

Fixing fish habitat in the Clarence estuary

A report on 13 projects funded by the NSW Recreational Fishing Saltwater Trust Fund in the Lower Clarence River

NSW DEPARTMENT OF

PRIMARY INDUSTRIES

Recreational

Fishing Trusts

Cover images from left to right: East Micalo Island (NSW DPI), Australian bass © Gunther Schmida, Little Broadwater (WetlandCare Australia)

Fixing freshwater fish habitat in the Clarence estuary

T he Clarence estuary is one of the most significant areas for marine biodiversity in NSW. It has the fourth largest area of mangrove forest in the state, the second largest area of seagrass and the eighth largest area of saltmarsh. In addition, the estuary is recognised as the most important wild catch fishery in NSW, accounting for approximately 30% of the state's total annual catch.

The health of our rivers and creeks is influenced by our on land activities. In the past, waterways throughout NSW, including the lower Clarence Catchment, have undergone extensive change due to urban, industrial and agricultural development. Erosion, drainage of floodplains and wetlands, installation of floodgates, construction of structures which restrict fish passage and removal of riparian and aquatic vegetation have all degraded fish habitat. This has put pressure on native fish populations and fishing opportunities.

In 2002 the NSW Recreational Fishing Saltwater Trust Expenditure Committee (RFSTEC) provided \$120,000 from recreational fishing licence fees for a two year, pilot fish habitat rehabilitation program in the lower Clarence Catchment. Local government, Landcare and Rivercare groups, community groups, angling clubs and individual landholders were eligible to apply.

The pilot program, managed under the NSW Department of Primary Industries Aquatic Habitat Rehabilitation (AHR) program, provided grants varying from \$5,160 to \$10,000 to 13 successful applicants for innovative rehabilitation projects to improve native fish habitat and ultimately enhance recreational fishing opportunities and commercial fishing in the catchment. Local angling clubs, individual landholders, Landcare and Rivercare groups, local government representatives, professional fishers and environmental groups are commended for their significant commitment and efforts.

The projects aimed to:

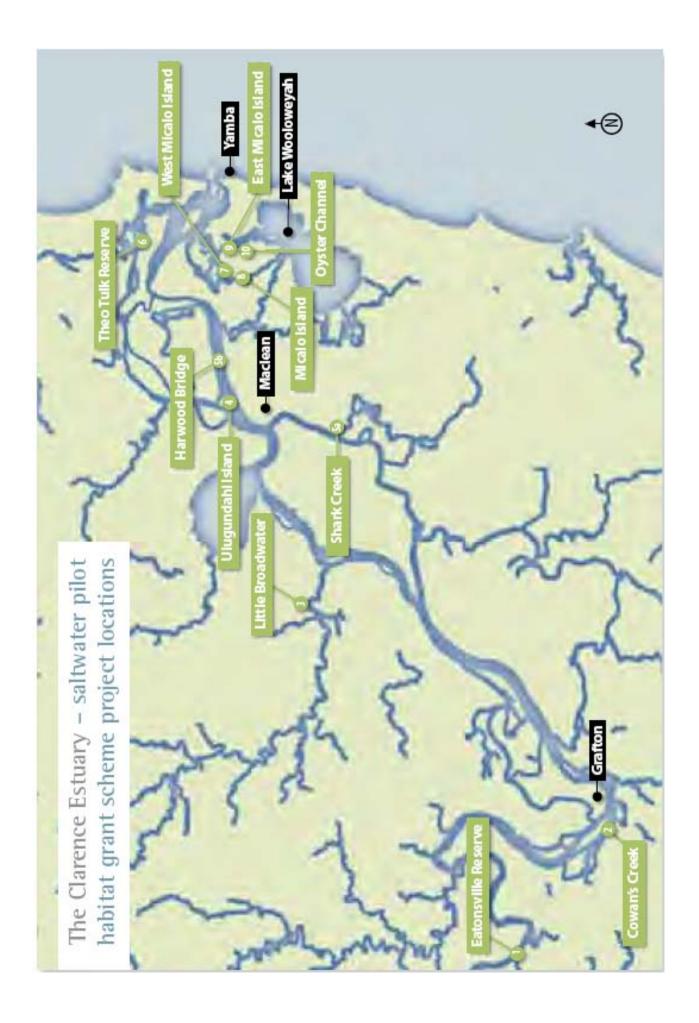
- remove barriers to fish passage
- reinstate natural flow regimes
- rehabilitate riparian zones
- remove exotic vegetation
- · revegetate with native species
- fence off waterways to restrict stock.

