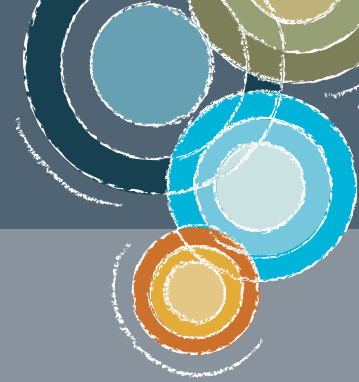


# Managing wetlands in intensive agricultural systems



## Cotton production

Cotton enterprise realises multiple benefits from protecting waterways.

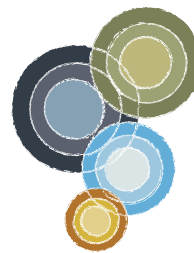
### The link between farming and wetlands

Rivers, creeks, lagoons, springs, ring tanks and dams are all wetlands. In fact, Queensland's beautiful coastline is also wetland.

Intensive agriculture relies on wetlands to support a range of production processes. For instance, wetlands regulate irrigation and stock water quality, provide flood management and erosion control and improve pest management (through wetland vegetation). Aside from their on-farm benefits, they are a place to fish, put the boat in, or swim.

Land use practices have the potential to impact both on-farm and downstream wetlands. To ensure wetlands remain functional, farm practices sometimes need to be adjusted. In some instances, building or modifying wetlands can help with nutrient removal, sediment control and water re-use, among others.

This case study is one of a series developed by the Department of Primary Industries and Fisheries (DPI&F) through the Queensland Wetlands Programme. It demonstrates the benefits of wetlands in improving farm management and incomes, and the farm practices that contribute to wetland health. The series can be viewed in the Managing Wetlands section of *WetlandInfo* ([www.epa.qld.gov.au/wetlandinfo](http://www.epa.qld.gov.au/wetlandinfo)).



Queensland  
Wetlands Programme

### The Queensland Wetlands Programme

The Australian and Queensland governments established the Queensland Wetlands Programme to protect wetlands throughout Queensland.

The Queensland Wetlands Programme is lead by the Australian Department of Environment, Water, Heritage and the Arts and the Queensland Environmental Protection Agency. A number of Australian and Queensland government agencies and organisations assist in the Programme's implementation.

The Queensland Wetlands Programme would like to thank Arcturus Downs staff, Ross Ingram, Greg Barnett and Rebecca King and the following organisation for their contribution to, and support of this product:



[www.cottonaustralia.com.au](http://www.cottonaustralia.com.au)



Australian Government



Queensland  
Government

Queensland  
Wetlands Programme

## The cotton farm and its environment

Arcturus Downs near Springsure in Central Queensland is a 16,000 hectare property that uses flood and trickle irrigation to farm about 1000 hectares of grain and cotton.

The property is located in the Brigalow Belt bioregion of Queensland's Central Highlands and includes regional ecosystems that are 'endangered' (*Acacia* and *Casuarina* open forests) and 'of concern' (*Eucalyptus*, coolabah woodlands).

The irrigated area is bordered by the Comet River to the east and Orion Creek to the west, and is bisected by an anabranch of the Comet River. The Comet River is a major tributary of the Fitzroy River which flows through the Fitzroy Estuary to the Great Barrier Reef lagoon.

## A vision for sustainable water use

The plan to protect the property's remnant vegetation and local waterways began 11 years ago. A key objective was to sustain both farm profitability and land condition. More recently, the farm has adopted the Cotton Best Management Practice program to further these aims.

The quality of water flowing into the Great Barrier Reef lagoon has deteriorated significantly over the past 150 years. Sediments, nutrients and chemicals washing off agricultural and other land uses into waterways and, ultimately, the reef lagoon, are having a detrimental impact on reef health.

Because the Comet River regularly breaks its banks during summer storms, parts of the property were set aside for flood management and to provide biodiversity and water quality outcomes. The property now boasts 581 hectares of native vegetation corridor in the form of a 'flood runner' through the centre. The corridor allows animals to move between waterways and reduces soil loss during the wet season when flooding can occur.

The property is licensed to flood-harvest from the Comet River, although Irrigation Manager Greg Barnett acknowledges the importance of leaving enough water in the streams "for fish, frogs and birds, and for staff to have opportunities for recreation when things are quiet".

