05

Livestock management

Impacts of grazing 92
- Grazing impacts on streamside vegetation 92
- Grazing impacts on soil and streambeds 93
- Grazing impacts on water quality 93
- Grazing impacts on habitat 93

Management options 95
- Riparian fencing 95
  - *What type of fence?* 95
  - *Where should a fence go?* 97
  - *Fencing across waterways* 98
- Watering points 99
  - *Constructed drinking points* 99
  - *Off-stream watering points* 100
  - *Farm dams* 101
- Off-stream shade and shelter 102
- Waterway crossings 102
- Managed grazing 103
  - *Rotational grazing* 104
  - *Tactical grazing* 104

Case study: Controlling stock in riparian lands 106

References 108

Impacts of grazing

The introduction of livestock was, and continues to be, a major departure from the native grazing regime of the Australian landscape. Ungulates (hoofed animals) such as sheep and cattle are particularly foreign to Australian soils and native plant communities, and as such the impact of livestock to sensitive landscape areas, including riparian lands and their associated aquatic ecosystems has received much attention.

Riparian land is important because it is often the most fertile and productive part of the landscape, in terms of both agricultural production and natural ecosystems. It generally has deeper and more fertile soils than the surrounding hill slopes due to past erosion and river deposition. In addition, it often retains moisture over longer periods because of its position lower in the landscape[1].

Riparian lands, as the interface between terrestrial and aquatic ecosystems, provide a powerful indicator of overall catchment quality. The grazing and trampling activities of domestic livestock have had a particularly pervasive influence on riparian habitats[2]. Livestock spend a considerable amount of their time at land-water interfaces as they congregate to drink, access palatable forage and gain refuge from heat. Introduced livestock and inappropriate grazing management are among the most significant causes of chronic modification to land-water interfaces in Australia[2].

Livestock grazing can affect four general components of an aquatic system - streamside vegetation; the shape, composition and structure of both the stream channel and the streambank, and water quality[3]. These components form the habitat essential for the survival of aquatic species, such as fish, and other species that utilise aquatic ecosystems.

Grazing impacts on streamside vegetation

The prolonged trampling, rubbing and browsing of riparian lands by stock can physically damage plants and compact the soil[4]. Compaction may reduce soil infiltration rates, increase runoff and decrease water availability to plants as well as reduce germination rates of seeds[3]. The potential of the riparian zone to act as a buffer strip and improve water quality is also decreased[5], while loss of groundcover allows soil temperature to rise and increases evaporation from the soil surface[3].

Figure 43
The access of livestock to waterways has many detrimental impacts on river bank stability and water quality. NSW DPI.

Grazing impacts on soil and streambeds
Loss or modification in composition and biomass of soil-binding vegetation communities, together with the impact from hard-hoofed animals reduces the structural stability of stream banks[6]. This impact results in increased susceptibility to erosive forces and results in higher loads of sediment into waterways. Overgrazing leads to bank slough-off creating false setback banks, accelerated sedimentation, and subsequent silt degradation of essential in-stream habitat, such as refuge pools, spawning and food producing areas[3]. Destabilisation of the streambanks can also lead to impacts on channel morphology with channel widening and shallowing, and initiation of stream bed erosion (for more detail on stream bank and stream bed erosion see Section 8).

Sheep can be particularly detrimental to riparian zones. They cannot travel far to water, so their movement tends to be concentrated around watering holes and streams. They are also very close grazers and need good grazing management to maintain groundcover and reduce the susceptibility of the riverbank to erosion and slumping[4].

Grazing impacts on water quality
Uncontrolled livestock grazing affects water quality in several ways, including:

- an increase in water temperature due to the loss of streambank vegetation and reduced shade cover,
- an increase in turbidity resulting from increased levels of suspended sediments from exacerbated bank erosion and/or elevated inputs from overland flow, and
- an increase in nutrient and pathogen levels from soil, overland flows and faeces. Faeces and urine of stock in the riparian zone and waterway directly contributes to phosphorous and nitrogen levels in streams. Cattle have been found to defecate 50 times more per metre of stream crossing than on adjacent raceways[7]. This contributes to high levels of *Escherichia coli* (up to 100 times higher than background levels[7]) and suspended sediments and nutrients to the water column. The result is water unsuitable for stock watering purposes, consumers and recreation.

Figure 44
Sheep are said to have a greater impact than cattle in the riparian zone. NSW DPI.

Grazing impacts on habitat
Livestock in riparian zones can also have significant detrimental effects on in-stream and bank-side ecology. Elevated nutrient and sediment loads can lead to prolific algal growth, reduced light penetration in the water column and suppression of in-stream processes. Vital habitats can be smothered by deposited fine sediments and disturbed by animals walking in-stream.

Fish and aquatic invertebrate population diversity and assemblages can be indirectly affected by all the impacts to the water quality and loss of habitat as described above. Other organisms affected by uncontrolled grazing in riparian lands include terrestrial birds and freshwater crayfish.

