On-farm wetland demonstration Lower Burdekin

John Quagliata, a Burdekin cane farmer shows other farmers how the rehabilitation of a wetland on his property will benefit his cane farming enterprise and also the quality of water entering the local waterway.

Project objectives

The Queensland Department of Agriculture, Fisheries and Forestry (QDAFF) partnered with the Queensland Wetlands Program (QWP) to establish an on-farm wetland demonstration site on John Quagliata's property at Airville in the Lower Burdekin. Commencing in April 2013, the project aimed to:

- implement a range of works to improve water quality entering the wetland and local waterways
- enhance biodiversity in the wetland through the planting of native endemic trees
- improve knowledge of water quality improvement to be achieved through wetland systems by implementing a water quality monitoring program
- communicate the project outcomes throughout the cane industry and the community.

The site

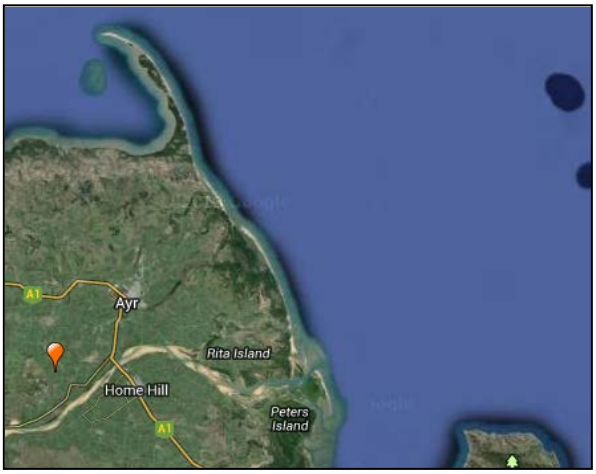
The site is located in the Sheepstation Creek sub-catchment of the Lower Burdekin delta (see map opposite). The wetland at the site is 590m long, averages 100m in width and has three distinct ponds with a total volume of 34.9 megalitres (ML).

The wetland is situated in a natural depression which has been deepened to obtain fill material. It has been blocked by a road and a paddock at both ends. When Sheepstation Creek is in flood, water backflows and connects to the wetland.

At the beginning of the project the wetland was overgrown with weeds and devoid of native vegetation. It received irrigation run-off from the adjacent cane farm which had the potential to carry nutrients, herbicides and sediments into the wetland.

'My vision for the site is to clean the area up, plant some native trees and make it a place where my grandchildren can enjoy nature. Down the track I may want to recycle water back onto my paddocks from the wetland.'

John Quagliata December 2012



Quagliata's wetland. Photo: QDAFF

The wetland prior to the project commencing. Photo: QDAFF

Partners

A range of partners were involved in the project:

- Giru Barra and Cray provided technical advice, design plans and supervised works.
- NQ Dry Tropics NRM supplied advice on tree species; supervised planting and weed removal; provided trees, fertiliser and information for the ongoing maintenance of the wetland.
- The local natural resource management group Burdekin Bowen Integrated Flood Plain Management Advisory Committee (BBIFMAC) and James Cook University's TropWATER implemented a water quality monitoring program.

Design considerations and challenges

The planned works will greatly enhance the ability for sediment removal, water quality improvement and irrigation reuse, however the site challenges were:

- that it was highly modified from its natural state over a number decades to develop adjacent sugar cane paddocks
- farm and industrial wastes with the potential to contaminate groundwater very close to the surface had been dumped immediately upstream of the wetland
- the risk of damage to the wetland and farm infrastructure such as roads and paddocks in large flood events when flows from the Burdekin River breaks out and passes through the site
- irrigation tailwater entered the wetland at five different drainage points
- any construction works and tree planting could not impede the movement of farm machinery
- the outlet point was blocked by a raised road.

