APPENDIX 6. WETLAND MANAGEMENT STORIES

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DOCKERS PLAINS PASTORAL COMPANY

Where	**5km north of Wangaratta on the Ovens River (NE Victoria)**
Enterprise	**Primarily beef cattle (1200 breeders)**
Size	**3072 hectares**
Wetland area	**1125 hectares of Ovens River floodplain country**

What they did

- Erected 19km of fencing to control stock access to wetlands and river banks (commencing at the end of 2005)
- Installed an off-stream stock watering system to remove the reliance upon creek access
- Commenced the implementation of comprehensive weed control.
- Entered into a five year management agreement with the North East Catchment Management Authority (NECMA) under their 'River Tender' programme
- Commenced a detailed monitoring and evaluation project.

Why they did it

- To protect environmentally sensitive areas of the floodplain country from damage through stock grazing and trampling
- To improve the condition of remnant native vegetation by removing invasive weeds and encouraging natural regeneration
- To demonstrate good 'land stewardship'.

Cost

- The total project cost is approximately $270,000 over five years
- The above figure includes $20,000 to be spent on the monitoring and evaluation component of the project (funded jointly between the NECMA and Dockers Plains Pastoral Company).

Assistance

- Funding assistance was received through Round 1 of the NECMA 'River Tender' programme.

Benefits

- Obvious improvements in the condition of wetland vegetation have been recorded, even though this project is still in the implementation phase
- The area of environmental weeds within the floodplain River Red Gum remnants has been greatly reduced.

Monitoring & evaluation

Three rounds of monitoring have been carried out so far with some natural regeneration of native trees and shrubs recorded.

Their story

The Dockers Plains Pastoral Company (DPPC) farms 3072 hectares of Ovens River floodplain and Riverina Plains country downstream of Wangaratta in north-east Victoria. The main property is situated on the lower reaches of the Ovens River about 30km from its confluence with the Murray River above Lake Mulwala.

The 1125 hectares of Ovens River floodplain country owned by DPPC includes about 660 hectares of remnant vegetation extending back across the floodplain from the right bank of the river. Reedy Creek is a major tributary of the lower Ovens and has its confluence with the main river on the property.

The Ovens floodplain country includes over 60 discrete wetlands which, when measured along their longest axis, total some 17 km. In addition, this section of the property has:

- 16.5 km of Ovens River frontage (property boundary)
- 1.2 km of Ovens River anabranch
- 16.8 km of Reedy Creek
- 2.65 km of Reedy Creek anabranch.

With the exception of the Ovens River boundary, the remaining channels are all contained within the property resulting in a total of 57.8 km of river/creek/anabranch banks.

The Riverina Plains section of the property also has a scattering of more isolated red gum plains wetlands associated with a temporary creek system, Whim Creek.

Among the floodplain wetlands some are filled primarily from floods in the Reedy Creek system, others from floods in the Ovens, and still others from localised overland flow from the adjacent plains country. Different wetlands fill at different flood stages on both systems e.g. it is possible to have wetlands overflowing along Reedy Creek (from localised thunderstorms in the headwaters of that system) while the Ovens fed wetlands remain completely dry. This hydraulic diversity, coupled with the physical diversity and extensive areas of remnant vegetation make the DPPC floodplain country particularly biodiverse.

The close proximity of the plains country wetlands and their associated remnant vegetation enhances the landscape further. It is a long term objective to connect all these areas together with vegetated corridors.

In 2005 the company engaged an environmental consultant to prepare a whole-of-property environmental plan. The project described here sits within that overarching planning framework.

The property environmental plan identified the floodplain and plains country wetlands and associated areas of remnant vegetation as being very significant environmental assets. The wetlands were divided into five simple groups:

- **Floodplain wetlands**
  - lagoons (wide more or less oval expanses of deep open water that only dry out occasionally)
  - billabongs (former channel meanders)
  - reedy wetlands (wetland areas more or less completely dominated by emergent native water plants)
  - meadow wetlands (shallow wetlands that fill briefly after heavy rain/flooding, in which water plants dominate).
- **Plains wetlands**
  - Red Gum Plains Wetlands.