Habitat structure is a major determinant of bird species diversity. Extensive grazing practices can significantly alter the structure and composition of riparian habitat through a combination of trampling, grazing, changes in nutrient fluxes and loss or altered recruitment. Collectively these impacts result in a decline in abundance of riparian birds[8]. Likewise, freshwater crayfish which burrow into riverbanks, are also affected by riparian land uses that impact on soil condition and vegetation cover. In-stream habitat stability which is conferred by intact riparian vegetation is important in crayfish survivorship. In conjunction with bank instability, soil compaction and larger nutrient loads, significantly fewer crayfish burrows are found in areas of grazed riparian lands than in native forest[9].

Many landholders throughout NSW are recognising that often environmental and agricultural objectives can be achieved simultaneously and are now implementing management techniques that control stock access to riparian areas and improve the health of waterways[1]. One challenge when considering controlling stock access to the riparian zone is to assess the current economic value of the riparian land when grazed versus the economic and non-economic benefits to the environment and productivity under grazing regimes that exclude stock from waterways and riparian areas. For those whose family have farmed the land for generations, giving livestock free access is generally a custom and the concept of actively managing access is a new and potentially testing one.

Land and Water Australia have produced an excellent publication for landholders that offers suggestions on how to manage riparian land in a way which is appropriate for particular situations *Stock and waterways: a manager's guide* (*2006*)[10].

There are a range of options available to landholders who wish to manage their livestock in ways that minimise impacts on riparian zones and waterways. These include:

- fencing off riparian areas,
- fencing across waterways,
- providing alternative stock watering points,
- providing waterway crossings, and
- grazing management.

The benefits of managing livestock in riparian zones:

In the home:	Improves property profitability.
In the paddock:	Maintains healthy ground cover, improves pasture productivity.
In the catchment:	Reduces disturbance to in-stream habitat, promotes ecosystem services.
In the community:	Improves downstream water quality for stock, drinking and recreation.

Management options

Riparian fencing

Excluding or restricting stock from waterways and the land surrounding waterways is the quickest and easiest way of improving waterway health[10]. Fencing will encourage vegetation and plant regeneration, providing an effective buffer strip, a useful wildlife habitat and corridor and will aid in stabilising of the waterway[11]. However, concerns are often raised with regards to riparian fencing including the initial cost of fence installation and watering points, cost of fence maintenance and loss of fences in flood prone areas, the loss of productive grazing land, and the encroachment of invasive weeds into fenced areas. If these concerns are addressed effectively from the outset of a riparian rehabilitation project it could make the difference between a project progressing or stalling for apprehensive landholders.

What type of fence?

Fences in riparian areas are subjected to forces and strains not experienced elsewhere on a property and therefore must be designed and constructed properly[12]. The risk of destructive flows during flooding is one of the most common challenges. A wide variety of fencing options are available and the type used will depend on its purpose, the surrounding topography, size of the area, soil type, flood risk, stock type, material availability and cost. It will probably never be possible to design a fence that will withstand the force of a major flood, however steps can be taken to minimise risks[10].

Figures 45a, 45b, 45c, & 45d
Fencing in riparian areas needs to take into consideration flood risk whilst also allowing for adequate control of stock type.

The following table (modified from reference 12) provides a comparison between a few different fence types you may come across when working with a landholder and assesses their suitability for the riparian zone area. The comparison indicates that electric and in some cases plain wire fencing may be the most suitable for riparian areas. Electric fencing is a versatile method for controlling livestock (and unwanted wildlife)[11] and if properly designed, constructed and maintained, can be the most effective and least expensive fence type for riparian areas[12]. Plain wire fences are also recommended for use in riparian areas due to their ease of construction and reduced likelihood of collecting flood debris. These fencing types are also suitable for actively managing stock access in areas which are grazed in rotation or 'crash grazed', as described later in the section.

Table 7: Fencing options for riparian and flood-prone areas

Option	Advantage	Disadvantage
2 or 3 wire electric fence	Can be dropped or removed for weed removal Suitable for cattle control Less likely to collect flood debris Comparatively cheap to erect and maintain Quick and easy to erect Curved fence line possible Fewer posts required Longer life	Not adequate for sheep and lambs Not suitable where vegetation overgrowth likely Needs an electricity supply (mains or solar) Droppers may be needed depending on post spacing Stock require 'training'
4 (or more) wire electric fence	Suitable for cattle and sheep Can be dropped or removed for weed control Still less likely to collect flood debris Still quick to erect Still comparatively cheap Curved fence line possible Longer life	May not be adequate for lambs Not suitable where vegetation overgrowth likely Needs an electricity supply (mains or solar) Droppers may be needed depending on post spacing Costs increase with wire increase Stock require 'training'
2 wire electric fence with mesh at base	Effective against most stock (including lambs) Relatively quick to erect Strong	Susceptible to flood damage Higher maintenance costs Increased erection costs Limited ability to follow natural stream curve Less droppers required
4 strand plain or barb wire fence	Collects less flood debris Cheaper than mesh fences	Requires more posts and droppers Not as effective in stock control Limited ability to follow natural stream curve Susceptible to rust
Conventional fence using Ringlock® or Hingejoint®	Very effective in stock control (especially lambs) Strong Contain 'inbuilt' droppers reducing costs Quickly erected	Prone to collect flood debris Expensive High maintenance costs Limited ability to follow natural stream curve Susceptible to rust