Determining rehabilitation priorities

After confirming that the earthworks were excluded from state planning approval requirements[1], consulting John Quagliata and his neighbour, and considering budget constraints, it was decided Stage 1 project works focus on the 'inlet' point of the wetland. This would involve:

Works on the access road and diversion bank. Photo: QDAFF

1 The State Development Assessment Provisions seeks to ensure that development is planned, designed, constructed and operated so as to not cause harm to the hydrology of wetlands in wetland protection areas (WPA wetland [http://www.ehp.qld.gov.au/ecosystems/wetlands/wetlandsfaq.html#how_have_wpa_wetlands_been]) that protect matters of national and state environmental significance including the outstanding universal values of the Great Barrier Reef.

- stabilisation of a farm access road with an abrupt drop off into the wetland. This would reduce the potential for sediment to enter the wetland from heavy rainfall and flood events
- construction of a sediment basin upstream of the wetland to drain irrigation tailwater from 30ha of cane paddocks. It was designed to capture, detain and filter sediment prior to entering the wetland
- construction of high flow and overflow structures including a rock spillway and diversion bank. This compacted ridge of soil and rock would intercept concentrated water flows in high rainfall and flood events. An existing low point at the site would form a high flow bypass channel which would enable water to circumvent the sediment basin in times of high rainfall and reduces the risk of erosion, damage to aquatic vegetation, and the export of sediment from the sediment basin to the wetland.
- removal of rubbish to reduce the risk of groundwater contamination and improve aethetics
- revegetation to improve biodiversity outcomes
- water quality monitoring to demonstrate to farmers the ablity of wetlands in treating agricultural pollutants.

Rehabilitation works

Step 1—Site clean up

The first step in the rehabilitation was the removal of weeds to enable machinery access and provide areas for revegetation. A combination of controlled burning, slashing and herbicide was used to remove the weeds.

Twelve tonnes of metal rubbish was removed and another 60 tonnes of masonry debris was retained and reused on the construction of the diversion bank and spillway.

Step 2—High flow and overflow structures

The diversion bank was designed to direct local paddock run-off in high intensity rain events to a hard-faced spillway. Depending on the volume of water, the spillway discharges would flow to either the sediment basin via a drain or to the highflow bypass channel which circumvents the sediment basin. The diversion bank's profile was kept low so it would not to impede the Burdekin River's flood flow path.

Step 3—The sediment basin

Design considerations for the sediment basin including the slope of the sediment basin's batters and the depth of the basin were determined by assessing the soil classification type (Charman, P. 1978), 'Queensland Wetlands Program's Wetland Management Handbook'

and QWP's 'Sediment basin' and 'Constructed wetlands' fact sheets[2].

Using recommendations from these sources it was determined that a 0.5ML sediment basin was sufficient to capture irrigation run-off from the 30ha paddocks.

Tailwater drains were extended from the paddock's drainage outlets to the sediment basin via another hard-faced spillway.

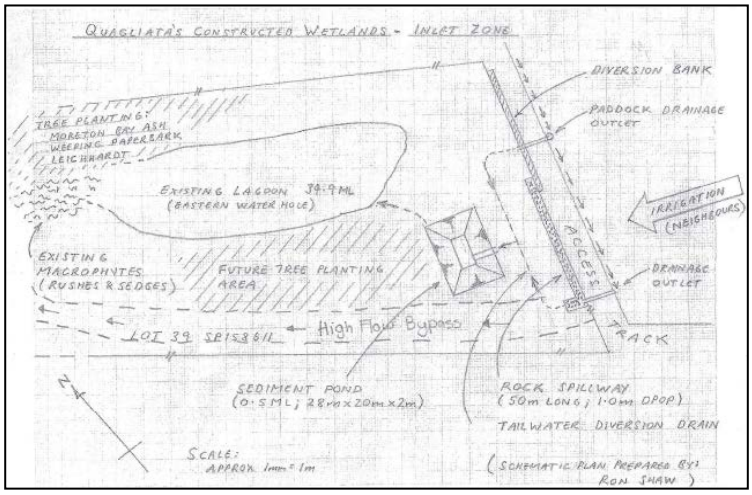
To further filter sediments and reduce erosion, grass and macrophytes were established in the drains and the sediment basin's inlet and the outlet into the wetland.