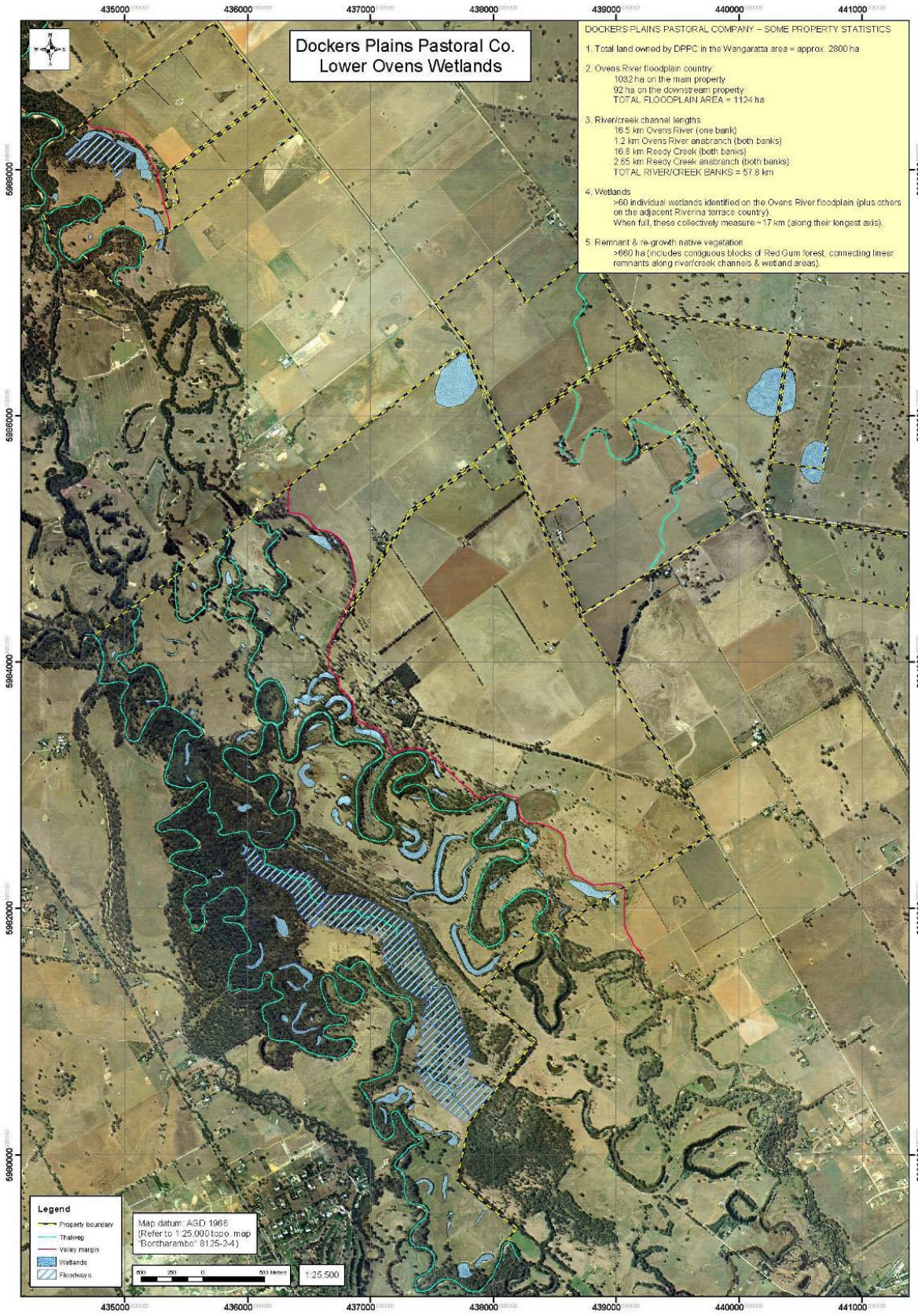
Image 1: This classically shaped horseshoe billabong wetland is primarily filled by flood water from the Ovens River. Although shallow at the end shown in the photograph (which is less than 30m from the river) this wetland is generally deep and only dries out fully during the most severe droughts.