To date the program has:

- improved over 300 hectares of estuarine wetland and floodplain habitat
- reinstated over 10 kilometres of fish passage
- generated nearly \$430,000 in supporting contributions
- secured matching funding of \$120,000 from the Northern Rivers Catchment Management Authority
- · promoted projects in the media
- increased community interest in rehabilitation projects to improve fish habitat.

The success of the program during 2002-2004 resulted in the introduction of a Coastal Fish Habitat Grant Program in 2005 with a total funding allocation of \$160,000. This opened up the program to all coastal catchments and allowed an increase from \$10,000 to \$30,000 as the upper limit available for individual projects.

This booklet summarises the 13 projects that were funded in the original pilot program and aims to provide examples and facilitate future on-ground projects to rehabilitate aquatic habitat.



Theo Tulk Reserve saltmarsh rehabilitation

The site

Theo Tulk Reserve is a 16 hectare flora and fauna reserve on Goodwood Island in the lower Clarence River, situated 15 kilometre north-east of Maclean. The reserve encompasses a range of valuable ecological communities including mangroves and floodplain forest, and is a unique example of the natural vegetation community which once existed in the lower Clarence estuary. However, uncontrolled vehicle access, illegal camping and encroachment by exotic weeds have damaged the sensitive plant communities and degraded the reserve.

The project

BioManagement Ltd., a local environment group, supported by professional fishermen and the Clarence Fishermen's Cooperative Limited, applied for funding to implement the first stage of a project 'to protect and enhance the wetland values of the Tulk Reserve' and control the destructive vehicle access.

The outcomes

Stage 1 of this project has

- removed large amounts of exotic weed
- erected a substantial post and cable barrier fence to manage vehicle access
- removed excess mounds and ridges caused by wheel ruts to allow natural tidal regimes
- ensured natural recolonisation of saltmarsh vegetation can occur.

The successive stages of this long-term saltmarsh rehabilitation project will further improve and protect this valuable remnant environment.

Proponent	BioManagement Ltd.
Map location	6
Land use	reserve, fishing, bird watching
RFSTEC grant	\$6,573
In-kind support	\$19,000
Funding year	2004/2005



Four-wheel drive tracks through the sensitive reserve vegetation (BioManagement Ltd)



Construction phase of the strong post and cable fence (BioManagement Ltd)

Some saltmarsh facts

- They provide essential food resources, habitat and shelter to a number of native fish species, including yellowfin bream and sand whiting.
- They are inundated occasionally by high tides.
- They are characterised by plants such as red samphire (*Sarcocornia quinqueflora*), salt couch (*Sporobolus virginicus*) and rushes (*Juncus kraussii*).

East Micalo Island aquatic habitat rehabilitation

The site

Micalo Island was historically recognised as one of the most ecologically important areas of the lower Clarence River because it provided essential nursery and breeding habitat for a diverse range of species including recreational and commercially important fish. However, the island has been severely degraded by past traditions of clearing land for agriculture, and drain and levee bank construction for flood mitigation.

The project

Fred and Chris Welsh, who run a number of cattle and horses on their property, recognised the importance of healthy aquatic habitat to native fish populations and improved land management. Fred and Chris decided to undertake a rehabilitation project to enhance fish habitat, fish passage and tidal flushing in the waterways on their property. They applied for funding to install a tidal floodgate at the mouth of a drain and increase the width of a pipe running through a levee bank, thereby providing a stronger connection between the drain and the main river channel.

