striking the balance

a family's quest for a sustainable future in agriculture

by John Spearpoint

John and Janelle Spearpoint with their two sons Hayden and James. Greswick Angus is on the Williams River in the lower Hunter Valley of NSW. (Photo courtesy Jenny Gilbert Communications)

Greswick Angus is a Cattlecare accredited grazing operation with properties in the lower and upper Hunter Valley, producing breeding bulls and replacement heifers. The home property 'Hilmont' of 140 hectares (350 acres) has 3 km of frontage to the Williams River that provides drinking water for Newcastle and lower Hunter communities. (Photo courtesy Jenny Gilbert Communications)

Acknowledgements

First, and most importantly, I want to acknowledge the contribution of Janelle and our boys Hayden and James. Their support in providing assistance in the field is greatly appreciated.

Special thanks to the NSW Government Environmental Trust and Hunter Water Corporation for providing the funding support to help realise the environmental restoration work we have implemented.

Thanks also to:

Williams River Best Management Practice (BMP) Demonstration Project steering committee members and their organisations:
Digby Rayward – District veterinarian, Rural Lands Protection Board, local landholder and chairman for the project
Roland Bow and Emma Hamilton – Project officers, Hunter Water Corporation
Bruce Petersen – Environmental Manager, Port Stephens Council
John Wilson – Regional Director, NSW Department of Primary Industries
Neil Griffiths – District Agronomist, NSW Department of Primary Industries
Sharon Vernon – Hunter-Central Rivers Catchment Management Authority
Rob Henderson – Kooragang City Farm Manager, Hunter-Central Rivers Catchment Management Authority
James Hopson – Local landholder

Hunter Bird Observers Club for regular monitoring of bird survey sites across the property
University of Newcastle for providing students who helped with monitoring activities

All photographs unless individually acknowledged, by John Spearpoint

Foreword

Many people who are caught up in the hustle and bustle of urban living dream of a simple life – perhaps on a farm. But living on a farm is not a simple life at all. In fact, it's a complex balancing act between the need to earn a living and a necessity to sustain the environment.

John and Janelle Spearpoint are making their dream farm a reality – and a very practical one. After initially pursuing careers away from agriculture, they are now building up a beef grazing enterprise 'Greswick Angus' that is environmentally sustainable, profitable - and a very pleasant place to live.

How they are doing it is described in this booklet.

Selecting the farm was easy: they had a farm to go to. Janelle's family had been successful dairy farmers on the Williams River for several generations and had already made the move into beef production.

But while this was an advantage in some ways, it also raised some difficult questions on how traditional management on the farm could be adapted to meet new challenges.

All family farms are subject to change and this property was faced with more change than most. The Williams River which marked their boundary had been dammed by a major weir designed to bring water to the people of Newcastle. That had interrupted the natural tidal cycles, raised water levels and led to drainage problems.

In many ways, it was the changes on the river that first brought changes on the farm. For example, as riverbanks are important for both beef production and for environmental protection, there was a focus on riparian management right from the start.

There was also an early emphasis on whole-farm planning. This was the only way the Spearpoints could achieve the flexibility necessary to rotate stock, make pasture improvements and still incorporate environmental management into a production regime.

John and Janelle have always felt that taking an active position on environmental management makes good economic sense. They believe that the time to incorporate environmental management is not when one is forced to do so retrospectively but at an early planning stage.

There is a social dimension to the work at Greswick Angus as well as an environmental and economic one. Farmers are in a unique position as land managers who not only produce food and look after the environment but also maintain pleasant rural landscapes that the rest of us enjoy - and all at no cost to anyone but themselves.

In seeking sustainable landuse options, therefore, John and Janelle deserve success: for their own fulfilment and for the benefit of the Lower Hunter community.

John Wilson
Regional Director, NSW Department of Primary Industries (DPI) Relations
Hunter and Central Coast

A note from the Chairman

The Williams River Best Management Practice Project has been jointly funded by the NSW Government Environmental Trust (referred to hereafter as Environmental Trust) and Hunter Water. The original concept was 'to determine the most cost effective and ecologically sound techniques for the restoration and rehabilitation of riparian areas'. This includes fencing, weed and streambank erosion control, as well as revegetation and general maintenance works.

The property 'Hilmont' was selected because of its diversity of environmental issues and location within a catchment area for drinking water.

In selecting this property we realised that we would need a whole farm approach for sustainable farm management and not just concentrate on the aquatic, stream bank areas.

For the first six months the steering committee worked hard with John and Janelle Spearpoint to identify the environmental problem areas on the farm and try to develop possible sustainable solutions. Many of the problems had already been identified by the Spearpoints.

'Best Management Practice' is in some ways an unfortunate title for the project. The Steering committee acknowledges that there is no 'best way' to solve these problems but we want to show the approach we took and what worked for us. We have trialed a number of different techniques for many problem areas and will report on the success or failure of these as the results become available.

I would like to thank all members of the Steering committee and especially the Spearpoints. The drive and enthusiasm of all members has made the project a success to date.

Digby Rayward
Chairman–Williams River BMP Steering Committee

Tocal College (CB Alexander Campus) edited and desktop published this booklet:
Design: Dean Morris
Editing: David Brouwer
Printing: Jennings Print

ISBN: 0 7313 0597 3
Published March 2006

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Dairying on the Williams

The property 'Hilmont' was typical of the many family dairy farms that established on the Williams River during settlement in the mid 1800s. Properties of 200-400 acres were carved from prime agricultural river flats with soft sandy loam soils ideal for dairying.

During the late 1800s, William Brooks (Janelle's great-grandfather), settled on the property. As an early adopter of new farming ideas, he was highly awarded for his pastures and dairy production. Diversification with poultry, pigs, sheep, bees, vegetables and an orchard provided a comfortable living from the land for many decades.

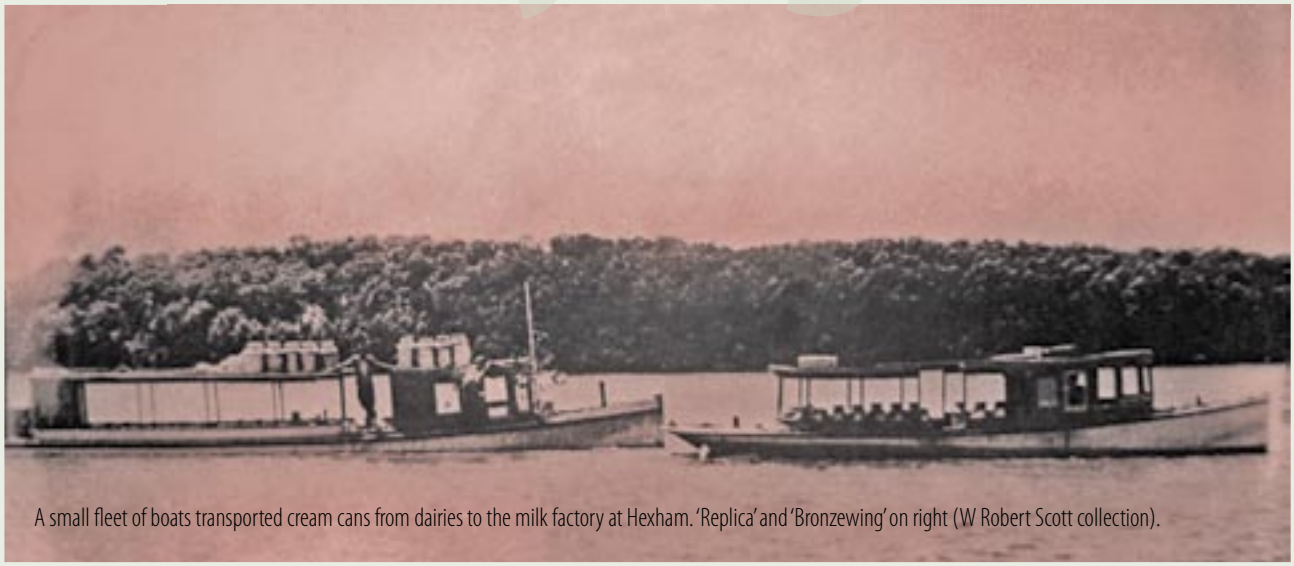
Much of the landscape in the lower reaches of the Williams River is flat to gently undulating, with annual rainfall averaging 1140 mm. The soils are naturally acidic (pH 4-6) sandy and silty loams, with clay loams and shallower soils on the ridges. Vegetation clearing was expected during pioneering settlement, and only small pockets of remnants and general riverbank vegetation were left intact.