Image 2: This meadow wetland is typically filled either by localised run off or from over-bank flows from Reedy Creek. Although only 600m from the billabong wetland shown above it functions quite differently. It is shallow and the warm waters stimulate the abundant growth of native wetland plants and invertebrates that will provide different habitat and food resources to the billabong wetland (see map on page 33 for photo location).

The floodplain country is divided into 31 paddocks used for the summer grazing of beef cattle. Much of this country is inaccessible in winter due to flooding.

The majority of this area has only been held by DPPC for about ten years, however the local oral history, records and observation suggest the following history.

- Although much of the floodplain was cleared during the late 1800s, some areas were left intact. Many trees were ring barked and the dead trunks still remain today. In some paddocks a scattering of mature trees were left
- A small steam-powered saw mill was operating on the main property in the1870s. It cut river red gum (Eucalyptus camaldulensis) and exported the products to Melbourne
- Sixty years ago about half of the area currently under timber was pasture. Significant regrowth of river red gum has occurred since this time, especially in the lower-lying wetter paddocks
- There is very little evidence of direct interference with the wetlands, e.g. there are very few drains. For the last ten years the large floodplain paddocks have been set-stocked with cattle in summer.



Map 1: Copy of the DPPC wetland overview map. The red line marks the eastern edge of the Ovens River floodplain (valley margin) while the blue line to the west marks the course of the Ovens. Between the two, Reedy Creek snakes across the floodplain adding to the mosaic of channels and wetlands. There are over 60 individual wetlands scattered across the floodplain, plus several more on the higher, flat plains country to the east.

DPPC is run as a commercial farming business. Primarily focused on the production of beef cattle, the farm runs approximately 1200 breeders. The company also takes its environmental management obligations very seriously and aims not just to maintain its environmental assets over time, but to progressively enhance them. 'I'd like to think that when water leaves this property it will be of better quality than when it entered' is how the owner summarised his attitude to the project. Additionally, when considering the objectives of the linking vegetation proposed under the property environment plan, the owner commented that ' in time, I'd like to be able to walk from one end of the property to the other [i.e. from the river flats to plains country] without leaving the cover of native vegetation'.

'I'd like to think that when water leaves this property it will be of better quality than when it entered … in time, I'd like to be able to walk from one end of the property to the other without leaving the cover of native vegetation'

DPPC are using four key indicators to provide evidence of improvement in wetland and remnant floodplain vegetation condition as a result of the project. These are:

- reduced water turbidity within those wetlands that are to be fenced off
- natural regeneration of wetland plants
- natural regeneration of native floodplain vegetation and a significant reduction in the area of key environmental weeds
- an improvement in the amount and biodiversity of the understorey.

In mid-2005 DPPC received substantial funding assistance under the North East Catchment Management Authority's (NECMA) River Tender funding scheme. This funding source has assisted DPPC to implement major sections of their environment plan for protecting and enhancing riparian vegetation. Under the five year River Tender agreement signed with NECMA, DPPC has undertaken to"

identify priority wetlands

install fencing to protect wetlands and other remnant riparian vegetation and carry out a programme of weed control

install an off-creek watering system for stock

participate in a jointly funded programme of monitoring and evaluation.

1. Identify priority wetlands

With such a large array of wetlands in the Ovens floodplain section of the property it was not considered practical to try and protect them all, primarily because of the fencing costs (both in terms of initial construction and ongoing maintenance). Wetlands were therefore prioritised using the following considerations.

Wetlands in good condition, or those in moderate condition but with high natural recovery potential, were selected first. This approach is consistent with the widely accepted principle that 'looking after the good bits first' is a far more efficient use of resources than trying to 'fix' highly degraded areas (Rutherford et al 2000). High recovery potential wetlands are those where an improvement in condition could be expected with minimal intervention e.g. a wetland that will recover through the natural regeneration of native plants by installing a section of fence to limit stock access.

