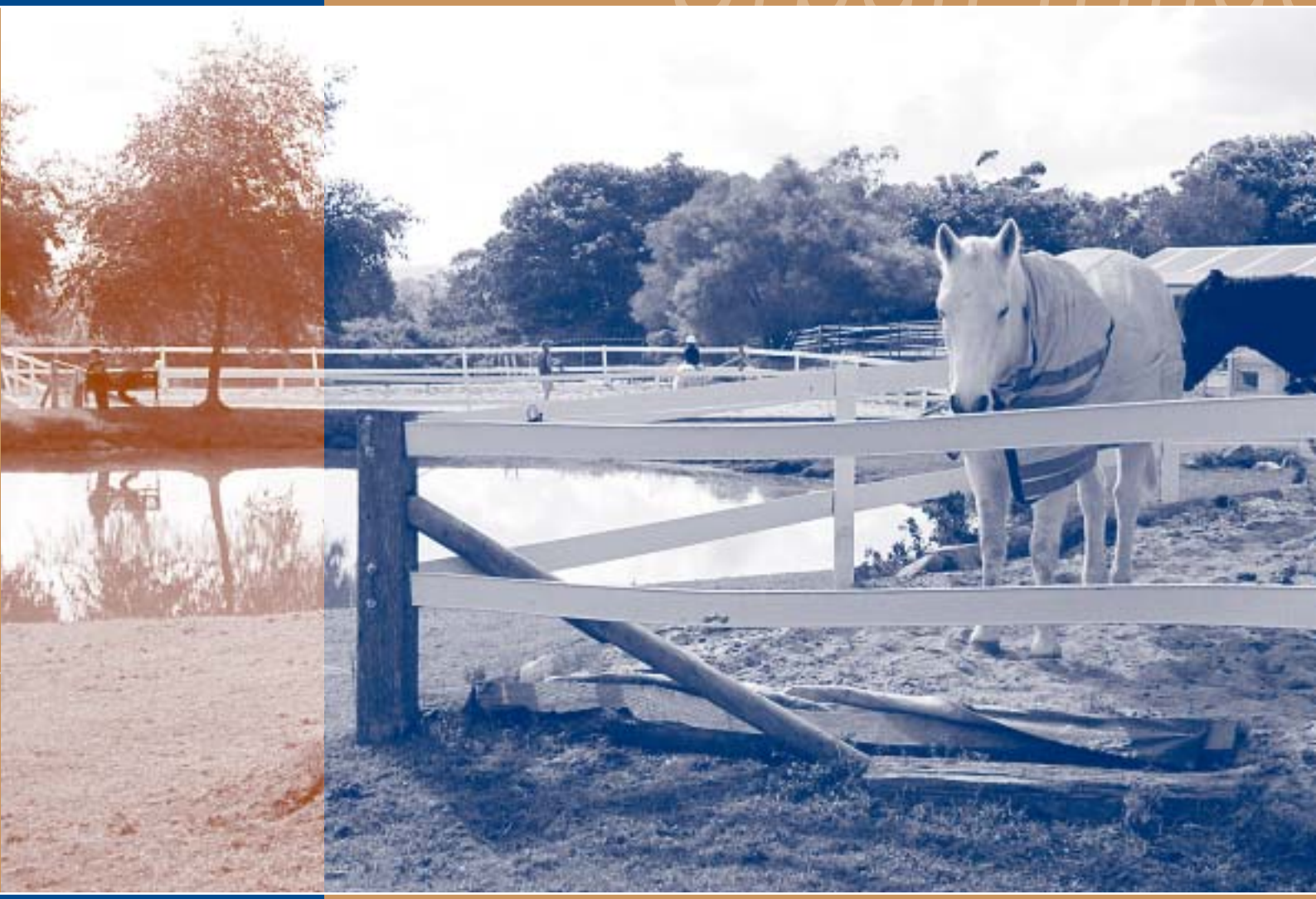
Environmental management on the Urban fringe



Horse properties on the rural urban fringe

Best practice environmental guide for keeping horses

our environment it's a living thing

Department of Environment and Conservation (NSW)

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Introduction

The following Guide provides practical advice on how to protect and improve the natural environment on and around your horse property and, at the same time, care for your horses. It provides insight into land and water management issues commonly encountered on properties where horses are kept and techniques for minimising the environmental impact of these properties.

Environmental impacts of horses

Properties where horses are kept can have a serious impact on the surrounding environment. This impact is mainly through water pollution. Water runs off paddocks and yards, carrying valuable soil and plant nutrients, as well as weed seeds and possibly chemicals to nearby waterways and other sensitive areas.