The moderately high rainfall and long growing season provided a safe climate for dairy farming over many decades. Annual cropping and irrigation from the adjacent river allowed fodder conservation for the cooler winter months when pasture growth slowed.

Janelle's father, John O'Keefe (aged 9 years) waiting for cream cans to be collected from the O'Keefe's wharf on the Williams River in 1942. (O'Keefe collection)

O'Keefe's dairy 'Hilmont,' 1966. Dairying was traditionally the main agricultural activity. Today only a handful of dairies remain in the area. (O'Keefe collection)

dairying on the



A small fleet of boats transported cream cans from dairies to the milk factory at Hexham. 'Replica' and 'Bronzewing' on right (W Robert Scott collection).

The thirst of the town

The Williams River averages 100 metres in width with a depth to 9-10 metres. It was the security of this water source that attracted the Hunter Water Corporation (then the Hunter District Water Board). Chichester Dam in the upper Williams catchment was constructed in the early 1920s and later, in the 1960s, the Seaham Weir was developed as part of the Grahamstown Dam scheme to capture even more drinking water for a growing population in Newcastle and surrounds.

Before the weir was built, the river and water levels responded to the tides of the Hunter River system. Steamboats plying the Hunter, Paterson and Williams Rivers delivered milk products from farms to the Hexham milk factory.

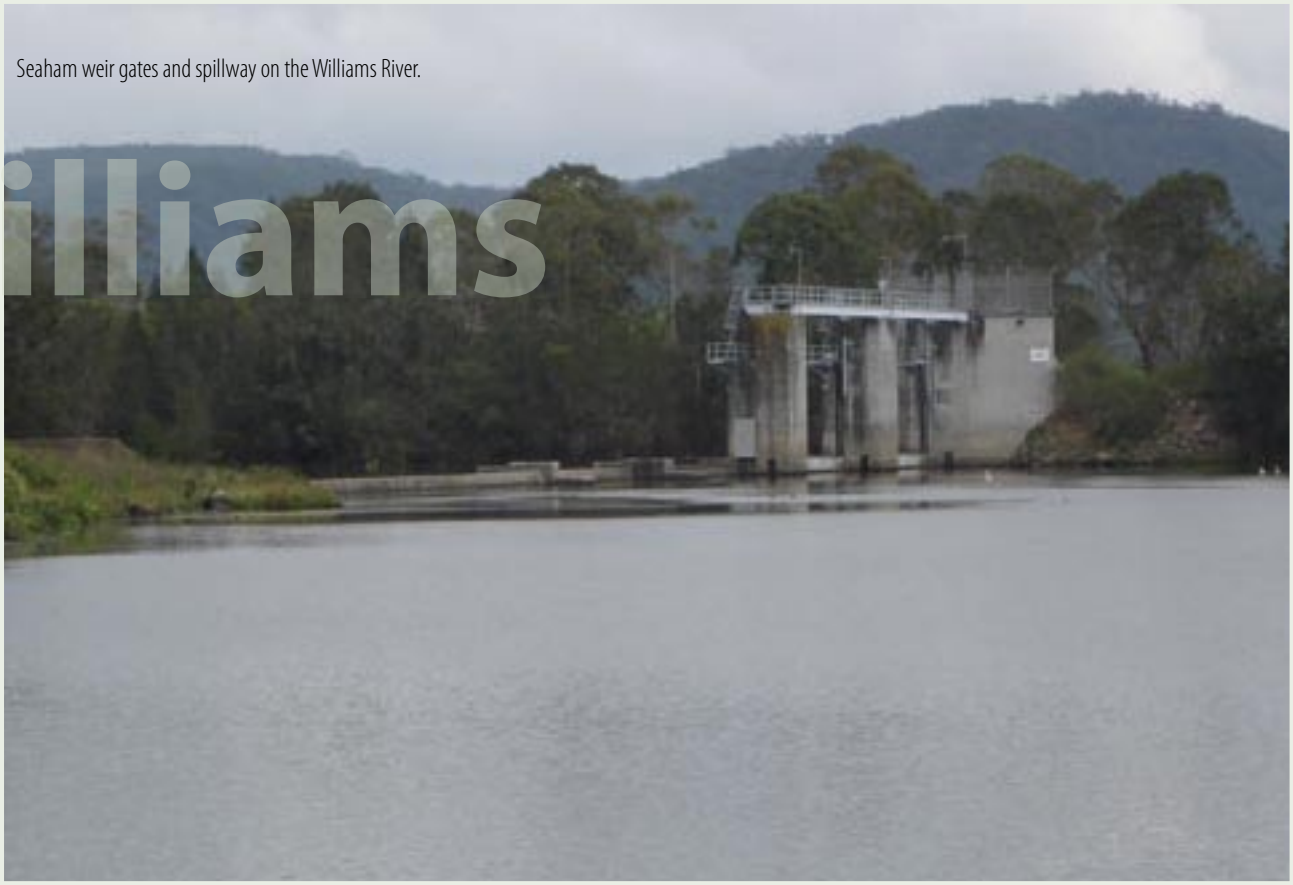
With the sealing of Seaham Weir in the 1970s, the O'Keefe family questioned the future of dairy farming on the property. Surface water moving through the property following local rain periods raised uncertainty over farm drainage. A move into beef cattle grazing was seen as a lower risk alternative.

During this period of change on the river, Eric O'Keefe (Janelle's grandfather) became a local voice for the farmers in communicating with government agencies. The farming community was concerned with the likely affects of the weir and localized flooding. This concern resulted in the upgrade of floodgates in the vicinity of the weir.

In the 1970s environmental issues and protection of valuable natural resources were not considered in the way they are today. Servicing a growing population with drinking water was the main aim.

When river levels were manipulated to suit town water needs the effects on riverside farmland and nearby vegetation became obvious. As river water levels were kept high, low lying areas remained flooded or waterlogged for longer periods and the vegetation suffered. The natural river system had been interrupted and the protective barrier created from the river reeds was lost. This allowed the riverbanks to become more susceptible to erosion.