## Managing waterways with Farm Management Systems and best practice

Managing the environment on Arcturus Downs by incorporating biodiversity into the farm landscape hasn't necessarily meant extra work. Good planning, soil and water management have been a key to success.

Five modules of the Cotton Best Management Practice (BMP) program are complete and two new ones, including the Cotton Land and Water module, are ready for audit.

Cotton Australia Policy Advisor Dan Galligan says the Cotton BMP program provides the structure for a Farm Management System (FMS) and is the most significant product available to the cotton industry.

Dan recommends the BMP program because it enables growers to assess the level of risk, customised to their property, against the best practices identified, and address areas of unacceptable risk.

He says that the Cotton BMP program doesn't focus just on environmental issues, it can also help growers to manage issues such as workplace health and safety and keep up-to-date with the latest industry research and extension activities.

### Cotton Industry FMS

- The Cotton FMS is the industry's BMP Program. The manual contains self-assessment worksheets, recommended best practices, information about issues, risk assessment and action plan templates.
- The seven modules are: applying pesticides; storing and handling pesticides; integrated pest management; farm design and management; farm hygiene; storing and handling petrochemicals; and land and water management.
- Growers are audited for continuous improvement and attaining certification standards established by the industry.
- The BMP audit has three stages:
  - Pre-certification assessment (PCA) status identifies growers who have entered the BMP process, undertaken initial risk assessment and are developing action plans to address sub-standard issues.
  - Certification audits are external audits to verify the BMP certification standard has been achieved.
  - Random audit surveillance involves random, third party audits and annual self assessments verify that the standard is being maintained.

## Irrigation water management

The first step was to create a detailed property plan to integrate the natural, vegetated waterways with the property's water reticulation system.

Irrigation tailwater and runoff from the irrigated production area is now captured in detention basins (sumps) for reuse.

To maximise water use efficiency, EnviroSCAN® soil moisture monitoring equipment is used as well as good soil management techniques such as controlled traffic, minimum tillage and crop rotations.

This attention to detail saw Arcturus Downs achieve exceptional yields for the 2006–2007 season: one irrigated field yielded **14.1 bales per hectare**, a record for the Central Highlands district.

Water quality in the Comet River is monitored in conjunction with the local Integrated Area Wide Management group, which supports growers and natural resource management groups in managing catchment outcomes.

## Riparian zone management

Native vegetation acts as a buffer between the production areas and waterways and is a recognised way to manage runoff and chemical spray drift.

At Arcturus, a 128 hectare belt of riparian vegetation along the Comet River acts as a final buffer for any pollutants leaving the site. Greg believes the best thing about large tracts of native vegetation is that they don't need to be managed—"we just leave it alone and let it look after itself". Initial fears that parthenium weed (*Parthenium hysterophorus*) would invade were unfounded, as the adequate ground and tree cover reduced its spread. The weed was out-competed by native grasses.

Significant amounts of fallen timber left along the waterways provide ground cover and habitat, and many native trees also provide shade. Slow burning, low intensity fires are used to reduce fuel loads every few years and lessen the fire risk.

Arcturus managers acknowledge that some potentially productive areas may be sacrificed to preserve large amounts of native vegetation. The ongoing cost of managing fields with numerous point rows can also be significant. However, they believe this is more than justified by the flood management and biodiversity outcomes provided by the retained vegetation.

## Integrated pest management

Farm agronomist Bec Kirby says native vegetation provides more services than improved water quality. Undertaking an insect count as part of the property's Integrated Pest Management program, she found native vegetation, particularly in the riparian areas, provided habitat for beneficial insects like assassin bugs.

Bec said that since Bollgard II® (an insect-resistant genetically modified cotton variety) was introduced, cotton pesticide use decreased by up to 85%, and beneficial insect populations increased on farms in the Central Highlands.

She suggested this explained more sightings of green frogs and endangered marsupials like the dunnart (*Sminthopsis* species), which took advantage of the increased invertebrate food source.

Greg Barnett also recognises the benefit of native vegetation in reducing spray drift—"we aim to have trees surrounding all sides of the irrigation area, as a buffer".

## What are the benefits to the community?

The management at Arcturus Downs has protected 7.32 km<sup>2</sup> (732 ha) of vegetation and 16.2 km of waterways, which may have been degraded or cleared for production under an intensive production system.

The wetlands and vegetation buffers maintained along the property's riparian zones do not represent native vegetation 'improvement'. However, the environmental benefit is that a significant tract of 'endangered' and 'of concern' regional ecosystems has been preserved. The preserved wetlands also provide a water quality buffer (an ecological service) in areas set aside from production.