Other fence types to consider include drop down and lay down fences and the innovative development of virtual fencing. Lay down fencing which is often marketed as 'flood-proof' can be collapsed manually by releasing pins that lock the end strainer assemblies into end posts. With good forecasting this ensures the fence is flat on the ground allowing flood waters and debris to pass over. Drop down fences fold down as the pressure from flood waters and debris builds up behind them and are suitable in areas prone to sudden flooding or where access is restricted[10]. Both drop and lay down fences can be easily re-erected after the floodwaters have passed.

Figures 46a & 46b

This collapsible fence which is a patented design by Ian Bell has been used in areas of high flood flow and survived several flood events. Ian Bell.

Virtual fencing is a relatively recent invention based on Global Positioning Satellite (GPS) technology. This innovative fencing idea is currently still in its design phase but, once available commercially, will see stock wearing collars or ear tags equipped with a GPS to monitor movement and position. Landholders will be able to establish boundaries within the system and if an animal strays too close to a virtual boundary line the collar will initially emit a hum, followed by a mild electric shock if the animal continues to stray closer. Stock will quickly 'learn' to avoid certain areas when triggered by the humming noise. This form of fencing could have great potential in reducing stock mustering time, improving property management and reducing fence maintenance costs.

Where should a fence go?

Adequate planning is essential before a new fence line is installed. Development of a property map which highlights waterways, wetlands, backswamps, areas which are prone to flooding and areas of problem bank erosion will lead to reduced fence maintenance time and improved property management. There has been considerable discussion about where streamside, floodplain and wetland fences should be placed[12] and opinion varies depending on what purpose the fence and riparian area will serve.

Environmentally conscious landholders are recognising that by sacrificing land alongside their waterways and protecting wetter areas on their property they can reduce future soil losses, improve water quality and minimise damage to fences from floods and erosion. The general rule of thumb is 'more is better than less'.

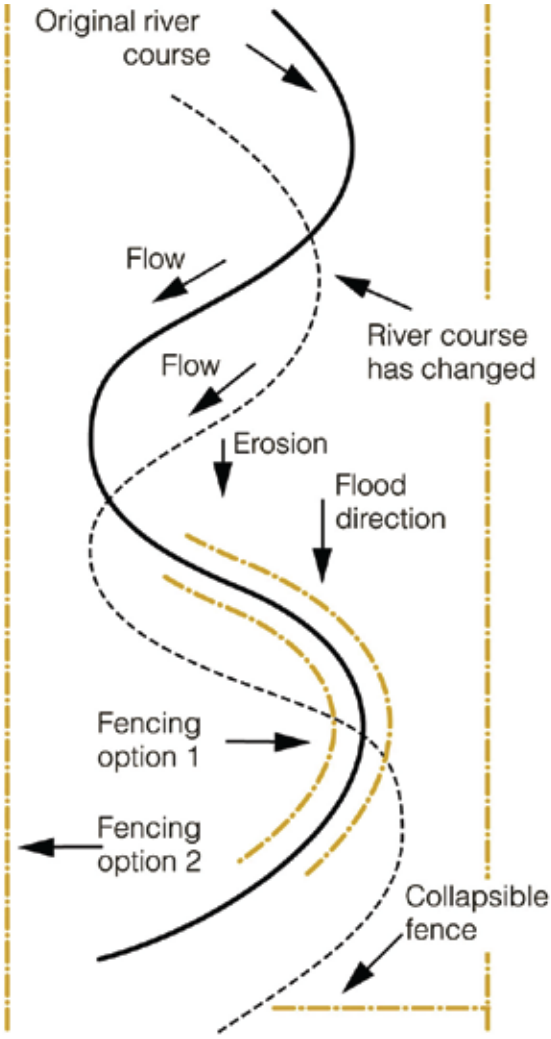


Figure 47
Positioning of a fenceline. Illustration in Price, P. & Lovett, S. (eds) 1993, Riparian land Management Technical Guidelines, Volume two: on-ground management tools and techniques, LWRRDC, Canberra.

Figure 48
When fencing across creeks, sacrificial 'blow out' sections are recommended.

A minimum distance of 10 metres from the top of the banks of small creeks and at least 30 metres from the banks of major rivers and creeks[10] is recommended particularly in areas prone to erosion. However, for improved environmental outcomes and providing habitat for wildlife, a minimum width of 30 to 50 metres is recommended. The further away the fence is placed the straighter it can be; this requires less material and takes less time to erect, thereby reducing the capital cost of the fence and increasing environmental benefits.