On our return to the land in the year 2000 we faced some tough decisions on the sustainability of a much-altered farming system.



Seaham weir gates and spillway on the Williams River.

An unexpected opportunity

Family illness allowed us to return to the land to continue the tradition of more than a century of farming. But this meant leaving behind established professional careers in Newcastle. We had always wanted to return to the land, but had never thought an opportunity would come so soon.

In common with many farm families, previous generations hadn't provided certainty through succession planning. There had been an unwillingness to invest in farm improvements. Farm infrastructure was in a poor state, pastures were declining through overgrazing and a lack of maintenance. Profitability was low and severe riverbank erosion was increasing.

There were important questions to be answered. Could the land continue to support our family? Could the land produce at a profit? What was the long-term future for intensive agriculture in our area? The fifth generation of the family to live on the property (Hayden and James Spearpoint) had arrived and our motivation to look after the land had become much stronger.

We needed a planned and cost-effective process for making changes. We had to set out our own direction and goals for the farm and explain our reasons for change. But like so many younger generation farmers, we were faced with a conservative, traditional farming approach, so we knew change would not be readily or easily accepted.

How could we invest effort and resources into repairing the land if our future could not be assured?

Succession planning became crucial before we could begin. We couldn't start to make those fundamental changes that would ensure our future until we knew what lay ahead. The succession issue hasn't been finally resolved, but for now a leasing arrangement has given us a sense of security.

Taking a whole farm approach

Property Management Planning, part of study towards a Diploma of Agriculture, showed us how to take a whole-of-farm view of planning. The process included a review of current business operations and highlighted sustainability issues—not only of the land itself, but the business and the family's long-term future involvement.

Now given a sense of purpose, the property planning exercise encouraged us to conduct a stocktake of resources and to clearly define actions that addressed key issues that were affecting the sustainability of the business.

We not only focused on improving production, but also allowed our thinking to extend beyond the boundary fences. A significant area of the farm was on the edge of a catchment where water discharged directly into the river. Wetlands, lagoons and waterways all contributed to drainage of the farmland.

Observing the water flow and impact on pastures, it became obvious that most of our farming land could affect the quality of water entering the river system. Wider community issues became important.

We had to develop a farm plan that took all these aspects of the farming business into account.

Aerial photography assisted our property planning. Clear overlays were used to map out ideas and computer software mapping programs were used to calculate distances, areas and GPS locations.

Severe erosion on the riverbank. This occurred on a straight section of riverbank after a river 'fresh' in June 2004. Riverbank restoration was integral to our whole farm plan.

Fence design as foundation

Subdivision followed the principle of separating land classes or areas of different fertility. Paddocks have also been reduced in size, now averaging about 4 ha. This gave us greater control over pasture grazing management. The aim was to use rotational grazing and to allow sufficient pasture rest periods before re-grazing.

The riverbank fence in one area of the farm now serves as a laneway, allowing easy mustering of stock and movement from one end of the property.

Another section of riverbank has been fenced to provide an access route during floods and the downstream portion of riverbank fencing has been positioned to totally exclude stock from grazing.

Fortunately, overtopping of the banks during floods is rare and fence design didn't need to cope with flood debris or high water velocity.

The type of fence construction was important to our breeding operation. A change of livestock mix meant fencing to cater for many classes of livestock, including cows, calves, bulls, and young stock—all behaving differently and exerting pressure at different positions of the fence.

Planning and design

Like most farmers who have completed property planning exercises, changing the paddock layout to support a new plan was made easier with an aerial photograph.

We needed to incorporate riverbank fencing and stock water troughs as it was becoming obvious in some places that cattle could no longer access the river for water. Finding cattle stuck in the river unable to climb the banks highlighted the need for riverbank fencing.

But to suggest erecting a fence along the riverbank was met with fear. "I'll lose valuable grazing land", "I'm not giving away any land" and "The weeds will get out of control" were responses all too familiar to farmers. We needed a compromise—solutions that not only improved everyday management but also worked towards land restoration.

We spent a lot of time observing cattle movements around paddocks, mapping cattle camps and tracks to understand livestock grazing behaviour.

A laneway along the riverbank aids movement around the farm.

Crash grazing area along the river. Note paddock fence on right hand side of levee and tree planting for replacement shade in paddock. Area between riverbank fence and river can still be used for access or strategic grazing.

We could not rely on electric fencing alone, as our stud breeding program and isolation during floods meant this style of fencing would be inappropriate.

A low-cost electric fence just wouldn't have protected the works we had undertaken along the riverbanks.

The style of fencing we eventually chose comprises timber split posts, barbed wire and electric wire supported by stand-offs. This has given us both better control of cattle, and allowed the expansion of lower cost fencing into other areas.

A wetland area, for example, was fenced using galvanized star pickets (due to highly acidic soil around the wetland) and two-strand electric wire for ease of erection and low material cost.

So for us, some key fences needed to be of solid construction. This gave us the framework for controlling cattle and a basis for farm management options into the future.

Loss of stock water and shade

As we redesigned the fencing, we faced an almost total loss of stock water and shade, as free access to the riverbank was cut off. This needed to be addressed.

Stock water troughs were positioned in paddocks at furthest points from the river. They were serviced by a main poly pipe line linked to an old concrete tank, previously used for dairy wash-down and household gardens. Even before the fences were erected, stock preferred to drink from the troughs—they were much easier to get to than climbing the riverbanks!

The main stock watering system is connected to a permanent electric pump on the riverbank. Constant monitoring of the main tank ensures that stock don't run out of water.

At one end of the property, a portable fire fighter pump is used to fill another tank, gravity feeding a series of lightweight poly-style troughs.

Stock watering by off-stream troughs may seem simple, but more time and effort is needed in maintenance, monitoring and refilling. The benefit is that fresh, clean water from a trough is of better quality than drinking from a dam or farm drain.

During the hot summer months, it was common to find an entire mob of cattle resting under the shade of trees along the riverbank or even standing up to their waist in water to keep cool. Heat stress in black-coated Angus cattle was a real concern as it was likely to reduce productivity.

Stock shade across the farm became an even higher priority than riverbank fencing. Tree species selected for shade lots included fast-growing trees (eg. *Acacia* sp.) for quick results, along with slower-maturing eucalypts for lasting shade.

Water troughs were located away from shade areas to encourage more even pasture grazing across the paddock. Restricting cattle access to the riverbanks that once provided shade and water should reduce the impact on vegetation and water quality.

In April 1999 the only shade for stock was along the river.

This tree lot was planted in 2001. Photo taken December 2002.

Three years later cattle have access to paddock shade and a laneway has been created.

Planting trees

The revegetation of riverbank areas and shade-lots began in earnest during spring 2001. Local nurseryman Noel Jupp provided a mix of tubestock plants grown from seed collected from native trees across the property. We planted 3000 trees in the first year, followed by another 3000 the next year.

In our variable climate, we have found that the best time to plant is autumn, and we planted along riverbanks only when there was moisture in the soil following a period of rain or after a 'fresh' in the river.

In the first year we planted some trees in spring and spent time and energy watering them during summer. We have since resisted watering trees apart from at planting, preferring to let nature decide what is hardy enough to survive.