An array of wetland types were identified on the property. When selecting which wetlands to rehabilitate, an effort was made to select examples of as many types as possible e.g. when assessing a given area, a wetland of type A was in better condition than a wetland of type B, but type B was selected for fencing because it was the best example of this type of wetland, while the type A wetland was already represented, and selected for rehabilitation, elsewhere on the property.

i. For any environmental enhancement works to be a long-term success it is important that they are integrated into the overall management of the property. The environmental planning works carried out by DPPC had identified that unrestricted stock access and weed invasion posed the biggest threats to the wetland assets.

The proposed new fencing to protect wetlands was integrated with the overall stock management plan for the property. In some cases this meant the choice between fencing one or another wetland came down to which involved a fencing layout that best suited the existing or proposed future paddock system.

ii. Maintaining farm infrastructure can be time consuming and expensive. Fences within flood prone areas are notoriously maintenance intensive and as such it has been general practise to keep the quantity of such fencing to a bare minimum. When considering fencing options for the protection of environmental assets in riparian areas the likely long term maintenance requirements must be carefully considered in terms of how much, where and of what design.

2. Fencing

Having decided which wetlands were to be rehabilitated the next task was to firm-up on the exact location of each individual fence line. In this regard the following issues were considered.

i. The need for 'buffers' around the wetlands

When planning to fence out a wetland or other water body the concept of 'buffer zones' needs to be taken into account. As the name suggests, a buffer zone is an area of land between the fence and the wetland that buffers it from the surrounding landscape.

Exactly what you are buffering the wetland from will change from site to site and this fact, coupled with local topography, will determine how wide the buffer zone needs to be. In agricultural settings, a typical situation is to buffer wetlands from sediments or nutrients that may be washed from the surrounding paddocks.

Dense grass buffers (or 'filter strips' as they are sometimes referred to) have been shown to be particularly effective at buffering wetlands from these inputs. For example, when aiming to trap sediments the width of the buffer is heavily dependent on how much soil movement is expected and the slope of the paddock surrounding the wetland. Based on these two factors recommended widths may vary from 2m to >30m (Land & Water Australia, Technical Guideline 1, 2001). Given that the DPPC floodplain country is not cropped, has only minimal fertilizer applications, and is generally flat, a buffer width of 10m on average was deemed sufficient to minimise sediment and nutrient inputs.

ii. How is the area being fenced off going to be managed in the longer term?

Any area fenced off will require some form of management over time. Deciding what the ongoing management issues are likely to be, and how these will be dealt with, has a direct bearing on fence design and location.

As all the wetland fencing proposed by DPPC included wide buffers, the ongoing management of groundcover plants around the wetlands, especially with respect to fire risk, was an important issue. Practicality dictated that the easiest way to manage groundcover build up would be to 'crash graze' the fenced areas occasionally e.g. during dry periods when stock would have a minimal impact on wetland plants. This meant that the fencing design and layout would have to cater for moving stock in and out of the fenced areas.

Image 3: Flood fencing installed on a billabong wetland (see map on page 33 for photo location). The design incorporates very strong railway iron end assemblies with a minimal fence panel construction of three electrified plain wires. The widely spaced plain wires are less prone to collecting flood wrack which is the usual cause of fence damage during floods. The use of timber 'droppers' also helps by making the fence panels very flexible (the panel can twist). Each section of fence between the railway iron posts is also wired separately – this ensures that if one section is washed out it doesn't take the rest of the fence with it.

iii. Where can the fence be placed to minimise flood damage?