Proponent	Fred and Chris Welsh (landowners)
Map location	9
Land use	private, grazing
RFSTEC grant	\$10,000
In-kind support	\$26,733
Funding year	2004/2005



Contractors laying the new floodgate pipe (Fred Welsh)

The outcomes

The new tidal floodgate and larger pipe have

- introduced tidal flows and fish passage to over 5 kilometres of waterway and extensive areas of saltmarsh
- increased the range of fish in the newly opened habitat to include mullet, flathead and bream
- improved water quality
- reduced nuisance aquatic weed growth.



'We see this as a win-win situation for the environment and property owners' Fred Welsh (NSW DPI)

Permanently closed floodgates

- prevent fish passage to important breeding and feeding habitat
- fragment and alienate fish populations allow noxious aquatic weeds to flourish
- increase water acidity due to acid sulfate soil drainage which can lead to fish kills.

Micalo Island *fish passage, mangrove and saltmarsh rehabilitation (stages 1 & 2)*

The site

Micalo Island is a low-lying island in the lower Clarence estuary, subjected to periodic flooding and tidal inundation. The island is recognised as an essential breeding and feeding habitat for a diverse array of important native fish species and other aquatic animals. However, land clearing, flood mitigation and cattle grazing have altered the island's natural terrestrial and aquatic environment, with the project site being highly modified and degraded.

Proponent	Robert Schafer and Allan Byrne (landowners)
Map location	8
Land use	private, grazing
RFSTEC grant	\$19,602
In-kind support	\$25,398
Funding year	2003/2004 & 2004/2005

The project

Property owners and neighbours Rob Schafer and Al Byrne recognised the impact uncontrolled cattle grazing was having on the ecology of Micalo Island and its aquatic habitat. Drawing upon advice provided by NSW DPI, Rob and Al developed a two stage project to restrict cattle access, improve natural tidal flows, provide additional fish habitat, enhance fish passage, encourage regeneration of mangrove and saltmarsh communities, and improve water quality.

The outcomes

In their project Rob and AI have

- rehabilitated over 25 hectares of wetland mangrove and saltmarsh communities
- installed 500 metres of fencing to restrict cattle access
- excised sections of levee banks to reintroduce natural tidal flows
- removed several barriers to fish passage including narrow pipes and floodgates
- improved connectivity to the main river channel
- constructed a "fish friendly" bridge crossing.



Re-introduced tidal flows allow natural mangrove regeneration to occur (NSW DPI)



"The wetlands are teeming with fish from crustaceans right through to the big stuff like stingrays" Rob Schafer (NSW DPI)

What happens when fish can't move freely?

- 70 % of coastal fish species in south-eastern Australia would not be able to complete essential life history stages.
- Fish populations become fragmented and alienated.
- Fish can't access important breeding and feeding grounds.
- Fish species can become locally extinct.

Oyster Channel *rehabilitation of flows, habitat and fish passage (stages 1 & 2)*

The site

This project site was also located on Micalo Island, at the lower section of the Clarence River system. Once dominated by estuarine wetland which provided an important habitat for juvenile fish, amphibians, crustaceans and migratory birds, the site became (as described by landowner Les Vance) 'dry, severely degraded by land clearing, drainage and levee construction'. In addition, the land is used for grazing cattle and horses.

Proponent	Les Vance and Edward Spears (landowners)
Map location	10
Land use	private, grazing
RFSTEC grant	\$19,980
In-kind support	\$26,878
Funding year	2003/2004 & 2004/2005

The project

Les developed the first stage of a rehabilitation project on 12 hectares of his property with technical advice from NSW DPI and applied for funding from RFSTEC to transform degraded wetland habitat, reinstate natural tidal flows, enhance fish habitat, and improve water quality. The following year Les and his neighbour Ed developed the second stage of the project to build on the successes of stage 1 and expand the rehabilitation area.