Looking back, we have gained immensely from learning to treat each area differently. In the early plantings, there was not enough emphasis on specific site management or encouragement of natural regeneration. I guess we were seeking a quick-fix solution.

Changes made along the way included:

- Assessing the existing vegetation to see if planting is actually necessary. Encouraging natural regeneration by controlling livestock access may work, and is certainly cheaper.
- Understanding the reason for revegetation. Is there simply a lack of vegetation? Is vegetation lacking in the mid-storey or understorey? Is planting needed to provide soil-binding benefits?
- Learning the growth habit of native tree species. Some are quick to establish but have a short life span (eg. Green Wattle *Acacia irrorata*). Others are slow to establish (eg. Tuckeroo *Cupaniopsis anacardioides*) or need a canopy to provide shade before they will establish (eg. Lilly Pilly, Red Ash). Some species such as Swamp Oak regenerate freely from suckers, so are not suitable where invasion into the paddock is likely. But they prove useful along lower sections of the bank, where they are allowed to regenerate naturally rather than being included in the tubestock plantings.
- Species selection and placement. Some species like the large Eucalypts are more suited to the upper slope, while others prefer 'wet feet' (eg. Bottlebrush, Lomandra, Carex) to keep their roots moist.
- Matching existing vegetation types. It is important to promote a diversity of species as long as it suits the vegetation community.
- Plant density and spacings between plants. Dense plantings with too much canopy suppress grass and other ground covers. It's useful to consider how the mature tree will look and develop.
- Shade-lot maintenance. Will it be opened up later for grazing or need to be accessed by machinery?

The first stage of riverbank restoration was fairly ad-hoc, aimed at merely filling in the gaps to strengthen existing stands of vegetation. After 12 months, some areas had flourished while others had failed.

With access to funding from the Environmental Trust, we took a more systematic approach to restoration. Along the areas accessible by machinery, we deep-ripped some months before planting to allow water to soak deep into the hard compacted soil. Round bales of mulch hay were rolled out to provide an organic layer in which to plant. All the trees were protected from wind and rabbits using plastic or cardboard tree guards. Alternatives such as soil conditioners, fertiliser tablets, jute matting and weed suppression mats were all trialed.

Trees are likely to improve the capital value of the land through aesthetic improvements alone. However, that million-dollar view of the river is also important for some people buying into a rural lifestyle.

Above: A typical section of riverbank suffering from the stress of cattle access. Photo taken December 2002.

Below: Same area three years later. Photo taken December 2005.

Various establishment techniques were used to promote the growth of native tubestock plantings.

a. A large round bale of mulch hay was rolled out over a deep ripped and sprayed area before planting.
b. Fertiliser tablets, soil conditioners and water saving crystals were mixed with the soil at the time of tree planting. Trees were tagged for monitoring.
c. Soft sandy soil was stabilised using biodegradable jute mesh. We planted directly into the mesh. Photos taken May 2005.

Best management practice

Hunter Water recognised the need for high quality water from the Williams River to service a growing urban population. For a number of years they have actively funded restoration and rehabilitation programs along the Williams River.

During 2003 the Catchment Management Authority and Hunter Water developed a project brief to trial and demonstrate Best Management Practice (BMP) in riparian land management. The Environmental Trust and Hunter Water provided funding. After an expression of interest process, 'Hilmont' was selected as the most suitable site for the project.

These funds allowed us to build on the environmental work we knew had to be done to secure our future on the farm. We set about designing 21 treatment areas that tackled the land management issues we were facing across the property.

We had already recognised that good riparian land management extended beyond the riverbank and included activities around wetlands, dams, drainage lines and low-lying paddocks. Installation of fencing and stock water; weed control and revegetation; erosion and feral animal control; monitoring of soil nutrients and water quality; and a close eye on grazing management would all need to become components of the project.

Rehabilitation using revegetation was tackled in a number of stages. A fence controls cattle access, native tubestock were planted along the slope, and *Phragmites* (river reeds) established near the waters edge. Photo taken April 2004.

Livestock grazing used as a management tool

For some time now farmers have battled with suggestions made that livestock were the number one cause of riverbank erosion, and cattle should be permanently excluded from these areas. In fact, riverbank erosion is a complex process caused by many factors. When all impacts are combined their interaction puts further strain on the altered river system.

In areas that have been fenced off to totally exclude livestock, weeds and continued erosion have become a concern. Weed management in particular is a real and underestimated problem for us. We have come to realise that strategic grazing can be used to manipulate groundcover and control weeds rather than to have stock taken out of the equation altogether.

The cattle are now viewed as four-legged grass harvesters—cheaper to run than machinery. And a fence is only a means of controlling grazing pressure. Each fenced area has a gateway access and even though some areas haven't been grazed for over two years (to allow vegetation to establish), there is the option of allowing crash grazing later.

Managing these areas differently to the paddock was the biggest change for us. The laneway along the river became a drought reserve—a kind of 'long paddock' or 'living haystack'. Other areas are crash-grazed by lighter animals during winter when pasture in other paddocks becomes short. Grazing these areas for short periods leaves more vegetation intact than in a paddock, and a long rest interval allows more vegetative growth.

Cattle crash grazing along the riverbank with permanent riverbank fence on the right, a temporary electric fence protects recently planted tubestock. A small mob of cattle for a short period leaves a denser pasture than normal paddock grazing.

Riverbank surveying

We knew ourselves where the riverbank had previously been before the weir was constructed and sought advice from government agencies. But differing opinions on the cause of increasing erosion became frustrating when consensus on a cause could not be reached.

To confirm it wasn't a normal river process, further evidence was needed, so we conducted a survey of riverbank profiles at 14 sites along the property commencing in 2005.

Having established this baseline data, we re-surveyed in early 2006 and noted that some sites showed more than 500 mm of erosion in just 12 months. We believe these surveys will prove useful as indicators of river changes.

The initial survey of riverbank profiles was conducted with assistance from University of Newcastle and NSW Maritime Authority. Surveying is repeated annually to assess the rate of riverbank erosion.

Tackling weeds

Weeds across the property ranged from nuisance weeds to those that poison livestock if eaten. Major weeds included Lantana, Blackberry, Broadleaf Privet, Prickly Pear, Morning Glory Vine and Giant Reed.

Weeds along riparian areas were once kept in check by cattle grazing—enough to retard the growth of weeds. Even today those properties that have not fenced off their river banks have fewer weeds.

With so many other projects under way aimed at

improving productivity (such as re-fencing and pasture renovation), weed control dropped down the priority list, as it wasn't contributing directly to the business bottom line. The time involved in removing weeds from three kilometres of riverbank and across grazing areas became daunting.

Within two short years of excluding cattle we were starting to see Lantana flourish and Morning Glory Vine smothering native trees along the water's edge. The continual undercutting and bank slumping was providing an ideal seedbed for weeds to germinate and flourish. But in some cases the Morning Glory Vine and Lantana were actually holding the bank together.

Some of the incentive funding available through the BMP project allowed us to employ a team of bush regenerators—'human bulldozers' experienced in native tree identification and weed control. Using 'cut and paint' methods and selective weed removal, teams of four people moved through areas of wall-to-wall Lantana with little disturbance to native vegetation. The results were remarkable.

With the weeds gone, we had a different perspective on the extent of erosion. It uncovered badly eroded sections once hidden by Lantana. Silt barriers were constructed in some gullies to reduce water velocity and protect these degraded areas.