Regardless of the landholders' objectives for managing riparian land, be it for water quality, productivity or wildlife, they must still comply with the *Native Vegetation Act 2003*. As outlined in Section 2, protected riparian lands (within 20 metres of the bed or bank of a prescribed stream) are classed as vulnerable under the Act and clearing associated with routine agricultural management activities is limited because of its environmental sensitivity.

As a priority, the fence should be located out of the flood zone; using natural landscape features such as floodplains, levees and terraces to produce a wider riparian zone. Fencing above the flood level will reduce flood damage, and reduce the likelihood of stock loss. Used in conjunction with a cheaper fence installed closer to the waterway a 'river paddock' or 'river pasture' can be created which can then be used for rotational grazing or for high value periodic crops.

Fencing across waterways

Often fencing may be required across waterways or to restrict access to steep sided waterways such as gullies which are prone to erosion. Here, suspended fences or hanging fences are appropriate which consist of steel cable, high tensile wire or chain suspended across the waterway between two secured posts. A curtain of material such as chains, timber or corrugated iron is attached to the cable which can rise and flex with the flow[10]. If chains are used, they can also be electrified for increased effectiveness. Mesh is not recommended here as it will collect large amounts of flood debris and increase maintenance costs. In addition, wind must be taken into account when considering corrugated iron or timber curtains. It is important to ensure this section of fence is isolated from the rest of the fence, ensuring that in a major flood this section can 'blow out' or 'break away' without damaging the main fence[12].

Watering points

Limiting or managing stock access to riparian areas removes a valuable source of stock water and may subsequently require the provision of alternative watering points (and shelter). Adequate stock water is particularly important during drier summer and autumn months, when livestock have the most impact on the floodplain[2].

There are two main types of stock watering systems to consider: those that allow stock access to the waterway but only at strategically located restricted watering points, and those that necessitate water to be pumped or gravity fed from a water source such as the waterway, or a bore into a series of tanks, troughs or another artificial water source such as a dam.

Constructed drinking points

There is anecdotal evidence that cattle do less damage to watercourses when given limited access rather than full access. Cattle do not like to be crowded at drinking points so when access is restricted they seem to prefer to drink and then return immediately to the paddock[12]. Restricted access points need to be located at sites of low erosion potential such as the inside of bends where water flow is slower and angled away from the direction of the flow to reduce erosion. Access points should be relatively flat and stabilised with rocks or heavy gravel. Fences will be required to ensure stock do not wander into other areas of the riparian zone or out into the waterway. However it is important to note, poor water quality may still be a problem at these sites, with effluent produced in and around access points ending up in the waterway[10].

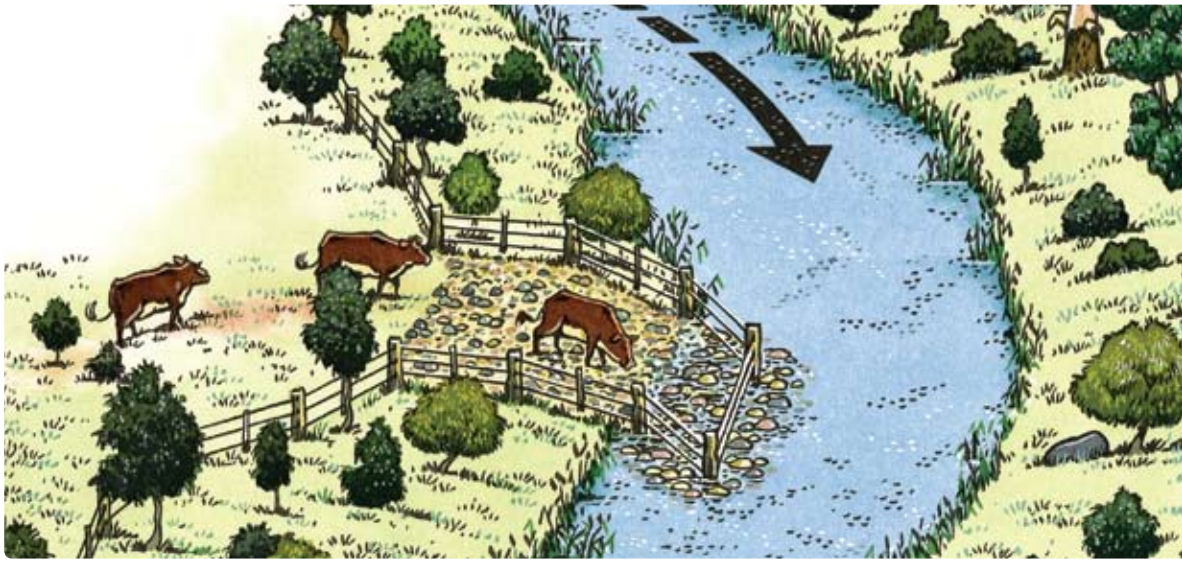


Figure 49a top
Restricted water access point. Illustration Paul Lennon, in Staton, J. & O'Sullivan, J. 2006, stock and waterways: a manager's guides, Land & water Australia, Canberra.