The outcomes

This collaborative project between Les and Ed has

- restored tidal exchange to 15 hectares of wetland
- opened up 1.5 kilometres of waterway for fish passage
- created artificial refuge islands for predator-safe nesting
- erected fencing to restrict cattle access
- planted over 600 native trees.

Les has observed wildfowl and native fish species breeding in the rehabilitated habitat, already illustrating discernible benefits to the aquatic and terrestrial environments.



A former wetland - too parched to support fish habitat (Les Vance)



"We've allowed the brackish water back in and the result over the past year has been fantastic, with the mangroves starting to selfseed and the fish and bird life coming back" Les Vance (NSW DPI)

Restricting natural water flow can degrade aquatic habitat by

- increasing deposited sediments
- filling in essential fish habitat
- inundating previously dry land
- producing lentic environments dominated by exotic fish species and nuisance weeds.

West Micalo Island Saltmarsh rehabilitation and flow restoration

The site

Situated on the north western side of Micalo Island in the lower Clarence River estuary, this degraded project site experienced poor tidal flushing. For nearly 30 years, water flow into an extensive saltmarsh area was restricted due to inadequately sized pipes located under a levee bank, which was also used as an access road. The results of this reduced tidal flushing were restricted fish passage to essential habitat, poor water quality, noxious weed growth, stagnant water, algal blooms and an overall reduction in aesthetic value.

The project

To overcome the problems associated with poor tidal flushing into key habitat areas on their property, Geoff and Maree proposed a rehabilitation project and applied for funding from RFSTEC in 2004. Supported by guidance from NSW DPI they aimed to restore fish passage and tidal flows to 50 ha of estuarine wetland and saltmarsh, while also improving general water quality. Like Fred and Chris Welsh (see page 9), Geoff and Maree were initially delayed getting contractors on-site to do the works due to the large amount of development works underway in the region.

Proponent	Geoff Flett and Maree Kelly (landowners)
Map location	7
Land use	private, grazing
RFSTEC grant	\$8,825
In-kind support	\$20,875
Funding year	2004/2005



Degraded saltmarsh with restricted tidal flows (NSW DPI)

The outcomes

Geoff and Maree persevered with their project, and once the contractors were on-site they installed three large pipes of 1200 millimetre diameter under the road in less than two days and for a lower price than originally quoted. Since then the new pipes have

- reinstated tidal flows to 50 hectare of estuarine habitat
- improved fish passage
- reduced siltation
- improved water quality
- reduced nuisance weed growth.



Mangroves and saltmarsh benefit from reintroduced tidal flows (NSW DPI)

Bass basics: Australian bass (*Macquaria novemaculeata*) depend upon specific water qualities to complete their life cycle.

- Downstream migration occurs during higher flows at 11-18 °C.
- Spawning takes place in brackish water at salinities 1/3 to 1/2 that of sea water.
- Juveniles avoid areas with a low (acidic) pH.
- Increased turbidity can affect bass respiration, feeding and breeding..

Little Broadwater Wetland rehabilitation and fish passage

The site

Little Broadwater is a low-lying, originally tidal estuarine wetland that provided an important habitat for recreational and commercial fish species. However, drainage systems, floodgates and levee banks which were constructed in the late 1920s to exclude tidal and flood flows, have degraded the wetland severely. Fish passage was restricted, essential fish and wildfowl habitat was lost, and water quality was poor.

Proponent	WetlandCare Australia
Map location	3
Land use	grazing, private
RFSTEC grant	\$9,860
In-kind support	\$95,860
Funding year	2003/2004

The project

In collaboration with NSW DPI and Clarence Valley Council, WetlandCare Australia initiated a three year trial project to restore tidal flows to over 170 ha of estuarine wetland and recreate fish breeding and nursery habitat. WetlandCare Australia applied for assistance from RFSTEC to provide stewardship payments to Little Broadwater landholders. The payments were a financial incentive for landholders to remove cattle from high value fish habitat (the first scheme of its kind in Australia).