Some weeds may never be totally eradicated due to seed reserves in the soil. We need annual follow-up treatments to keep weed densities at manageable levels.

Noxious environmental weeds were not limited to the land. Alligator Weed and Water Hyacinth on the river remain major concerns, especially given our expanse of drainage channels and wetland areas. On land, Alligator Weed is capable of out-competing all pasture species and is toxic to livestock.

Preventative devices were built across floodgate structures and entrances to gullies where these weeds may enter from the river. We now monitor these areas as a routine, but especially after a river 'fresh', when fragments can be easily broken and dispersed along the river. Small patches can now be easily removed manually.

Removing the heavy Lantana also opened the canopy to provide more light, and slowly grass cover is naturally re-establishing. Tobacco Bush, regarded as a weed, was left standing during weed removal in areas where there was no other tall vegetation. This has created an artificial canopy for other species to hopefully establish. The Tobacco Bush will be controlled later.

Weed removal by experienced bush regenerators showing high density Lantana. The Lantana that has been removed was piled up to create wildlife habitat. (Photos courtesy Trees in Newcastle 2005).

Invasion from Alligator Weed is threatening landholders along the Williams River. Alligator weed, with its ball shaped white flower and hollow stems (inset), spreads rapidly across the surface of water. Easily broken fragments can quickly re-establish.

a. Constructed log jam using a fallen Casuarina tree. Barriers placed at intervals down the gully reduce water velocity and collect sediment.
b. Staked hay bales positioned at angles down the slope to create a pooling effect.
c. Lantana wrapped in hessian and shaped into flexible log structures for securing along the gully.
(Photos courtesy Trees in Newcastle 2005).

Floating devices and screens are being trialed to prevent the intrusion of environmental weeds.
a. Floating PVC with a geotextile fabric hanging underneath the water surface.
b. Floating PVC style gate with a metal skirt of fine mesh underneath.
c. Interlocked PVC sections with fine mesh underneath. This floating boom can move with the water level.

Bringing back the river reeds

The amount of bank undercutting along the entire length of river frontage is frightening. Bank slumping is common following a river 'fresh', when the undercut section can't support the weight of the saturated soil above it. We began our revegetation work using water-edge plants as a protective barrier to the undercut sections.

Past experience suggested that revegetation using river reeds would be more successful than costly structural works.

Fallen trees along the riverbank were also used to advantage, and left to lie across the bank into the river. These not only provide fish habitat but also give natural protection to the bank. We took advantage of using these snags by planting behind them, or in the shallow silted areas created from the slumped bank.

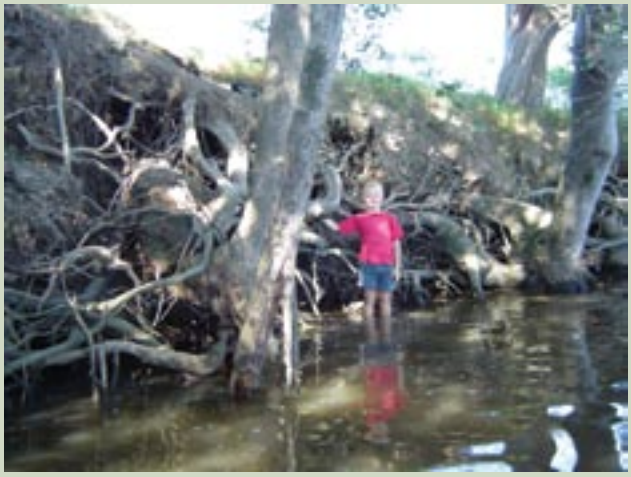
We also thought about using log structures for rehabilitation. But because of speed-boat activity on the river, the legal implications we faced caused us to shy away from their use.

Several different species of native emergent macrophytes (*Phragmites australis, Cladium procerum, Schoenoplectus validus, Bolboschoenus fluviatilis, Juncus usitatus, Carex appressa*) were planted directly into the river bed along shallow sections of the river.

We have convincing photographic evidence that before the Seaham weir was built, *Phragmites* was by far the most dominant vegetation, lining the entire length of the river and forming a valuable buffer several metres deep protecting the riverbank from waves generated by regular steamship voyages along the river.

Today, establishing aquatic vegetation is proving difficult and is not helped by the constant pounding of waves from boats and changes in river levels to suit water extraction.

The search for an effective solution continues.



A section of riverbank undercut to 2 m. Not even the tree roots were able to hold the soil together.

Six different species of aquatic vegetation were trialed along undercut sections of the riverbank to act as vegetative barriers. Aquatic planting January 2005.

The destructive force of boat wash makes our efforts to plant protective vegetation difficult.

Managing sensitive areas

It soon became obvious that further subdivision of our grazing areas could improve the management of sensitive areas (wetlands and drains) and pasture use.

Some problems we saw included:

- a cattle track through the middle of a wetland area to get to the shade at the other side
- cattle crossing drainage channels, creating erosion tracks along the drain walls
- cattle standing in the middle of wetlands on a hot day to keep cool, and
- stock preferring to eat the sweet feed (Water Couch) growing in the shallow water of the wetland, leaving the drier unpalatable grass (Carpet grass, Couch grass) in the paddock to hay-off.

Traditional management of these low-lying areas included burning to remove the old dry pasture, and regular slashing to keep rushes under control. We now have greater grazing control by fencing these sensitive areas, giving a different management focus to the wetlands and water courses across the property.

During dry times, these can be valuable sources of feed, and during wetter periods they play an essential role in filtering the water and nutrients before these enter the river system. It makes sense to graze these areas differently to the paddock, and grazing only occurs at times when livestock have low impact on the surrounding environment.

Fencing of these areas need not be elaborate. Although the odd calf does slip underneath the wire, a two-strand electric wire with 8 m spacings has proved suitable as an internal divisional fence. Each fenced area also has a gate access to enable strategic grazing.

Also using the funding available, we constructed a number of small bridges to remove the impacts of cattle on the drains.

A lagoon wetland connects to the river via a drainage channel and floodgate. The wetland and channel has been fenced using two-strand electric wires and galvanized star pickets.

Cattle grazing the wetland during a dry period.

Drainage channels have been fenced to control cattle access. A buffer between the drain and the fence allows for machinery maintenance of the drains and slashing along drain edges.

Part of the property during a major flood in May 2001.

Productive pastures in low-lying areas

Around the many wetlands on 'Hilmont' are open grasslands that can quickly become waterlogged after heavy rain. Before the construction of Seaham Weir these areas drained quickly, allowing highly productive grasses and clovers to be grown for dairy cattle.

Today, the poor drainage and periodic waterlogging from the weir has raised the water table in these areas and changed soil nutrient balances. Waterlogged soils affect the cycling of nutrients and phosphorus becomes more mobile.

Since the weir was sealed these paddocks had been under-used, supporting only poor quality pastures such as Couch grass, Carpet grass and Rushes.

Pasture improvement had previously concentrated on more productive paddocks because the risk of flooding in these low areas meant that investment was risky. We were also conscious that any future development work in these paddocks may impact on water quality.

We had already purchased a seed drill for direct drilling pasture. Our aim was to reduce soil disturbance from conventional cultivation and the risk of nutrient loss through water run-off.