Figure 49b bottom
Restricted drinking points can also be useful in wetlands and farm dams.

Off-stream watering points

Installing a watering system can be initially expensive and time consuming, and requires ongoing maintenance and operating costs[10]. However, there are many benefits to property management from having an off-stream stock watering system. These include:

- improved water quality. Studies have shown clean water can improve stock health and productivity with increased growth rates and better wool, milk or meat production. For example, weight gain of up to 23% can be achieved by yearlings through the provision of clean trough water[13],
- flexibility to provide stock with supplements and medicine,
- better overall utilisation of feed on offer through improved grazing and pasture management,
- reduction of stock losses from bogging and drowning in the waterway,
- improved mustering times,
- improved general riparian health and rejuvenation of riparian plants and groundcover, aiding in the enhancement of overall catchment health[14].

Watering system choice and paddock layout needs to be carefully considered, and paddock subdivision may be required. Air, stock-operated, solar, wind, fuel or mains power driven pumps as well as gravity fed systems can be used to fill dams, tanks and reticulated troughs. It is essential to ensure watering sites such as troughs are located to minimise erosion resulting from stock tracks[12] and are well away from riparian areas.

In some situations, it may simply not be practical for a landholder to install riparian fencing. Although not the most favourable option, environmental gains can still be achieved with low stocking rates and the provision of clean off-stream water and shade away from the waterway[15]. Canadian studies have shown that even without fencing, when given a choice between clean water from a trough and surface water supply, cattle overwhelmingly (80% of the time) selected trough water[13]. The degree to which livestock can be attracted away from the riparian area will depend on season, topography, vegetation, weather and behavioural differences[16].

Figure 51
left
If not already installed, the infrastructure required to maintain trough water will also need to be considered, options include wind, solar or diesel driven pumps. NSW DPI.

Figure 50
far left
If alternative water points are placed strategically they can provide a water source for more than one paddock, ensuring clean water for livestock and enhanced productivity.

Farm dams

In many cases farm dams are ideal for stock watering away from the wetland, river or stream channel, and they have many benefits to farmers. Small farm dams have the added advantage of being cheap to construct and require little long-term maintenance[17].

In NSW, restrictions apply to the size and location of new farm dams which may be constructed. This policy is aimed at minimising the negative impacts that farm dams can potentially have on stream flow. Landholders are permitted to construct additional dams up to their Maximum Harvestable Right Dam Capacity (MHRDC) without a licence provided that:

- Total capacity of all dams on the property does not exceed the MHRDC calculated. For example, if the MHRDC is 0.07 ML/ha, and the property size is 100ha, then the total capacity of all dams on the property must not exceed 7 ML. If the property already has 5 ML of dam storage capacity, then additional dam construction is limited to 2 ML.
- MHRDC dams are only constructed on 1st or 2nd order streams which are minor watercourses. Dams to be constructed on 3rd or higher order streams require a licence from the NSW Department of Water and Energy.

In addition, farm dams constructed before 1999 (provided they are only used for stock and domestic purposes) and farm dams up to 1 ML on small properties do not require a licence[18]. Dams constructed primarily for the purpose of erosion control which are generally less than 1 ML are exempt from the MHRDC calculation.

The dam should be large enough to adequately meet the water requirements of livestock drinking from troughs, plus any other water needs around the farm which are sourced from the dam such as a reticulated water and domestic use[17]. If the dam is large enough the landholder can consider including an island in the middle to attract and provide habitat for bird species and other fauna.

Buffer strips as discussed in detail in Section 3, can also be applied with similar success for water quality around farm dams. There are few differences in the approach taken to establish dam buffers. However, the following considerations are also important:

- It is a good idea if the buffer zone around the dam is the same shape as the dam.
- Unlike other buffer zones, stock will need access to water to drink; this can be provided at designated points.
- Ensure the buffer zone is as wide as is possible, the wider it is the more effective it will be.
- Ensure any debris in the buffer zone remains in place; this is vital for habitat for flora and fauna.

Off-stream shade and shelter

The shade provided by the riparian corridor can make it a magnet for livestock during the warmer months. Often, the shade of the riparian vegetation is the only source of relief from the summer sun. High-intensity use of the corridor by herds or flocks quickly deteriorates the corridor's health. Therefore, providing off-stream shade and shelter is as critical as providing off-stream watering. Principles to consider include:

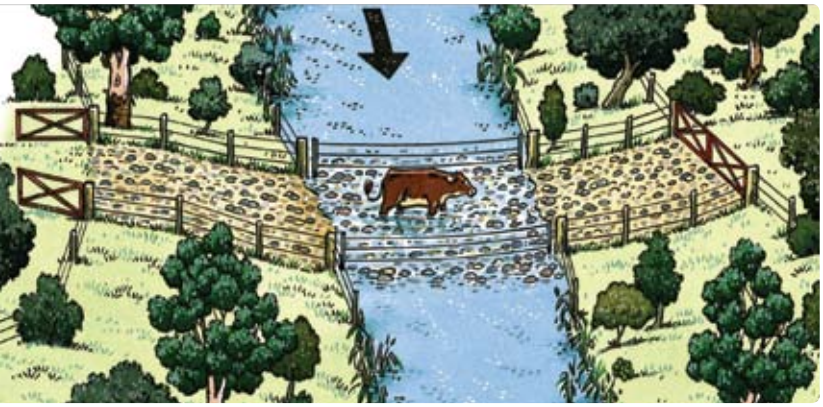
- Shelterbelts should not be placed more than 400 m from a water point, and no more than 800 m from each other.
- The ideal shade tree is a tall endemic with a dense canopy, tough bark and deep root system to withstand livestock damage.
- Shelter areas should be placed according to the prevailing winds.
- A heavy shrub layer in the shade area will prevent the cooling effect of breezes, a light shrub covering is more effective.
- Plants need to be protected in their first couple of years of growth[17].

Waterway crossings

It if often essential for landholders with pastures on each side of a waterway to move their stock across the waterway. However, as mentioned above, stock moving through the waterway can have a number of detrimental impacts on the health of the waterway, on the organisms that inhabit it and on the quality of water for stock, the property owner and downstream water users. The construction of a structurally sound, fish-friendly crossing is essential for property management and environmental gains. Stock crossings can benefit farm business by:

- making travel time faster for property owners and stock,
- improving stock health by reducing stress and lameness,
- providing easier access when waterways are running high, and
- providing better access to areas of the property[15].

Careful selection of crossing location is essential, areas prone to erosion and meander bends should be avoided. Crossing types which keep stock and animal waste out of waterways are optimal and include box culverts or bridge structures. Further information on suitable crossings is provided in Section 7.



All works conducted in a waterway in NSW require a permit under *the Fisheries Management Act 1994*, and all new waterway crossings must provide for the free passage of fish.

Figure 52
An example of how a stock crossing can be constructed to minimise damage to the waterway. Illustration Paul Lennon, in Staton, J & O'Sullivan, J (2006), *Stock and waterways: A manager's guide*, Land & Water Australia, Canberra.

An alternative, potentially more economically viable crossing option for a landholder may be a stable rock-gravel bed level crossing. A crossing of this type can be constructed so as not to adversely affect the flood conveyance or stability of the channel whilst still allowing for fish passage[19]. These crossings take advantage of natural high points in the channels bed profile and are constructed from rock or gravel to harden the channel bed formed on a layer of filter cloth to prevent undermining. To ensure fish passage is provided the upstream slope of the crossing should be a maximum of 4:1 (hortizontal:vertical) and the rock scour apron of the crossing should have a downstream slope of 20:1, with the lowest section of the crossing being in the centre of the channel[19]. Although a crossing of this type minimises damage to a waterway, it still allows stock to enter the water and will contribute adverse levels of nutrients to the waterway.

Managed grazing

Complete exclusion of livestock is generally the preferred course of action for riparian areas and for wetlands in poor condition[10]. However, landholders might be concerned that the installation of riparian fencing means the potential loss of productive land, land which they will more than likely still have to pay rates on, and the possibility that, without adequate control measures, the newly protected area could become a haven for invasive weeds. In some circumstances complete stock removal from these productive areas may not be a viable option, and to a certain degree allowing carefully managed stock access may provide additional benefits.

Actively managed grazing limits the length of grazing time and only allows grazing in non-critical periods. It can potentially enhance farm productivity and protect the environment simultaneously. It has been argued that livestock grazing can be a useful management tool to achieve conservation objectives where it:

- controls the biomass of existing potentially dominant, grazing-sensitive plants,
- provides disturbance niches required by rare or significant plant species,
- maintains fauna habitat structure, and
- enhances the diversity of species and vegetation structures across the landscape (burning or other disturbance regimes may achieve similar outcomes) [20].

Grazing management can have a significant role in:

- optimising pasture growth rate, which positively influences carrying capacity and efficient water use,
- ensuring efficient feed use and profitability to meet livestock production and market targets,
- ensuring feed quality is satisfactory for stock,
- ensuring persistence of desirable plant species,
- maintaining adequate ground cover to reduce runoff, prevent erosion and improve water quality,
- maintaining stable pastures, and
- potentially controlling insect infestations[21].

Integrating grazing with riparian vegetation management needs to ensure that riparian function is maintained, the stability of the streambanks and streambeds are not compromised, and riparian vegetation is rested long enough for seed to set and seedlings for palatable species (to livestock) to establish.

Access into the waterway itself should be restricted and grazing avoided:

- at highly erosive sites,
- in areas that have never been exposed to livestock grazing,
- in wetlands and riparian pastures straight after a flood, after fire,
- when plants are flowering, seeding and establishing,
- during fish, aquatic organism or bird breeding events, and
- when the area is drying (to prevent pugging of the soil)[22].