The outcomes

With the support gained through the RFSTEC stewardship payments, to date this project has

- re-established natural tidal flows
- increased the biodiversity of previously dry paddocks, to include yellowfin bream, mullet, herrings, prawns, catfish, long-necked freshwater turtle, saline-tolerant sedges and aquatic plants
- erected 3500 metres of fencing to restrict cattle access
- improved water quality (formerly acidic pH 4-5 to neutral pH 7).



Acid sulfate scalding at Little Broadwater prior to re-introduced tidal flows (NSW DPI)



Fish sampling in the formerly dry paddocks which are now a thriving wetland ecosystem (NSW DPI)

Important activities of wetlands and floodplains

- They release nutrients and carbon, the basis of aquatic food chains.
- They provide essential breeding, feeding and nursery habitat for birds, amphibians, juvenile fish and other animals.
- They filter sediments and toxic materials from run-off before it reaches the main water body.

Shark Creek/Harwood Bridge Riverbank riparian rehabilitation (stages 1 & 2)

The site

Shark Creek and James Creek (Harwood Bridge site) are located in the lower Clarence Catchment, northeast of Maclean. Both sites have sensitive mangrove communities, which provide an essential habitat for juvenile native fish species. However, the riparian zones of both creeks were severely degraded, their banks heavily eroded, infested with invasive weeds, and covered with illegally dumped rubbish. Additionally, creek water quality at the two sites was poor.

The project

The two sites were chosen for a collaborative 'riparian rescue project' by Clarence Valley Council, Clarence Landcare and Shark Creek Landcare groups, complementing previous works by dedicated local landowners and the Shark Creek Landcare group. The riparian rescue team aimed to 'to re-establish the naturally occurring riparian community, significantly improve riverbank stability, fish habitat, and contribute to biodiversity targets for the Lower Clarence Catchment'.

The outcomes

This successful project has

- reduced weed cover at James Creek from 80% to 10%
- reduced weed infestation at Shark Creek from 50% to less than 5%
- erected fencing to protect mangroves
- planted over 300 native trees
- rehabilitated over 5 hectares
- installed informative signs
- produced community education posters
- generated wide community support for similar projects.

Proponent	Clarence Valley Council, Clarence Landcare & Shark Creek Landcare
Map location	5a (Shark Creek site) & 5b (Harwood Bridge site)
Land use	recreational
RFSTEC grant	\$20,000
In-kind support	\$20,000



Severe infestation of the riparian zone with strangling exotic vines (Clarence Landcare Inc)



Newly planted native species following an intensive weed management program (Clarence Landcare Inc)

Invasive exotic vegetation (eg willows, camphor laurel and lantana)

- excludes native vegetation
- · creates a poor habitat for native fish
- changes riparian zone structure and function
- reduces shade levels and causes water temperature fluctuations
- may deflect flows and cause bank erosion and instability.

Cowan's Creek riparian rehabilitation

The site

Cowan's Creek, on the north-western outskirts of Grafton, was considered to be in a degraded condition, offering poor habitat quality to native fish and other aquatic species due to reduced tidal flows, unrestricted cattle grazing, degraded riparian vegetation and unstable streambanks.

The project

WetlandCare Australia with local landholder support, sought funding to restore the riparian zone along a section of Cowan's Creek. The project built on the success of earlier work by Clarence River County Council and a local Landcare group that had improved fish passage by installing a tidal floodgate at the mouth of the creek (the first of its kind in the Clarence Catchment), and rehabilitating Cowan's Ponds. The landholders planned to fence the creek to restrict stock access, re-establish riparian vegetation and improve the creek's aquatic habitat.

