the **most difficult** aspect of the project?

"Carting all the cores to line the gully."



The end result; mostly grass to look at



## planting trees to reduce mass movement risk

<b>Landholder</b>	Ian and Diane Moore Manager - Michael Whaley
<b>Map reference</b>	4
<b>Land use</b>	Cabinet timber
<b>Soil Erosion Solutions Grant</b>	\$4,725 (soil tests, trees, mulch, grass seed, herbicides)
<b>Landholder's in-kind contribution</b>	\$9,320 (labour, mulch, fertiliser)

### The benefits

- The established trees will provide long term stability to the slope.
- The planting provides connective habitat between existing rainforest areas.



### Landholder's experience

What was the **best thing** about this project?

"The site visit was invaluable – Abigail, Gerry and Stephanie – receiving that level of consulting and planning help for free was fantastic."

What was the **most difficult** aspect of the project?

"Ragweed took over around trees over the summer – it was a huge job to remove from each tree."

### The site

A series of small landslips worried the owners and manager of this property. The slips seemed to be the result of saturated soils on the steep grassed slopes.

### The project

- Rainforest trees were planted on the slopes to remove water from the soil profile and hold soil in place with their deeper root systems.



Michael Whaley and some of the planted trees



## tree planting to reduce mass movement risk

<b>Landholder</b>	Stephen Marshall
<b>Map reference</b>	5
<b>Land use</b>	Grazing
<b>Soil Erosion Solutions Grant</b>	\$3,705 (contract fencing, trees, fertiliser, mulch and planting)
<b>Landholder's in-kind contribution</b>	\$3,705 (contract fencing, trees, fertiliser, mulch and planting)

### The site

A steep property with a watercourse flowing through the centre had numerous slip areas, several of which had developed into gullies.



One of the gullies just after fencing and planting



A newly planted tree

What was the **most difficult** aspect of the project?  
“The maintenance of the planting – which is going well.”

### The project

- Slip and gully erosion areas were fenced to prevent stock access worsening the erosion.
- Rainforest trees were planted to remove water from the soil profile and hold the soil in place with their deeper root systems.

### The benefits

- The bare areas now have vegetation cover.
- The established trees will provide better long term stability to the slope.
- The protected rainforest plantings have improved farm biodiversity.

### Landholder's experience

What was the **best thing** about this project?  
“The ease of the application process which was facilitated by DPI staff.”



Mulch piles indicate the position of tree plantings



## from a gully to a stable hillside

<b>Landholder</b>	Nick and Perina Oliver
<b>Map reference</b>	6
<b>Land use</b>	Grazing and rainforest remnants
<b>Soil Erosion Solutions Grant</b>	\$4,865 (electric fencing, geotech fabric, rocks, seed, trees, mulch)
<b>Landholder's in-kind contribution</b>	\$5,760 (tractor work and labour)

### The site

A stock track on a steep slope had initiated a gully that had grown to 160 metres long and up to 2 metres deep. Soil from the gully was ending up in the nearby creek.



The gully before works

### The project

- Cattle were excluded from the gully.
- Check dams of rock and geotech fabric were built at intervals down the gully.
- Some sections of the gully were lined with geotech fabric and filled with rock.
- The filled area was mulched over to allow grassing over.
- Trees were planted alongside the gully.

### The benefits

- The hillside is now stable.
- Less sediment is entering the creek.
- The tree plantings link up with existing significant remnant vegetation.



Filling and mulching of the gully

### Landholder's experience

What was the **best thing** about this project?  
 "Stabilising the soil – it has worked a dream."

What was the **most difficult** aspect of the project?  
 "The timetable was hard – our project needed a lot of labour so getting the work done in time with all the other things in life and on the farm was difficult. We were also worried by a sense of inflexibility of the plan we'd committed to for the funding when the best way to do the work only became clear after we'd started. In the end this was alright but it was more complicated than just doing things on your own."