A number of strategies were employed to ensure that fences suffered from minimal flood damage, including:

- positioning fences on high ground wherever possible
- identifying flood channels and avoiding these areas or, if they had to be crossed, were wired using separate 'sacrificial' sections of fence (see Figure 2 for further details of the fence specification)
- fencing out the entire area well away from the main flood flows where a group of wetlands was located on very low-lying ground. While this involved the apparent loss of some large areas of grazing country, these new 'wetland paddocks' can provide valuable fodder in tight seasons.

iv. Other issues and considerations

- If possible, fences were positioned away from trees to minimise the damage from falling limbs.
- Does the new fence have to connect to an existing one?
- To save costs fence lines were made as short as possible, with as few changes in direction as possible, while at the same time avoiding fencing off too much valuable grazing country.

v. Design

To further minimise fence maintenance, careful consideration was given to the fence design. The eventual configuration chosen can be summarised as having a very sturdy framework (end assemblies, gate assemblies and posts at changes in direction) with minimal and flexible electrified plain wire panels.

With this design, the basic framework of the fence is unlikely to be damaged even by the biggest floods while the plain wire panels will be less likely to collect flood wrack (debris carried by flood waters) – which is the usual cause of fence flood damage. In addition, the sparse plain wire panels are relatively easy to replace if they are lost.

Design advice and comprehensive fencing design manuals are available from the following equipment manufacturers' web sites (note – no endorsement is implied or given to suppliers included in this list):

www.gallagher.com.au

speedrite.com.au/speedrite_new

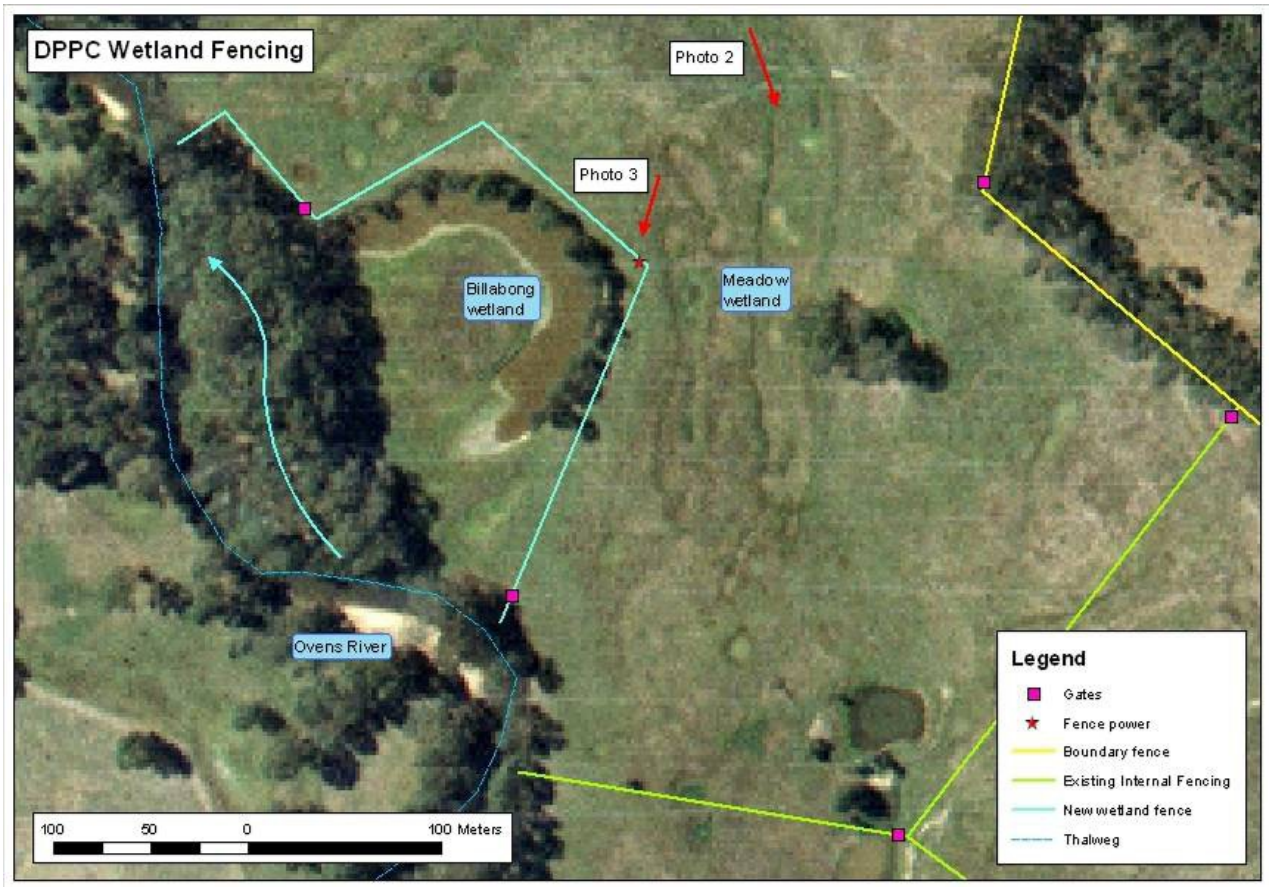
Design feature	Comment
Railway iron end assemblies, gate and corner posts. Tubular metal stays concreted into the ground and welded to the railway iron.	A very sturdy arrangement that will withstand most flood conditions. Will not be damaged by fire either. Even if most of the fencing panels are lost, the main framework of the fence will remain (which is the most expensive bit to install).
Three plain wires (two electrified; one earth return).	*Flood damage to fencing is not usually caused by water flowing over the fence, but rather by the build up of vegetation (flood wrack) against the fence that the moving water then pushes against. Barb wire and chainmesh fences collect flood wrack very readily. Fences with widely spaced plain wires do not.*
Widely spaced star pickets and timber 'droppers'.	A minimal amount of star pickets and droppers were used in the construction of the fence panels. Droppers are not driven into the ground but merely maintain the wire spacing. This makes the fence panel very flexible and hence less likely to collect flood wrack.
Each section of fence was wired separately between the railway iron end assemblies and/or corner posts.	Wiring the fence as separate panels means that if one section is removed by a flood it doesn't pull the whole fence down – only the damaged section will require replacement.
Stand-alone power units.	In most cases, each wetland was provided with its own stand-alone solar powered fence energizer. On a large property where fences cannot be inspected regularly this ensures that any local damage (e.g. a falling tree limb) will not result in a loss of power to all the wetlands.
Quality of construction.	Electric fences are only effective if they have power in them and can be very easily damaged by stock when the power 'goes out'. Taking care over the construction of the fences ensures that power outages are rare and that voltage levels are kept high. This encourages stock to develop a 'healthy respect' for the fences!