The outcomes

This project has

- fenced 2 kilometres of creek frontage with a 4 strand electric fence
- revegetated the area with over 500 plants, native to the local area
- stabilised the streambank
- improved water quality
- reduced exotic weed growth
- increased the diversity of fish species in the creek.

WetlandCare Australia hopes the success of this project will initiate more rehabilitation projects along Cowan's Creek, and encourage other landholders with creek frontage to become involved.

Proponent	WetlandCare Australia
Map location	2
Land use	private, grazing & cropping
RFSTEC grant	\$10,000
In-kind support	\$21,000
Funding year	2004/2005



Native vegetation planted by EnVite volunteers along the newly fenced riparian zone (WetlandCare Australia)



Cowan's Creek with a revegetated riparian zone and tidal flushing is free of aquatic weed and provides good quality habitat for native fish (Jeremy Challacombe)

Why livestock cause problems around waterways

- Livestock manure and urine increase nutrient levels which reduce water quality and can lead to algal blooms.
- Grazing stock damage native vegetation, disturb streambank soils and increase erosion.
- These impacts can be reduced by excluding stock from stream banks using fencing and providing alternative shade and watering points.

Ulugundahi Island riparian and mangrove rehabilitation

The site

Ulugundahi Island is a 26 hectare sand-spit in the central channel of the lower Clarence River. Partially surrounded by mangroves, the island is an important breeding and nursery area for native fish. The island is also highly significant to the cultural, spiritual, social and heritage values of the Yaegl people and other indigenous people of the North Coast and as such, has recently been added to the NSW State Heritage Register. After years of neglect, most of Ulugundahi Island was covered in noxious weeds and its shores eroded by the wind and tide.

The project

Yaegl Local Aboriginal Land Council initiated a rehabilitation project on Ulugundahi Island to involve the local aboriginal community, create a sense of island ownership and provide land for an organic vegetable enterprise. The Council aimed to

- remove noxious weeds manually
- plant trees native to the local area
- encourage the natural rehabilitation of mangroves
- improve aquatic and riparian habitat
- reduce the effects of erosion.

The outcomes

In its rehabilitation works on the island, Yaegl Local Aboriginal Land Council has

- cleared weeds from large areas of the island
- improved aquatic habitat and natural regeneration of native species
- constructed an outdoor education and recreation area for the community and colleges
- increased recreational fishing opportunities
- improved community understanding of the importance of the aquatic environment and rehabilitation projects..

Important roles of mangroves

- They provide food and shelter for fish.
- They recycle nutrients.
- They provide essential nursery habitat for juvenile fish such as silver biddies and flat-tailed mullet.
- They filter silt and toxic chemicals from run-off ..

Yaegl Local Aboriginal Land Council
4
organic vegetable farming, recreational & educational
\$10,000
\$69,000
2004/2005



A team of workers involved in the rehabilitation project (Yaegl LALC)



Easy access to fishing and new BBQ spots after the intensive weed clearing program (NSW DPI)

Eatonsville Reserve fish habitat rehabilitation

The site

Eatonsville Reserve covers over 14 hectares on the banks of the Clarence River, approximately 30 kilometres upstream of Grafton. Since it was gazetted in 1967 for public recreation it has become a popular fishing spot with locals and visitors. However, a combination of human disturbance and heavy cattle grazing in the reserve led to severe degradation of the river banks and wetland areas.

The project

Following community consultation, Clarence Valley Council earmarked over a hectare of the reserve for rehabilitation. The project aimed to restrict cattle access to this area, control weeds and revegetate with native plants. Council applied for funding to 'restore, protect and enhance the riparian zone of the Eatonsville Reserve in order to promote potential fish habitat and breeding grounds within the Clarence River'.

The outcomes

A team of workers from the local Council and angling and environmental groups

- erected over 300 metres of fencing to restrict cattle access
- revegetated the riparian zone with native vegetation
- initiated a weed management program
- rehabilitated 1.4 hectares of the reserve.

The Council has now developed a plan of management for the reserve and aims to further limit vehicle and cattle access, transforming the health of larger areas of the reserve and related aquatic habitats.