The bottom of the filled gully with tree plantings behind



## rock reinforcements for shady orchard watercourses

**Landholder** Ian Clapham, Yarralumla Plantations

**Map reference** 7

**Land use** Macadamias

**Soil Erosion Solutions Grant** \$10,000 (tree removal hire equipment & operator for earthworks)

**Landholder's in-kind contribution** \$10,011 (labour, tree removal, tree pruning, grass planting, maintenance, rock works & grass)

### The site

An older macadamia orchard with a nearly closed canopy had been established with little regard for natural watercourses. As a result there was extensive sheet erosion with exposed tree roots, and gullies had formed where waterflows concentrated in the orchard. The damage to the orchard floor meant machine-harvesting in those areas of the orchard was ineffective. A new owner wanted to reduce the dramatic soil loss and improve machine-harvesting while maintaining existing production levels.



Low light levels and tree rows cutting across natural drainage lines

### The project

- Gullies running down the interrows were filled with large gravel. Some trees were removed and others pruned to assist grass cover to be established over the top of the gravel, permitting machine-harvesting. The filled gully functions as both a subsurface and surface drain.
- Where water flowed across the tree rows small rock check dams were installed to slow the water down and encourage sediment deposition.
- Selected trees growing in natural flowlines were removed.
- Windbreak trees causing excess shading were removed.



Rock fill in a gully protects against further erosion

### The benefits

- Active gully erosion through the orchard has been greatly reduced.
- Extra light has improved groundcover, reducing sheet erosion.
- Sediment is being trapped within the orchard, rather than ending up in dams and watercourses.
- The orchard's production has not been interrupted or set back by the erosion control works.

### Landholder's experience

What was the **best thing** about this project?

"The support from Soil Erosion Solutions to identify the priorities, planning and refining the project."

What was the **most difficult** aspect of the project?

"Trying to do something effective without disrupting the running of the orchard at the beginning of harvest."



A small check dam protects where water crosses the tree line



## safe diversion of water

<b>Landholder</b>	Ian Clapham, Brooklet Farm Frank Elsworth, Figtree Plantation
<b>Map reference</b>	8
<b>Land use</b>	Macadamias
<b>Soil Erosion Solutions Grant</b>	\$10,000 (earthworks to construct diversion drain, matting to protect drain and grass seed)
<b>Landholder's in-kind contribution</b>	\$16,746 (removal of windbreak, labour)

### The benefits

- Run-on water has been safely directed to the dam or watercourse.
- There is less erosion within the orchards.
- Water quality leaving the orchards has improved.
- There is now better access along the boundary, and more turning room at the end of the rows.

### The site

Two neighbouring macadamia orchards had erosion problems from concentrated water flowing onto them from different parts of each orchard. There were especially deep gullies down the tree rows on Brooklet Farm from the run on water. An old windbreak on the boundary separating the two orchards had become a weedy rat haven, and made managing the water difficult. Both landholders worked together to resolve the drainage problems.

### The project

- The windbreak between the two properties was removed and mulched.
- A broad shallow diversion bank was constructed along the boundary to divert water to the farm dam and into a nearby stable watercourse.
- Excavated soil was used to form low profile mounds along the adjoining eroded tree rows.
- Jute erosion control matting was installed in the high flow area of the new drain to give immediate protection.
- Carpet grass and winter ryegrass were sown in all disturbed areas.



The diversion drain is formed



Jute erosion matting laid in the new drain's flowline

### Landholder's experience

What was the **best thing** about this project?

"The advice from NSW DPI's Soil Erosion Solutions on how to tackle the biggest problem at the site. I originally wanted to deal with the erosion under the trees but it was explained to me that we would be better dealing with the cause of the problem not the symptom."

What was the **most difficult** aspect of the project?

"We had trouble getting a suitable contractor to do the work at the time we wanted, so the works started 6 months late at the beginning of harvest. We then had some issues with the quality of the work; with heavy rain, some areas needed fixing up."



Grass growing through the erosion matting



# Macleans Ridges

## macadamia orchard floor improvements

<b>Landholder</b>	Brad Connelly
<b>Map reference</b>	9
<b>Land use</b>	Macadamias, nursery
<b>Soil Erosion Solutions Grant</b>	\$6,570 (soil profiling, soil carting, grass seed, fertiliser)
<b>Landholder's in-kind contribution</b>	\$7,766 (labour, supply of equipment, smothergrass)

### The site

This mature macadamia orchard had limited light reaching the orchard floor. Gullies had formed along the interrows leaving the trees with exposed roots. Soil was also being scoured out of orchard watercourses that had become shaded and lost grass cover.