In addition, grazing pressure should be carefully monitored and stock removed if signs of actual or potential damage are observed[10].

A successful grazing regime should not only consider the nutritional requirements for livestock, but should also recognise the vulnerability of riparian land to erosion and pugging, the life cycle of indigenous plants, and their tolerance to disturbance. Consequently, the objectives for buffers around dams, wetlands and riparian corridors along streambanks may vary even within a single property. Most buffers or corridors are established for livestock health, improving water quality, aesthetic enhancement and habitat conservation. Over the long term, restricting grazing on riparian land will enhance all of these values[17].

Rotational grazing

Rotational grazing normally requires subdividing pastures into smaller units and involves a planned sequence of grazing and rest periods. The rest period or rotation length is generally influenced by pasture growth rate[21]. In comparison to continuous grazing, or 'set stocking', rotational grazing allows sufficient time for vegetation to recover and regain vigour allowing pastures to build up. In turn, rotational grazing improves animal distribution by forcing livestock to use the landscape more evenly making them less selective[13]. This strategy also prevents stock camps and tracks forming which can become potential erosion sites. Rotational grazing can, in some circumstances, be a viable and similarly effective alternative to grass buffer strips in protecting stream ecosystems from the adverse affects of continuous grazing[23].

Tactical grazing

Tactical grazing recognises that grazing management needs to be flexible but made within a framework which considers farm and enterprise objectives. Tactical grazing incorporates four components:

- setting objectives for the property which could involve the environment, riparian protection and ground cover,
- determining strategies i.e. identifying the broad principles which need to be applied in order to achieve the objectives,
- implementing targets which are the general management decisions required to achieve the desired outcome, and
- monitoring results in order to provide an assessment of progress ensuring objectives are achieved[21].

Key things to remember:

- Riparian land is often the most fertile and productive part of the landscape.
- Uncontrolled grazing by livestock has a number of harmful impacts on the structural stability of the riparian zone and health of the aquatic environment.
- Complete restriction of livestock is not always the only answer.
- Carefully managed, sustainable livestock grazing can improve water quality, enhance aquatic ecosystem health and boost property productivity.

Case study: Controlling stock in riparian lands

'Nanena' John, Lyn, Steven and Danny Owens

The site

'Nanena' is one of three properties run by John Owens and his sons Steven and Danny which total 2,460 hectares in size. Sited in undulating to rolling hill country approximately 20 kilometres south of Bathurst, the property expands from the foreshores of Ben Chifley Dam (the water supply for Bathurst on Campbell's River). Across the three properties the Owens family run a successful merino sheep enterprise and a commercial Angus beef stud.

The area was extensively cleared in the past and is now only scattered with paddock trees and a few remnant stands of trees on the hill tops. Native trees present on the property include: yellow box, apple box, Blakely's red gum and red stringybark.

Back in 1992 John and some of his neighbours whose properties all fronted Reedy Creek, a feeder creek for the dam formed a landcare group – the Chifley Dam Backwaters Landcare group. Together they applied for funding to initiate rehabilitation works on their properties, including major bank and bed stabilisation earthworks, tree planting and fence installation.

The project

Nanena's close proximity to Ben Chifley Dam makes the quality of water coming off the property a major priority. The property suffered from high levels of gully erosion along nearly 6 kilometres of gully and minor tributaries which flow straight into the dam. In addition, uncontrolled access of live stock into sensitive areas contributed to the sediment and nutrient loads flowing downstream and into the water supply.

With assistance from Bathurst Regional Council, the Owens applied for incentive funding from the CMA to complement previous rehabilitation works on Nanena and were successful in obtaining funding to improve water quality and control livestock.

To better manage livestock around sensitive erosion sites over 9.5 kilometres of riparian fencing was installed, excluding grazing from a total of 5.7 kilometres of gullies. Alternative stock water points were installed in adjacent paddocks. The alternative water system includes a solar pump to pump water from gully to header tanks and reticulation to four concrete troughs.

Once livestock were restricted, revegetation could begin on the riparian zones. Over 8,600 native trees and shrubs which were endemic to the area were planted creating a significant corridor down to the foreshores of the dam. The revegetation was conducted in winter and even without the hot summer days, the drought conditions proved to be problematic. However, the Owens managed to get a good survival rate by watering the plants by hand.

Over one year a total of 40 hectares of riparian corridor was managed for stock access, erosion and sediment control as well as positive outcomes for biodiversity on the land and in the aquatic environment.

Benefits of the project

As a result of this collaborative project between the landholder John Owens and Bathurst Regional Council the quality of water flowing off Nanena into Ben Chifley Dam has improved. By managing cattle access into sensitive areas gully erosion has been reduced. In the long term the newly planted riparian buffers will stabilise gully wall soils further reducing erosion, whilst also acting as a filter to slow down water as it flows off the land, trapping any sediments and nutrients before the water flows into the dam.