Proponent	Clarence Valley Council
Map location	
Land use	crown reserve, public recreation including fishing
RFSTEC grant	\$5,160
In-kind support	\$7,745
Funding year	2003/2004



Semi-permanent wetland ponds within the reserve provide important habitat for fish, other aquatic species and wildfowl (NSW DPI)



Over 300 m of fencing was erected to restrict cattle access to sensitive areas of the reserve (Clarence Valley Council)

Benefits of riparian zones

- Streambank vegetation helps trap sediment and nutrients before run-off drains into a waterway.
- Plant roots help stabilise streambanks and prevent erosion.
- Native trees provide organic litter and food for aquatic life.
- Native trees shade the water and control water temperature.
- Fallen branches offer habitat for native fish species.

Fixing fish habitat in the Clarence estuary

Clarence recreational fishers are delighted with the way their money is being spent in the Clarence estuary.

'Our club would support anything that restores or improves the habitat for our native fish stocks and in particular native weed beds, river's edge snags and removal of threats or upstream barriers such as levies or flood gates.

We support programs which tackle the problems head on and wish to see:

- the continuance and expansion of the program
- the restoration of healthy fish stocks by improving habitat and removing threats
- our licence fees making a tangible improvement in the amateur fishing in the Clarence'.

Scott Flynn

President, Big River Bass Fly Fishing Club



Recreational fishers enjoying a day "messing about in boats" (Mark James, NSW DPI)

Do your local fish need some TLC?

If you'd like to improve fish habitat in your local area or your favourite fishing spot, here's 5 steps to get you started:

- 1. Talk with local anglers, NSW DPI Fisheries Conservation Managers, council officers, Landcare, Rivercare or local environment groups to identify habitat issues.
- 2. Involve your neighbours and your neighbours' neighbours!
- 3. Apply for permits, funds and resources, and encourage others to contribute.
- 4. Plan well but start quickly good progress encourages other people to help.
- 5. Involve your local media and create awareness about your project and its benefits to your community.

If you would like additional information on aquatic habitat rehabilitation projects or the Recreational Fishing Trust Fish Habitat Grant Scheme please contact a member of the NSW DPI Aquatic Habitat Rehabilitation team:

Region	Catchments covered by region	Postal Address	Phone	Fax
North West	Border Rivers, Namoi, Gwydir, Barwon-Darling	Aquatic Habitat Rehabilitation PO Box 3047, Tamworth, NSW 2340	(02) 6765 4591	(02) 6762 1993
Central West	Macquarie, Castlereagh, Lachlan	Aquatic Habitat Rehabilitation PO Box 865, Dubbo, NSW 2830	(02) 6881 1284	(02) 6881 1295
South West	Murrumbidgee, Murray, Lower Darling	Aquatic Habitat Rehabilitation Unit 3/556 Macauley Street, Albury, NSW 2640	(02) 6042 4205	(02) 6021 0113
North Coast	Coastal catchments from QLD border to Macleay River	Aquatic Habitat Rehabilitation 1243 Bruxner Highway, Wollongbar NSW 2477	(02) 6626 1107	(02) 6626 1377
Central Coast	Coastal catchments from Hastings to Brisbane Water	Aquatic Habitat Rehabilitation Private Bag 1, Nelson Bay, NSW 2315	(02) 4916 3926	(02) 4982 2265
South Coast	Coastal catchments from Hawkesbury Nepean to Victorian border	Aquatic Habitat Rehabilitation PO Box 1 Sydney Markets, Flemington, NSW 21	(02) 9764 3067	(02) 9746 3409

For further information about aquatic habitat rehabilitation projects visit: <u>www.dpi.nsw.gov.au/</u> aquatic_habitats or subscribe to Newstreams, the free NSW DPI bi-monthly e-newsletter. Email the editor at rebecca.lines-kelly@dpi.nsw.gov.au

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