Non-market valuation surveys are used to estimate a community's 'willingness to pay' for improvements in non-market goods and services such as environmental quality and ecological services.

One non-market valuation survey suggested that Queenslanders would be 'willing to pay' \$330,000 per year—for up to 20 years—for the ecosystem services provided by the biodiversity corridor on Arcturus Downs.

## So what's the bottom line?

The community benefits from preserved native vegetation, especially where it maintains environmental water quality. However, it is recognised that there are costs to the landholder.

DPI&F conducted an economic analysis and generated a discounted cash-flow budget (for more information on the economic analysis contact DPI&F on 13 25 23). This showed that by preserving 732 hectares of native vegetation in highly productive areas the farm will forgo potential income of **\$155,750** per year (over 20 years).

## Going the next step

Several other activities are planned to enhance water quality and biodiversity outcomes at Arcturus:

- create habitat islands in the ring tanks to reduce wave action and water loss, and provide more nesting opportunities for birds;
- dig permanent deepwater holes to provide year-round refuge for fish; and
- convert one of the borrow pits into an artificial wetland.

## Key assumptions in the economic analysis

<b>Area of corridor</b>	7.32 km <sup>2</sup> (732 ha) of Brigalow Scrub
<b>% of corridor cleared</b>	It was assumed that only 60% of the uncleared vegetation (441 ha) would have been developed and the remainder left as riparian vegetation.
<b>Development costs of land</b>	It was assumed the development of this land would cost \$2,150/ha. This figure included initial clearing, stick raking, two cultivations, levelling, furrows, and constructing a head ditch, tail drain and siphons.
<b>Cropping system</b>	Assumed to be a monoculture of Bollgard® cotton, reflecting the availability of water rather than the opportunity to double crop.
<b>Annual crop gross margin</b>	\$1,700/ha, which reflects the average gross margin for the previous three years in the Central Highlands district.
<b>Discount rate</b>	A 7% discount rate was used in the analysis.
<b>Water security and cropping frequency</b>	Arcturus Downs is dependent on flood lifting for all its irrigation operations. It was assumed that sufficient water would be available from flood lifting to support irrigation 60% of the time.
<b>Period of analysis</b>	The period of analysis for the discounted cash flow budget was 20 years.
<b>Capital works depreciation</b>	It was assumed that the initial capital works were 80% depreciated at the end of the 20 years. The residual value was treated as a positive contribution to the discounted cash flow in year 20.
<b>Additional Fixed Costs</b>	It was assumed that the additional cropped land would not require any additional fixed costs.

The analysis didn't take into account other values provided by the biodiversity corridor such as habitat for beneficial insects, erosion control, weed suppression and recreation.

## Sustainable outcomes for cotton and healthy waterways

The staff at Arcturus are convinced that cotton growers can engage with the community on environmental issues by embarking on natural resource management activities and demonstrating best practice through the Cotton BMP program.

Greg Barnett summed it up nicely—“it’s better than a featureless bit of ground and you can bring people out here and be proud of what you’ve done.”

Arcturus Downs is an excellent example of how good wetland and vegetation management can be linked to industry Farm Management Systems to achieve profitable and sustainable agricultural outcomes. These practices are also contributing to wetland protection by reducing nutrient and sediments loads, reducing weeds, and increasing beneficial vegetation.

For more information on how to protect or rehabilitate wetlands, visit Managing Wetlands at [www.epa.qld.gov.au/wetlandinfo](http://www.epa.qld.gov.au/wetlandinfo)

## Acknowledgments

Arcturus Downs staff—Ross Ingram, Greg Barnett and Rebecca Kirby

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Dan Galligan—Cotton Australia

## Other Products

Managing wetlands in intensive agricultural systems—cane production

Managing wetlands in intensive agricultural systems—dairy production

Managing wetlands in intensive agricultural systems—ginger production

Managing wetlands in intensive agricultural systems—nursery industry

For more information visit Managing Wetlands section of *WetlandInfo* at [www.epa.qld.gov.au/wetlandinfo](http://www.epa.qld.gov.au/wetlandinfo) or contact:

DPI&F Business Information Centre  
on **13 25 23** (weekdays 8am to 6pm)

Email: [callweb@dpi.qld.gov.au](mailto:callweb@dpi.qld.gov.au)

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