Newly constructed sediment basin. Photo: QDAFF

Step 4—Revegetation

An important aspect of the project was the planting of native endemic trees and macrophytes. Scott Fry, project officer with NQ Dry Tropics NRM, organised volunteers and the Gudjuda Reference Group's NRM Team to plant the vegetation.

Once established, the vegetation will provide shade to the wetland and sediment basin, reduce weed growth and water temperature, enhance wildlife habitat and improve the aesthetics of the site.



Project design schematic provided by Giru Barra and Cray.

[2] Available at www.wetlandinfo.ehp.qld.gov.au

Sediment basin with irrigation water. Photo: QDAFF

How the sediment basin works

Sediment basins are run-off detention systems that target the removal (settling) of course sediment through the reduction of flow velocities and temporary detention.

- Course sediments and organic matter contained within irrigation tailwater and rainfall events are trapped in the sediment basin constructed upstream from the wetland.
- Herbicides and nutrients, can move off farms attached to finer sediments. Finer sediment will to a lesser extent be captured by the sediment basin.
- Sediments settle out from the water and accumulate at the bottom of the basin. Every few years, John will drain the sediment basin, remove any accumulated sediment and return the soil to his paddocks.
- Water in the sediment basin will be detained from several days to weeks, depending on irrigation scheduling and rainfall events, before overflowing into the wetland.
- Wetland vegetation such as macrophytes (sedges and rushes) both within the sediment basin and the wetland will help filter finer sediments, take up dissolved nutrients and pollutants, including pesticides, agrochemicals, heavy metals and hydrocarbons. Macrophytes will shade the water keeping it cool and provide habitat (food, shelter and nesting) for wildife such as small fish, frogs and birds.

Step 5—Communication

Knowledge and learning's from the project have been exchanged with other farmers, industry and the community through bus trips, presentations to local community groups, Queensland Wetlands Program training and the development of media releases and a YouTube video.

Step 6—Water Quality Monitoring

Water quality monitoring will continue into the future.

- Initial water quality monitoring undertaken in conjunction with John has initiated discussion around fertiliser and irrigation management.
- TropWATER will be investigating the effectiveness of the sediment trap and wetland in trapping and treating agricultural pollutants.

Tree planting at the wetland. Photo: QDAFF

What's next

John and the project partners are keen to progress to other stages of the rehabilitation including:

- the development of a wetland management plan utilising the Queensland Wetlands Program 'Guidelines and template for preparing a wetland management plan'[3]
- installation of snags to provide habitat and refuge for fish and other aquatic biota
- further revegetation.

Project partners will continue to visit John to provide assistance for future stages and ongoing technical advice.

3 Written for primary producers (grazing, dryland cropping) in Queensland's inland catchments and available at www.wetlandinfo.ehp.qld.gov.au

Further information

Wetland Management in Agricultural Production Systems resources as listed below and further wetland management tools and guides are available at http://wetlandinfo.ehp.qld.gov.au/wetlands/management/wetland-management/

'I am really happy with the outcome of this project. Now I can see how the sediment basin will work. Friends have commented on how good the wetland looks and what an asset it is. It will look even better once the trees are up a bit.'

John Quagliata November 2013

The wetland six months after construction. Photo: QDAFF

The Queensland Wetlands Program supports projects and activities that result in long-term benefits to the sustainable management, wise use and protection of wetlands in Queensland. The tools developed by the Program help wetlands landholders, managers and decision makers in government and industry. The Program is a joint initiative of the Australian and Queensland governments.

Contact wetlands@ehp.qld.gov.au
or visit www.wetlandinfo.ehp.qld.gov.au

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