Figure 2: Design features of the fencing for riparian zones used by DPPC

vi. Cost

Approximately 19km of fencing was erected by DPPC under the River Tender project which fenced out 35 wetlands and several kilometres of creek and river banks. The fencing was installed by a contractor on a supply-and-erect basis and the all inclusive price was $5.80/m run of fence (excluding GST). Note: this price is an average and price is very dependent on:

- the availability and cost of railway iron
- the total size of the job (economies of scale)
- the total number of end assemblies and gates with respect to the total length of fence (the end and gate assemblies were the most expensive part of the job).



Map 2: The fence around this billabong wetland has been kept on the high ground, is as straight as possible, avoids overhanging branches and has been kept out of the flood channel (blue arrow). Gates are positioned so that cattle can be moved in and out easily for grazing when required. The numbered photo points (red arrows) refer to the photographs contained in this case study.

3. Off-stream watering system

Fencing off wetlands and creek access often necessitates the installation of an alternative stock watering system. As such systems tend to be very expensive, the quality and size of the areas being protected must be carefully reviewed in order to justify the expense.

In one section of the property wetland and creek frontage fencing was proposed that would cut stock access to their only watering points. An alternative watering system was developed and its location was based on two key considerations:

- access to a reliable source of water to keep the tank and trough system full during summer periods of peak demand – in this case a deep pool within Reedy Creek
- proximity to the junction of three paddocks so that each could be served with water at minimal cost in terms of pipe layout.

In estimating the size of the system required the following simple 'rules-of-thumb' were used:

- beef cattle can drink up to 10% of their body weight per day in summer
- for an average animal weighing 500kg this means 50L/animal/day
- multiply this figure by the maximum number of animals that will be serviced by the system to work out the maximum daily demand e.g. 250 head @ 50L/day = 12,500L per day.