With some funding assistance through the BMP project, we were able to turn our attention to pasture improvements in a low-lying area of the farm. A range of pre-treatments were trialed, including burning, mulching and spraying. Pasture establishment techniques included direct drilling and broadcasting seed. We also trialed a range of different pasture species including Kikuyu, Broadleaf Paspalum, Setaria, Haifa White Clover, and Maku Lotus—all selected for their tolerance to waterlogging and recommended by our local DPI agronomist.

Establishing more productive pastures allows better utilisation of grazing areas, greater filtering capacity and more nutrient cycling. Nutrients moving below the root zone by leaching or being moved off the paddock by run-off potentially causes higher fertiliser costs and may reduce water quality in the Williams River.

Above: Pasture improvement in the low-lying paddocks across the property.

Below: Same area after 95 mm of rain in March 2005.

Solving the pasture puzzle

We had already been switched onto the role of pastures in our business—they are the driving wheels of profitability. But improvements come at a cost, and soil testing was one of the first pieces of the puzzle that determined where the pasture improvement dollars should be spent.

Before soil testing, it was common practice to use single superphosphate (SSP) as a blanket application across most of the farm. We didn't even realise that some paddocks in fact had an excess of phosphorus (P).

Direct drilling of pasture to minimise soil disturbance.

Other paddocks were quite deficient in P and would need the equivalent of 10 years of SSP to reach target levels. Still other paddocks had excess sulfur, and didn't require the sulfur component of SSP. The soil tests have not only more than paid for themselves, but have also delivered environmental benefits.

Topsoil samples are now collected each year for monitoring of changes in soil fertility and although some farmers see the initial cost of a soil test as a waste of money, without it we would be flying blind.

Chemical use is fairly low. Sub-lethal doses of glyphosate are used on occasions to interrupt the growth of pasture while new seed is germinating—a technique called 'frosting'.

Selective herbicide spot spraying using a handgun applicator is used to control patches of blackberry and blady grass and for managing unwanted regrowth.

The lime story

Back in the late 1930s, William Brooks was reported to have used lime top-dressing on 'Hilmont,' bringing big responses to dairy pastures. Soil acidity is common to coastal soils, with soil pH for the property averaging 4.5 ($CaCl_2$) in 2000.

Today, after the extensive application of lime, the soil pH has been raised to 5.8 ($CaCl_2$) and pasture growth is remarkable.

Our application rate is commonly 2.5 tonnes/ha, which raised the soil pH in the top 10 cm by 1.0 pH unit in the first 12 months, with a residual effect expected to continue for a number of years.

Ground spreading lime to improve soil pH and chemical balance.

Lime is one other essential part of the puzzle. We need to be aware of major nutrient deficiencies such as phosphorus and ensure we have a balance of legumes in the pasture mix to provide enough essential nitrogen for plant growth.

Pasture growth across low areas of the property during summer.

A role for fertilisers

Our understanding of fertilisers improved out of sight when we involved a local agronomist in our pasture improvement plans. The soil tests indicated what nutrients we needed to target, but relating soil test results to the right choice of fertiliser seemed like 'double dutch' until the agronomist explained the links between soil fertility and our grazing aims.

High fertility paddocks are maintained with appropriate fertilisers to maximise production. Pasture comprises high performance ryegrasses, red and white clover, and chicory.

There is no longer a blanket application of the same fertiliser at the same rate across the property. High analysis fertilisers and several different fertiliser products, in some cases custom blends, are used depending on the nutrient we are targeting.

Fertilisers are expensive and it wasn't practical for us to tackle the whole farm in one go. Targeting the better-producing paddocks first and adding more suitable grass species produced a quick result.

For these high-producing paddocks, we use nutrient budgets to forecast the likely removal of nutrient through grazing, and the rate to re-apply to maintain its healthy production.

The timing for fertiliser application is also important, with top dressing occurring mostly in late spring and late summer. This allows pastures to respond to the increase in nutrients when the autumn and spring rains arrive.

For the paddocks surrounding our sensitive areas and high production paddocks, we have a 'little but often' approach to fertiliser use. Fertiliser may be applied twice yearly, seasonally or following grazing so that there is not an overload likely to lead to nutrient run-off or leaching.

By classifying our paddocks into high, medium and low fertility areas, we could identify which paddocks needed maintenance rates of fertiliser, those that required a soil building program to raise their fertility levels and those that could be left till later.

GPS mapping of the paddocks has helped to accurately measure paddock sizes. This means that we don't make mistakes applying seed and fertiliser over a paddock area. This accuracy saves money.

There is huge range of fertiliser products now available on the market. To get a handle on what options will deliver the most productive and profitable results and give long-term benefits, we attended an industry workshop (Grow More. Graze More. Gain More.) The key principles of CRAFT (Choice, Rate, Application, Frequency, Timing) have been most useful in managing our fertiliser use.

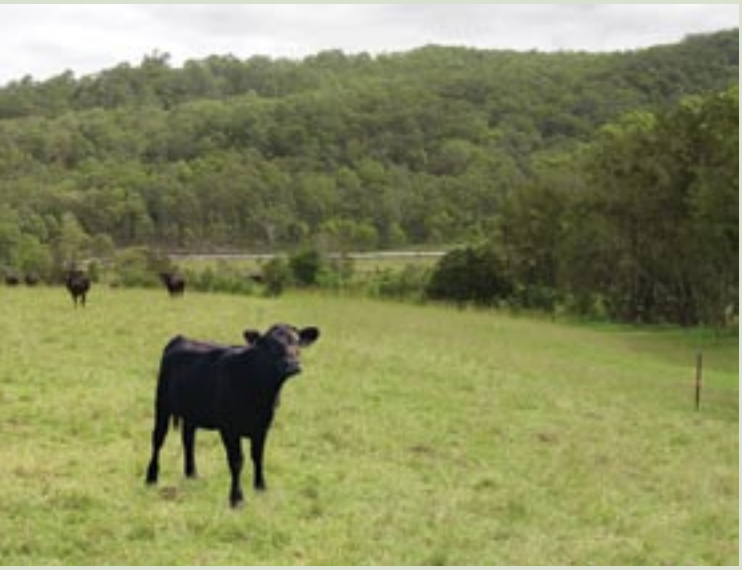
Pasture grazing that adds value

We can spend endless amounts of money applying lime and fertiliser and pasture seeding only to have it all undone with poor grazing management. The type of grazing depends on the individual enterprise, but for small-medium size properties we had already seen that set stocking would eventually lead to decline.

The basis for any grazing operation should be to match the pasture type to livestock needs.

In some of our high-performing paddocks, we use strip grazing and back fencing, a technique commonly used in dairy farming. A temporary electric fence creates a strip of feed accessible for only a day or two and then grazing moves on to a fresh strip. The previously grazed area is back-fenced to prevent further grazing and allow for pasture recovery.

Although this means moving electric fences every day or two, it allows us to maximise production from our better-performing paddocks so that other paddocks are not overgrazed. It has also encouraged a quiet temperament in our breeding herd, which has been a useful marketing tool when selling our animals.



A temporary electric fence is used to control cattle access to the steeper part of the paddock. Grass left on the slope is higher and more dense than the rest of the paddock, giving greater protection to, and less runoff from the slope.