Quote from John Owens:

'We are very happy with the works... we have been fortunate to use government funds to achieve so much and improve water quality. During a storm the fenced gully has nearly clean water running out the bottom of it... You need to see it to believe it!'

Quote from Clayton Miller Catchment Officer Tablelands :

This project is a great example of a large scale collaborative Water Quality project done in conjunction with Bathurst Regional Council, the Owens family and the CMA. The biggest benefit of this project has been the reduction in sediment and nutrients (improved water quality) into Ben Chifley Dam. Revegetation survival rates have been excellent considering two years of drought; this is mainly attributed to the Owens' diligence in hand watering the tubestock during prolonged dry periods'.

Top left: Steve and Danny Owens with Clayton Miller (L to R) check the revegetation at Nanena.
Top right: Solar power is used at Nanena to pump water from a tank in the gully to a header tank which feeds the troughs.
Bottom Left: Troughs were installed to provide water for stock.
Bottom right: With stock access restricted the gully could be revegetated to provide stability and biodiversity benefits.

References

1. Lovett, S & Price, P (eds) (2007), *Principles for riparian lands management*, Land and Water Australia, Canberra
2. Jansen, A & Robertson, AI (2001), 'Relationships between livestock management and ecological condition of riparian habitats along an Australian floodplain river', *Journal of Applied Ecology*, 38, pp. 63–75.
3. Kauffman, JB & Krueger, WC (1984), 'Livestock impacts on riparian ecosystems and streamside management implications, a review', *Journal of Range Management*, 37(5), pp. 430–437.
4. Terrill, D (1998), *Riparian zone management, review of literature*, report for the Goulburn Broken CMA.
5. Herron, NF & Hairsine, PB (1998), 'A scheme for evaluating the effectiveness of riparian zones in reducing overland flow to streams', *Australian Journal of Soil Research*, 36, pp. 683–698.
6. Bell, I & Priestly, T (1997), 'The problem of grazing stocks on river banks', *Agriculture Tasmania*, 3(1).
7. Davies-Colley, RJ et al. (2004), 'Water quality impact of a dairy cow herd crossing a stream', *New Zealand Journal of Marine and Freshwater Research*, 38, pp. 569–576.
8. Martin, TG & Possingham, HP (2005), 'Predicting the impact of livestock grazing on birds using foraging height data', *Journal of Applied Ecology*, 42, pp. 400–408.
9. March, TS & Robson, BJ (2006), 'Association between burrow densities of two Australian freshwater crayfish (Engaeus sericatus and Geocharaz gracilis: parastacidae) and four riparian land uses', *Aquatic Conservation: Marine and Freshwater Ecosystems*, 16, pp. 181–191.
10. Staton, J & O'Sullivan, J (2006), *Stock and waterways: a manager's guide*, Land and Water Australia, Canberra.
11. Brouwer, D (1997), *Managing waterways on farms*, NSW Agriculture, Tocal.
12. Wright, D & Jacobson, T (2000), *Managing streamsides: stock control, fencing & watering option*, Tasmania Department of Primary Industries Water and Environment, Kings Meadows, Tasmania.
13. Fitch, L, Adams, B & O'Shaughnessy, K (2003), *Caring for the green zone: riparian areas and grazing management*, 3rd edn, Lethbridge, Alberta: Cows and Fish Program.
14. Price, P, Lovett, S & Lovett, J (2005), *Wool industry river management guide: sheep/wheat zones*, Land and Water Australia.
15. Environment Waikato (2004), *Clean streams: a guide to managing waterways on Waikato farms*, Environment Waikato Regional Council, Hamilton.
16. McInnis, ML & McIver, J (2001), 'Influence of off-stream supplements on streambanks of riparian pastures', *Journal of Range Management*, 54(6), pp. 648–652.
17. Schneider, G (2007), *Where land meets water resource kit: a guide to riparian management in the Hunter valley*, Hunter-Central Rivers Catchment Management Authority, Tocal, NSW.
18. NSW Department of Water and Energy (2007), *Farm dams–where can they be built without a licence*.
19. Davy, A (2000), *Water notes 'Livestock management: construction of livestock crossings'*, Water and Rivers Commission, Perth.
20. Lunt, ID et al. (2007), 'A framework to predict the effects of livestock grazing and grazing exclusion on conservation values in natural ecosystems in Australia', *Australian Journal of Botany*, 55, pp. 401–415.
21. NSW Department of Primary Industries and Meat & Livestock Australia, 2006, *Prograze Manual*, 7th edn, NSW Department of Primary Industries, Dubbo and Orange.
22. McKeon, J, Richardson, K & Dunn, I (eds) (2002), *Managing wetlands on your property–inland NSW: resource folder*, prepared for the NSW State Wetland Advisory Committee, Department of Land and Water Conservation, Sydney.
23. Lyons, J et al. (2000), 'Influence of intensive rotational grazing on bank erosion, fish habitat quality, and fish communities in southwestern Wisconsin trout streams', *Journal of Soil and Water Conservation*, 55(3), pp. 271–276.