### The project

- Trees next to watercourses were pruned heavily to allow more light through for grassed waterways.
- Trees were hedged on one side to increase light availability on the orchard floor.
- The interrow soil was reprofiled to cover tree roots and form wide shallow spoon drains.
- Compacted soils were improved with a spike aerator.
- Smothergrass plugs were planted at each tree.
- Millet seed was sown over all disturbed soil areas.



The soil profiler shifts soil from the interrow into the tree row

### The benefits

- The reshaping of the orchard floor has halted the gullies that had been scouring out along the tree lines.
- Grassed waterways allow water to move through the orchard with less damage.
- Sediment loss to the creek has been reduced.
- Fewer exposed roots has made harvesting easier.



Hedging of one side of the trees

### Landholder's experience

What was the **best thing** about this project?

“Knowing the topsoil is going to remain where it is and improving soil biology - increased microbial flora, increased worms, improved health of plantation hopefully leading to sustainable production.”

What was the **most difficult** aspect of the project?

“Timing of works with the rainfall. It was difficult to get cover to hold the very loose soil so it did not wash away with the first lot of rain.”



The millet cover crop provided good short term protection



## reshaping gullies and return to pasture

<b>Landholder</b>	Keith Doherty
<b>Map reference</b>	10
<b>Land use</b>	Grazing and future cabinet timbers
<b>Soil Erosion Solutions Grant</b>	\$5,940 (hire of earthmoving equipment, purchase seed and mulch)
<b>Landholder's in-kind contribution</b>	\$5,940 (labour, tractor work)

### The site

The landholder had already done some work to reduce soil erosion on the property, and had identified four gully sites that needed remediation.

### The project

- Cattle were temporarily excluded from the rehabilitation sites.
- Some gates and sections of fences were removed to allow access for machinery.
- Eroded sections were reshaped, lined with rock and covered with topsoil.
- One very steep slope was terraced to slow down water flow.
- Slopes were detailed to allow slashing for maintenance.
- Disturbed soil was fertilised, seeded with grasses and mulched.
- Straw bales were placed across slopes to minimise soil and seed loss.

### The benefits

- More productive pastures that are easier to maintain.
- Less sediment in Boggy Creek.



Hay bales slow down water on a steep slope

### Landholder's experience

What was the **best thing** about this project?

"With our heavy rain in January 2008 it was very satisfying to stand above what was previously the worst section of erosion gully and watch the considerable flow of water travelling on top of the ground over new grass, rather than churning through the gully, tearing away at soil and rock, and depositing it all on the flat land and in the creek below."

What was the **most difficult** aspect of the project?

"The most difficult thing about the project was the sheer time and effort involved in manually cleaning up the surface rock following earthmoving equipment activities, and securing 800 straw bales on steep slopes to keep soil in its place and allow the newly planted grass seed to take."



One of the sites for rehabilitation



Reshaping in progress



## fencing out cattle

<b>Landholder</b>	Tony and Kim Curtis
<b>Map reference</b>	11
<b>Land use</b>	Grazing
<b>Soil Erosion Solutions Grant</b>	\$5,051 (fencing materials, troughs, hire of equipment and trees)
<b>Landholder's in-kind contribution</b>	\$5,050 (labour and water trough)

### The site

An intermittent watercourse, containing a series of dams, runs through this grazing property. Cattle traffic was eroding the banks.

### The project

- The dam and sides of the gully were fenced to exclude stock.
- Trees and shrubs were planted in the fenced area.
- New trees and shrubs were watered and maintained until established.

### The benefits

- Eroding areas are now grassing over.
- Less soil is ending up in the dam.
- The newly planted trees and shrubs will provide shelter for stock and improved wildlife habitat.
- The more stable environment will improve the quality of the water flowing into the downstream watercourse.