With our highly-improved pastures costing more than $300/ha to establish, we needed to match this outlay with a suitable class of livestock—in this case breeding bulls—that could produce a good return on pasture investment.

Other paddocks were more suited to long-lasting perennials like Kikuyu, Setaria, Rhodes Grass, Paspalum, and Haifa White Clover.

Developing a grazing strategy was made easier by following the principles of Prograze, where pastures are assessed for their quality and quantity of feed on offer. Grazing is matched to the most productive phase of plant growth, and knowing when to stop grazing is just as important as judging when to open the gate. It also became more important to leave a level of dry matter for regrowth and persistence, followed by a sufficient recovery period before regrazing.

Another grazing aim for us was to keep cattle out of watercourses, because manure and urine in these areas is regarded as a loss of nutrient from the paddock and a contiributor to poor water quality.

Property Management Planning helped us understanding the capabilities of each land type, and matching those classes to our livestock types has led to more efficient grazing across the farm.

Productivity improvements

By increasing soil fertility levels with careful fertiliser selection, we were able to achieve improved weight gains and higher stocking rates.

We are now stabilized at an average of 16 DSE/ha, dropping to around 12 DSE/ha during winter[1]. However, there was a period in the first two years when stock numbers were down, purely with the aim of improving the health and fertility of the soil.

Past overgrazing had led to a decline in soil organic matter, so we deliberately reduced our stock numbers to build up soil organic matter and improve pastures. Some paddocks were barely grazed in the first two years and other paddocks needed to be locked up for pasture improvement. Stocking rates were adjusted for this temporary loss of grazing area.

The target level for phosphorus on our river flats is 70 mg/kg (Colwell), with a goal of 35-40 mg/kg on surrounding ridges.

Fertiliser is only used to build or maintain fertility at a level that is best for the specific land class or soil type. We match fertiliser use to the potential productivity of paddocks.

Matching stocking rates to pasture feed availability during the year has been crucial to pasture persistence. One rule is to maintain at least 90 percent ground cover to reduce the risk of erosion. We are also building soil carbon levels by direct drilling extra pasture species into established paddocks and mulching paddocks following grazing.

Our livestock mix of breeding bulls and replacement heifers using artificial insemination has raised our gross margins. But investing in better genetics would have little benefit if we didn't produce good quality pasture.

We now see a faster response in pasture growth after rain, and less rain is needed to stimulate pasture growth. Improved weight gains and general herd health are the result. We believe that good soil fertility drives all other aspects of improved livestock productivity.

However, in the drive towards business profitability, we have to find a balance that doesn't sacrifice the environment or land sustainability. It's a challenge that every farmer faces.

1 DSE stands for Dry Sheep Equivalent. DSEs are used as a measure of stocking rate. The DSE figure is used to measure productivity across different livestock operations.

Looking deeper into the soil profile

Regular soil testing across the farm had been in place since our return to the land in 2000, the results being used to determine fertiliser rates and pasture improvement strategies. But test results of the low-lying areas across the farm and near the weir pool were quite surprising: high levels of sulfur and aluminium toxicity were indicators of a problem deeper down.

Surface soil testing indicated pH was as low as 4.2 ($CaCl_2$). Sulfate sulfur was recorded at 270 mg/kg with an aluminium saturation of 40%. (Target values are pH 5-6, sulfate sulfur 10 mg/kg, aluminium saturation <5%).

Deep soil cores were then taken from several metres below the soil surface by a NSW DPI soil scientist. The suspicion of acid sulfate soils was confirmed and found only 1100 mm-1300 mm from the surface. Mottling of the soil cores suggested that waterlogging of the area had allowed minerals to move easily through the soil profile. We don't know if any acid water stored in the soil profile was escaping into the Williams River.

A piezometer test well was constructed on the edge of the large wetland to monitor variations in water table depth. To date, results have indicated that the water table has not dropped below the top of the acid sulfate layer and that the pH of the water in the soil profile is extremely low (ph 4.5-5). If this groundwater pH drops any further, it may mean that the iron sulfide layer is producing sulfuric acid.

These results carried a message for our land management. We need to be very careful in cleaning out our drainage lines. They could only be cleared to a specific depth, as deeper excavation may expose the acid layer. Any excavation or remedial works around floodgate structures would need special attention.

While waterlogging in these areas was affecting pasture growth, at the same time it was also protecting the soil from a deeper underlying problem. Monitoring water table levels across the property now provides data that will hopefully allow us to manage the potential acid soil by keeping the water table high enough to cover the sulfitic layer but low enough so waterlogging doesn't affect pasture growth.

Local NSW DPI Agronomist Neil Griffiths (centre) and NSW DPI soils scientist Roy Lawrie (right) with field assistant inspect the deep soil cores from across the property.

A piezometer test well monitors water table depth in the acid sulfate soils area.

looking deeper

Water–a valuable resource

Water quality testing on the Williams River has been carried out periodically for many years, as the water is used for domestic consumption. At times the quality of water does not meet health guidelines. While it's true that cattle grazing riverbanks contributes to poor water quality, so does stormwater and septic run-off from rural development. The question arises: Was our farm contributing to poor water quality?

To answer this question, we began on-farm water testing. Using a test kit supplied by the Waterwatch program, regular testing across eight sampling sites allows us to monitor changes in water quality. A sample is taken from the river at the same time as other sites for comparison and results are entered into the Waterwatch statewide database (http://www.waterwatch.nsw.gov.au). Readings are taken of pH, available phosphates, and nitrate nitrogen.

The wetlands in particular are likely to be the best natural indicator of our environmental practices. Using nature to filter run-off is a key role of wetlands, and any changes in water quality here will allow action to be taken on the farm.

Our objective is to maintain or improve the quality of water leaving the farm, thereby keeping the nutrients where they are needed; in the paddock and on the farm.

Regular water testing of farm dams, drainage channels and wetlands helps us monitor changes.

Sensible Irrigation

Having access to fresh water for irrigation is one of the luxuries of where we live. Although average annual rainfall is around 1140 mm, it is also extremely variable, with dry springs and long, hot humid summers becoming more common.

Low pressure boomspray irrigation on summer forage sorghum. Our boys cooling off while checking its operation.

Irrigation has been used since 1945, soon after the installation of electricity and better centrifugal pumps.

Today, irrigation is more advanced, with a hard-hose traveling irrigator covering a relatively large area. Our irrigation is only used on high quality pastures or summer forage crops for rearing bulls.

Weather-based scheduling is used to determine irrigation intervals and efficiency testing has shown that the current system can be improved.

At the time of writing, a water sharing plan for the Williams River is being developed, and until security over our water entitlement can be guaranteed, we will hold off on investing in improvements to irrigation system efficiencies.

Multiplying like rabbits

Over the years, we have controlled feral animals in a haphazard way. When baiting for foxes one year, we realised the interaction between foxes and rabbits, noticing that controlling the foxes resulted in a dramatic increase in the rabbit population. While biological controls with the calicivirus and myxomatosis were reducing rabbit numbers, results varied with the season, and at times the rabbit numbers reach plague proportions.

Fumigating rabbit burrows following weed removal.

The impacts of rabbits on the landscape were becoming obvious on our tree planting. Tubestock plants were nipped off, and rabbit burrows in the soft sandy soils were further destabilising the riverbanks.