While the above rule-of-thumb was sufficient to enable a quote to be obtained for the system, when it came to the detailed design and installation DPPC referred to the expertise of a local installer.

A solar powered submersible pump system with a 13,500L poly header tank was selected. The solar array was mounted to a tracking device which maximises the output from the solar panel by keeping it correctly orientated to the sun. Such systems have significant advantages over more traditional windmills, diesel or mains electric pumps, including:

- solar systems run at their maximum efficiency during summer when the days are long and there is abundant sunshine. This also matches peak demand as cattle drink more during hot weather. In comparison, windmills tend to operate better during the windier winter months and therefore deliver their maximum performance when the demand is at its lowest
- installed properly, solar systems can be very reliable and, unlike many diesel and mains electricity pumps, do not require manual starting
- solar pumps are stand-alone systems and do not need a mains electricity supply
- solar systems have minimal ongoing running costs once installed.

The sizing of the solar panel array is heavily dependent on two key factors which have to be calculated on a site by site basis:

- peak water demand, i.e. how much water will you need to supply and over what timeframe
- head, i.e. from what depth will the water have to be raised to the header tank.

The solar panel, tracking system and pump package used was the 'Mono 150W Sun Buddy' supplied and installed by a local contractor.

Image 4: The 150W solar panel powers a submersible pump which provides water to the header tank. The troughs are gravity fed from the tank. Even relatively small systems like this one are expensive to install. The costs have to be justifiable in terms of the quality and size of the area being protected.

Cost

The solar panel, tracker and pump system supplied for this site cost approximately $5,730 with the complete installation totalling $9,800 (excluding GST). This latter figure includes using a contractor to install the pump, solar panel/tracker system and pipe work to the header tank, but does not include the tank stand or the pipe/trough system which was installed by DPPC.

Further information on solar powered water pumps can be found on the Mono Pumps website: www.mono-pumps.com/mono/home.nsf/p/home_au

Image 5: Weed control was another aspect of the work done by DPPC. Blackberry was spayed out successfully with minimal damage to the surrounding native vegetation.

4. Monitoring & evaluation

In a 50:50 partnership between NECMA and DPPC a comprehensive fiver year monitoring and evaluation programme is being carried out.

With a focus on vegetation dynamics, ten transects (including 'control' sites) have been established which are assessed twice a year (spring and summer). All the native and weedy trees and shrubs present are recorded and mapped, along with new recruits since the last assessment. Groundcover species are also mapped in smaller quadrats located along the belt transect centre line.

As part of this work, a comprehensive network of fixed photo-points has been established that will provide a visual story over time (the eventual catalogue will include over 500 photographs). The images on the next page are an example of the results from one of these photo points.