### Landholder's experience

What was the **best thing** about this project?

“Very happy with the outcome; there’s no erosion and keeping the cattle out is great. SES allowed us to do the whole project in one go, we couldn’t afford to do it all ourselves and the job is done properly.”

What was the **most difficult** aspect of the project?

“To meet the deadline for the funding we had to plant the trees at a non-optimal time – very dry and we were unable to supply enough water to keep them alive. Keeping the maintenance up is a bit time consuming.”



The fenced off watercourse



## dam spillway repairs

<b>Landholder</b>	Suzanne Hopfner and Harry Wolf
<b>Map reference</b>	12
<b>Land use</b>	Land managed for conservation use only
<b>Soil Erosion Solutions Grant</b>	\$5,000 (earthworks, seeds/mulch, hessian, stakes, gabion baskets, geotextile fabric)
<b>Landholder's in-kind contribution</b>	\$6,240 (labour)
<b>Landcare</b>	\$660 (administration)

### The site

This former grazing property had two severely eroded catch drains leading to a dam with a badly eroded spillway and back batter. The landholder wanted to fix the erosion without getting rid of the dam.

### The project

- The larger catch drain was filled in.
- Small check structures constructed from hessian secured with wooden stakes were placed across the smaller diversion drain to slow down the water flow and trap some of the sediment.
- The eroded batter on the upslope side of the dam was reshaped.
- The spillway gully was realigned and reinforced with a drop structure made of gabion baskets that directs water flow over a central area onto a Reno mattress (rock held in place with wire) below which protects the soil and prevents a scour pool from forming below the new 'waterfall'.
- Geotextile fabric was used to protect the waterline where it will have to carry high velocity flows.

- All disturbed areas were mulched and seeded with native grasses to promote rapid revegetation.

### The benefits

- Active erosion has stabilised, reducing sediment into the creek downslope.
- Innovative techniques used to stabilise the spillway have allowed the dam to be retained for water storage.
- The establishment of native grasses on the site has increased its conservation value.



The eroding spillway

### Landholder's experience

What was the **best thing** about this project?

"The availability of advice and support by community natural resource support officer, Anne Gibbs and NSW DPI soils advisory officer Abigail Jenkins at all stages of the project greatly helped the implementation. The gabion structure coped with 500mm of rain from November 2007 till January 2008."

What was the **most difficult** aspect of the project?

"Sourcing an appropriate earthmoving contractor and meeting the deadlines despite the weather."



The gabion drop structure that stabilises the dam spillway

# Coongbar

## a dam to stop a gully headcut

<b>Landholder</b>	Joshua Quinn and Kylie Brady
<b>Map reference</b>	13
<b>Land use</b>	Grazing
<b>Soil Erosion Solutions Grant</b>	\$8,500 (fencing contractor and materials, float for earthmoving equipment, fuel, plastic dam liner, gypsum, seed and fertiliser)
<b>Landholder's in-kind contribution</b>	\$9,250 (excavator and bulldozer work, labour)

### The site

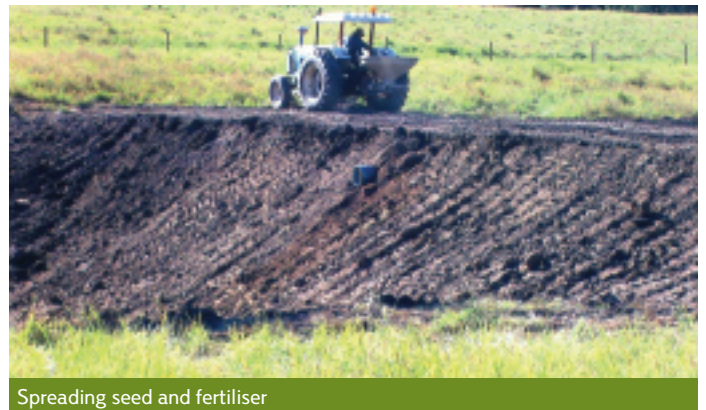
The landholders of this remote grazing property with dispersive subsoils were concerned about several active gullies. One of the worst gully heads had already cut its way over a kilometre up a broad valley, cutting a gully over 5m deep and often over 25m wide. We wanted to stop the advance of the headcut into productive pastures.