Healthy native tubestock defoliated by rabbits. Note the bare patches and scratch marks around the plant and rabbit dung in the background.

As one visitor pointed out to us, the cause of a large fallen Casuarina tree in the river probably began with a rabbit burrow higher on the bank. Water running down the slope and into the burrow was saturating the soil where the already undercut section of riverbank was struggling to support the leaning tree.

The short answer to the dilemma of feral animal control is to be vigilant and to use a range of control methods. Much like weeds, if they are not managed, they will get out of control. Monitoring and re-treatment is essential. Group control and baiting programs with the Rural Lands Protection Boards are useful community strategies to reduce large populations.

Birds as an indicator of habitat

From time to time we had noticed many of the beautiful birds that fly around the property, but had never taken the time to learn about them or their role in farm health. It was suggested that we involve the Hunter Bird Observers Club in monitoring bird species across our treatment sites, and after 18 months of bi-monthly bird surveys we have come to enjoy the time-out taken for sightings and identifying the birds.

To date over 110 different bird species have been identified, with many returning for nesting and breeding. When we planned our revegetation activities, our focus was on erosion control. We didn't really consider any indirect benefits to native plants and animals and the ecosystem services that they provide.

Now that we are aware of their benefits, our plan is to maintain and improve bird habitat. A diversity of native trees and shrubs will encourage them to stay.

Ibis taking a rest in a dead tree above a waterlogged paddock.

Tawny Frogmouth (Photo courtesy Tom Clarke Hunter Bird Observers Club).

Our favourite Tawny Frogmouth birds have returned to raise their young in a remnant forest just below our house, and regularly feed off the lawn at dusk. The colourful Azure Kingfisher and Rainbow Bee-eater are exciting to watch as they follow our canoe along the river. It is exciting to see the return of the Latham's Snipe migrating from Japan back to our wetlands.

There is nothing more refreshing than to have a hectic schedule on the farm interrupted by the spectacular flight of a bird, or to be distracted, anxiously waiting to see if the raptor captures its prey. We now often take just a minute or two to listen to the Thornbills chattering or to watch the Wrens darting amongst the vegetation.

Darter nesting in a fallen tree on the river.

Bird watchers in action along the riverbank.

Diversification– Greswick Honey

As we developed our grazing enterprise we were also tossing around a small business idea to supplement our farm income. We had planted several thousand trees, so using more of the natural resources across the property seemed like a good starting point. While revegetation was originally intended mostly for environmental benefits, we saw that this could also be a small and rewarding sideline.

Honey production re-ignited a tradition started in the early 1900s by William Brooks. The original apiary stood in an orchard beside the old homestead and many of the old-style trees still provide a regular food source for bees. Our own product, "Greswick Honey", developed and marketed through local retail shops across the Hunter Valley, has given us immense satisfaction.

Above and below: Beekeeping has provided an opportunity for diversification.

Counting the costs of biodiversity

How does one put a value on the economic benefit that environmental management for sustainability provides? It's a tough question and one that defies an equation. Even if for capital appreciation alone, we owe it to future generations to look after the land.

It is well-accepted that improving the environment not only improves on-farm sustainability but also provides broader community benefits. For us, without the funding assistance through Hunter Water and the Environmental Trust we would not have had the funds ourselves to invest in this scale of on-ground works.

Funding assistance allowed us to gain momentum and implement change at a faster pace and to work on areas that were not necessarily adding to the financial 'bottom line', but would deliver wider benefits.

The result of funding support was to help us improve our productivity while farming less land area and allow us to manage sensitive areas for their biodiversity value.

Water dragon lizards are common along the riverbanks.

Value of education

Our efforts to make the farm sustainable drove us to seek the latest information on farm management. Ideas and concepts have come from many people, among them the research and educational facilities of Tocal College, CB Alexander Campus.

Especially important to our business development was completing the Property Management Planning program while studying for the Diploma of Agriculture through Tocal. Further work for the Diploma of Conservation and Land Management made us feel as though we were definitely on the right track with our environmental works.

Operating in the primary industry sector is an ever-changing environment. Education is a life-long process and we are committed to keeping abreast of industry changes as a way towards a sustainable future.

Field days provide an opportunity to showcase our work. This is a tour group of Victorian Angus beef producers.

School students involved in an Envirothon event held at the property in October 2005. The challenge for the students was to identify what environmental issues faced the property.

Moving forward

Our involvement in the Williams River Best Management Practice demonstration project is a huge commitment over a number of years. There is still much work to be done on showcasing our property and there is more on-ground work yet to occur.

Our activities are constantly being evaluated, reviewed and monitored. Adjustments are being made all the time and will continue to be made. That's what it's all about: detailed planning, implementing, re-evaluating and adjusting (the Plan, Do, Check, Act cycle).

Our improvements are not complete. Pasture improvement programs will continue at a rate that suits available income, and there are always gains to be made through better herd genetics.

Grazing management, although working remarkably well, stills needs refining. At times we have too much feed rather than not enough, but this conservative approach suits us. Closer monitoring of grazing intervals and rest periods will give us better pasture use.

Our environmental programs, although well advanced, are still incomplete. When we started riverbank fencing and tree planting, we thought that this was the end point—the solution. Several years later, and by developing an Environmental Management System (EMS) for our business, we were still able to identify many areas for improvement.

Embracing change has become a total family affair. Janelle and the boys have provided those helping hands to get things done and their active involvement has given a great deal of family enjoyment.

Leisurely canoe rides along the river now turn into an Alligator Weed-spotting exercise. Hayden pesters for a day off school when the bird watchers arrive; keen to get the binoculars out to name another new bird. And it doesn't seem long ago that James reminded me it was time to get onto those rabbits again.

What we have achieved in such a short period of time only scratches the surface of what's truly achievable. What we've done is not new, but we have adapted sound ideas for our property using a structured and planned approach. It's not a 'one size fits all' formula. We are taking the time to find that comfortable balance that suits us and our land.

Shoreline in the 1960s showing an abundance of river reeds. There is no apparent erosion.

The same area in December 2004. The bank is severely undercut and has slumped. Revegetation began in spring 2001 and continues.

moving

Thanks to:

NSW Government Environmental Trust

Hunter-Central Rivers Catchment Management Authority

Hunter Water Corporation

NSW Department of Primary Industries

Port Stephens Council

Rural Lands Protection Board

The BMP project steering committee members keep a close eye on the progress of on-ground works.

forward

This is a story of how one young family set about making a landscape productive while restoring the natural ecosystem of an old dairy farm. They have been able to 'strike the balance' between production and the environment.

John and Janelle Spearpoint of Seaham in the Hunter Valley of NSW had the chance to return to the family farm and continue a farming tradition spanning five generations. They came with a vision for transforming the land using best management practices.

Today, after only a short time but massive efforts by the whole family, a difficult landscape now supports a healthy beef business operating in harmony with environmental actions.

Riverbanks and wetlands have been brought back to life and protected by fencing. Grazing is strictly managed. War is waged on pest animals and plants. Planning and monitoring; fencing, troughs and trees; and healthy soil and pasture are keys to the transformation.

In these pages we have a chronicle of hard work, business acumen and a unique cooperation between the farm family and government agencies. A vision for the land is being realised.

ISBN 073130597-3

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