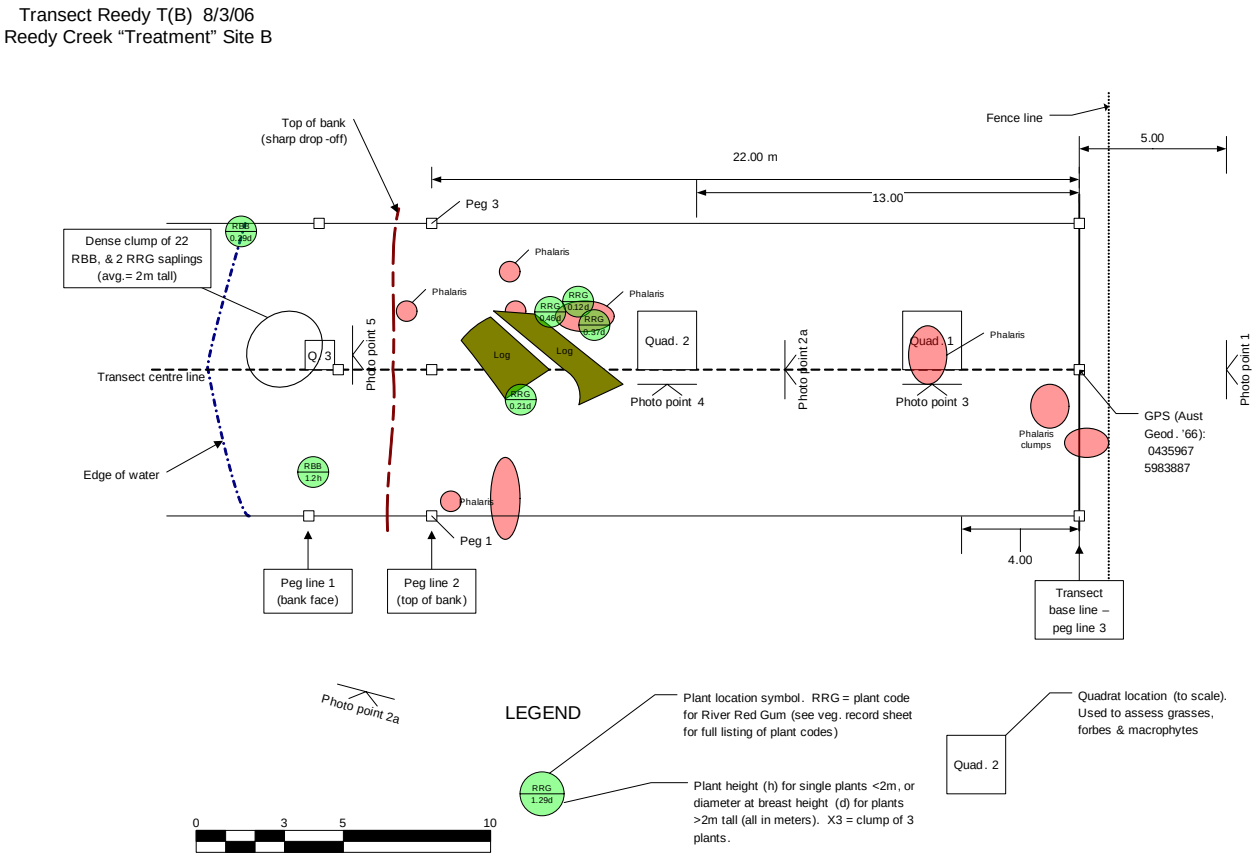


Figure 3: A comprehensive programme of monitoring and evaluation has been established to determine if the expected results are realised. Ten belt transects have been established and mapped, as in this example. Each transect will be re-assessed each spring and summer over a period of five years to see how the vegetation changes over time.

Progress

The major structural works and first round of weed control were completed by March 2006. In spite of the drought conditions that have dominated since that time, initial results from the project are encouraging:

- at several wetlands there has been a notable expansion in the cover of native water plants
- the initial weed control work has been successful with good targeting of weeds and minimal non-target species damage.

Image 6: This wetland was fenced out in November 2005. This photo was taken in March 2005.

The same wetland in February 2007. The re-growth of the native water plant giant rush *(Juncus ingens)* along the far bank is very obvious, in spite of the drought conditions.

Challenges

For the DPPC River Tender project the most important time for reflection will come after the next big flood when the success, or otherwise, of the fence design will be properly tested. The amount of damage, and time taken to repair the fences, will determine their long-term viability.

Summary

The DPPC River Tender project focuses on enhancing wetlands and areas of remnant floodplain vegetation that are already in moderate-to-good condition. The Ovens River currently enjoys minimal regulation and consequently the floodplain wetlands on the property enjoy a near-natural flow regime. The existing remnants and natural flow regime mean that the wetlands have a high degree of natural recovery potential.

Unleashing this recovery potential has involved identifying threatening processes (e.g. stock access, weed invasion etc), prioritising the environmental assets on the floodplain and implementing a series of carefully thought out on-ground projects. The monitoring and evaluation programme is designed to test the assumptions underlying the works and altered management practices that are being implemented.

References

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Rutherfurd, I. D., Jerie, K. & Marsh, N. (2000). *A Rehabilitation Manual for Australian Streams Volume 1.* Land and Water Resources Research and Development Corporation, Canberra.