Looking down the gully

### The project

- A dam was designed to reduce the risk of tunnel erosion and deliver most water flow to the gully floor via pipe.
  1. Grass and topsoil were taken off the dam site and stockpiled.
  2. The base of the dam wall was keyed in to an excavated trench.
  3. Soil for the dam wall was mixed with gypsum to reduce dispersion.
  4. The dam wall was built in 200mm stages and track rolled.
  5. A large tricklepipe was set into the dam wall to take flows up to greater than a 1 in 10 year flood event.
  6. A 3mm black plastic lining to prevent tunnelling was laid on the inside face of the dam wall, then covered with 1½ m of soil and track rolled.
  7. Topsoil was respread over the finished wall, then fertilised and seeded with perennial grasses and a cover crop of oats.
- The pipe outlet in the base of the gully was armoured with rock.
- The dam site and much of the downstream gully line were fenced off.



Spreading seed and fertiliser

### The benefits

- The gully head has stopped progressing, protecting upslope farmland.
- Innovative techniques used to protect the embankment from tunnelling allow the dam to be used for water storage.
- Fencing off the flow line will allow increased vegetation to establish on the gully walls downstream of the dam, and reduce soil loss.

### Landholder's experience

What was the **best thing** about this project?

"The dam gives us extra water for dry times and has helped prevent the erosion from getting worse."

What was the **most difficult** aspect of the project?

"Finding enough dry weather to place the dam in the gully."



The finished dam



## diverting water around a gully

<b>Landholder</b>	Bruce King
<b>Map reference</b>	14
<b>Land use</b>	Grazing
<b>Soil Erosion Solutions Grant</b>	\$2,200 (earthmoving, wire, seed & fertiliser)
<b>Landholder's in-kind contribution</b>	\$2,500 (labour, supply rocks, supply tractor)

- A small rock weir was constructed in the creek to dissipate the energy of the water flow discharging from the diversion bank. This leaky weir backs up water during high flows to create a temporary pond, slowing the water and reducing its erosive power before it travels downstream.
- The gully head and walls were reshaped and grassed.
- The diversion bank, reshaped gully and part of the downstream watercourse were fenced off to exclude cattle.

### The site



The gully before works

An active gully head had developed in a transitional area where a broad depression carried flood overflow from a wetland into a defined creek line. The open country and very gentle slope of the site allowed the creation of a preferred flow line around the gully area.

### The benefits

- The back push bank was a low cost way to stop further gully erosion.
- The amount of sediment passing into the creek has been greatly reduced.
- Aquatic habitat in the creek has improved.
- Native vegetation is re-establishing itself in the fenced creek area.

### Landholder's experience

What was the **best thing** about this project?

"We've stopped the progress of the erosion."

What was the **most difficult** aspect of the project?

"Trying to co-ordinate the earth works and the weather to complete the works in the time frame (and the paperwork)."

### The project

- Above the gully head a back push diversion bank was constructed. This ensured the diverted water ran along undisturbed ground and dense vegetation. The diverted water runs around the gully area and is directed back into the natural creekline further downstream.



The diversion bank seen from upslope

## rehabilitation of a quarry area

<b>Landholder</b>	Michael Hodgson
<b>Map reference</b>	15
<b>Land use</b>	Conservation
<b>Soil Erosion Solutions Grant</b>	\$8,250 (trees, shrubs, grass seed, fertiliser)
<b>Landholder's in-kind contribution</b>	\$10,460 (bank construction, sediment dam construction, deep ripping, labour)



Ripping and reshaping the surface



Constructing the diversion drain above the site



The slope before works

### The site

Large quantities of soil had been removed from this hillside property to construct a levee bank for the Clarence River. The area where the soil had been taken from was left barren and the slope had eroded badly.

### The project

- Diversion drains were constructed above the eroded slopes to divert water around the vulnerable area..
- The eroded slopes were deep ripped and the surface reshaped.
- Trees and shrubs were planted at a density of 800 plants per hectare.
- Fertiliser and pasture seed were spread over the rehabilitated area.
- A sediment dam was constructed below the site to catch sediment before it entered the river.

### The benefits

- A very degraded site has been largely stabilised
- Any further eroding soil is being caught in the sediment dam.
- The establishment of native trees and shrubs on the site has increased its conservation value.

### Landholder's experience

What was the **best thing** about this project?

"The project has done a fantastic job of stopping erosion and redirecting water to non-eroding routes. The soil at the quarry site now supports pasture."

What was the **most difficult** aspect of the project?

"Someone stole steel posts and sediment fencing from the project site. We were disappointed initially that pasture establishment was patchy. We did a soil test that told us we needed different fertilisers – so applied and pasture is establishing better."



The rehabilitated site



## soil conservation on a blueberry farm

<b>Landholder</b>	Sohan Atwal
<b>Map reference</b>	16
<b>Land use</b>	Bananas and blueberries
<b>Soil Erosion Solutions Grant</b>	\$9,300 (gabion rock, gravel, cracker dust, pipes, excavator hire, geofabric sandbags, grass seed)
<b>Landholder's in-kind contribution</b>	\$9,300 (labour, tractor work)

### The site

Part of this steep coastal farm was being converted from bananas to blueberries. The new mounds for blueberry rows ran downslope, so there was a risk of erosion down the interrows. An intermittent watercourse with subsurface flow runs through the centre of the farm. This made traffic turning areas boggy for a lot of the year, and the disturbed ground prone to further erosion.

### The project

- A soil conservation plan for the blueberry area was prepared with the NSW Soil Conservation Service.
- A gravel bank was constructed to stop water from the road running down an orchard track.
- Long blueberry rows were broken up with cross banks to intercept run off water and deliver it safely to managed watercourses.
- The central drainage line was improved with subsurface drainage.
- The capacity of the existing sediment basin was increased, and scour areas protected with rock.
- Disturbed soil was fertilised, seeded with grasses and mulched.
- Small erosion points at the edge of blueberry mounds were protected with geotextile sandbags to direct water flows into the grassed interrows.



The new sediment basin with rocky outlet

### The benefits

- The orchard has become a model for best practice in soil and water management.
- Banks and groundcover mean less soil is eroding from the orchard.
- The improved sediment pond means more sediment is being trapped on the farm.
- Less sediment and nutrients are being carried into a coastal stream.
- The subsurface drainage has stabilised important turning areas, making orchard operations easier.
- The cross banks to break up long slopes have also improved watering efficiency.

### Landholder's experience

What was the **best thing** about this project?

"Achieved everything wanted. The water does not flow down the gully anymore so the erosion has stopped, the drainage is improved so the tractor no longer gets bogged."

What was the **most difficult** aspect of the project?

"The steepness of the slope meant none of the trucks were able to get up it – so the materials had to be double-handled from the truck to a bucket on the tractor making the job slower."



Subsurface drainage improves the central flow line



Grassed crossbanks intercept water running down the blueberry rows

# Soil Erosion Solutions

erode *v.tr & intr.* wear away, destroy or be destroyed gradually [based on Latin *rodere* 'to gnaw']

## Soil erosion solutions for the whole farm

- 1) Keep soil covered with living plants or mulches - 90% ground cover as shown.



- 2) Keep soil disturbance to a minimum.



- 3) Re-vegetate as soon as possible after disturbance.



- 4) Divert water around erosion-prone areas.



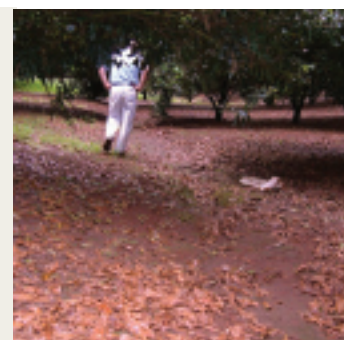
- 5) Maintain permanent ground cover on temporary watercourses.



- 6) Trap sediment before it leaves the farm.



- 7) Monitor erosion and take action before it becomes a problem.



### Soil Erosion Solutions

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