This can be remedied with proper land management.

Plants need nitrogen and phosphorous but excessive concentrations of these nutrients can lead to the growth of weeds on land and in streams. Nutrients can come from fertiliser, manure and areas of bare soil and may be either dissolved or bound to soil particles that are washed off during rain. Unless properly managed, a horse property can generate excess nutrients that in turn may encourage weeds that can choke nearby streams. Even if there is not a stream or water body on your property, contaminated runoff from manure and soil erosion can make its way into a local lake or creek or affect the ground water beneath your property.

Although your property may not contribute a large amount of pollution when it rains, it is important to remember that other properties will also drain to the same creeks or waterways as your property. This means that there may be a cumulative effect of the properties in your catchment contributing to water pollution. Over the course of a year, this can amount to large quantities of pollutants entering a creek and causing damage.

Increasing subdivision and development on the fringe of urban areas brings horse properties into close proximity to other land uses such as houses and schools. A horse paddock can contribute value to the scenic quality of such areas by providing an open green space. However, if it is poorly managed, it can also cause neighbourhood disputes due to dust and odours.

A well managed horse property is good for horses, has limited environmental impact and can be an asset for the local area.

The removal of native vegetation for housing and rural properties is endangering many of our native animals and plants. When properly managed, properties where horses are kept can contribute valuable habitat for our dwindling native plant and animal communities.

The good news is, that what's good for the environment also turns out to be good for you, your horses and your neighbourhood. Good land management protects horse health and water quality. A horse property that is organised and well managed can prevent disputes with neighbours, attract wildlife, and become an asset to the community.

Planning your property

Proper planning of the layout, management and use of your property can increase both its value and productivity. It will also make it easier for you to protect and enhance the local environment by avoiding potential problems. Your property may already have fences, dams, sheds and windbreaks in place. However, with a bit of thought and a few changes, most properties can be improved so that they are easier to manage and keep your land and horses healthy.

The Economic Value of Good Land Management

Improving your land management doesn't need to be costly; often a slight change in operations can make a big difference and lead to long-term savings.

For example, if you eliminate or reduce muddy areas on your property, you can eliminate the horse health problems associated with mud and the vet bills they incur. A more productive pasture can reduce feed bills. Composting manure can eliminate disposal costs.

Improvements such as strong fencing, well maintained dams and healthy pastures may increase the value of your property. However, bare eroding soil and weeds will decrease its value.

Take some time to look at your property and think about the following questions

How Many Horses?

The first decision to make when considering how best to look after your property is how many horses you keep and how they are housed and fed.

Many properties are managed so that the maximum amount of feed is obtained from pasture. This suits horses as pasture provides a cheap nutritious food source. If well maintained, a good pasture can also benefit the surrounding environment, because keeping a dense ground cover is the best way of limiting soil erosion.

In an area with fertile soil and a relatively high rainfall (above 700mm per year) it takes a minimum of about one hectare of pasture to feed a horse solely on grass. (Note that this assumes that the pasture and horses are actively managed to maximise food production from the pasture.) With more than one horse per hectare your horses will require supplementary feed and pastures and more intensive management to stop weeds and soil erosion. As the number of horses increases, so does the effort required to ensure that off site environmental impacts are minimised.

For example, if the number of horses kept is such that it is impractical to maintain a good ground cover, then runoff will need to be treated before it leaves the property. In some areas, stables where several horses are permanently kept need to be connected to an appropriate sewerage treatment system.

A busy property such as this will require careful management to maintain ground cover and control erosion.

What is the Current Condition of Your Property?

Have a look at your property and think about its general condition.

- Is there bare soil or signs of soil erosion? While bare soil is hard to avoid in small yards with horses, on other parts of the property it is generally a sign of a problem in the way the area is used and managed.

- Are dams or nearby creeks green or muddy or is the water clear? If dams on your property are green it may be due to algae. This suggests that there are excess nutrients washing off the land and into the dam, feeding the algae rather than your grass. If your dam is muddy, then your soil may be washing away as well.

- Is the pasture healthy? A healthy pasture will be fairly even in height (5-15cm) without any patches of bare earth or tall grass and will be largely free from weeds.

- Are weeds and grass spreading beyond the boundary of the property? Weeds and grass spreading from a pasture are frequently a sign that nutrients are being washed from the property.

  Additional nutrients introduced through soil enrichment (including animal manure) need to be fixed in the soil and taken up by pasture species in the same location.

- Are creek banks vegetated with native plants or are they bare and eroding? Erosion of the banks of streams and rivers is one of the major causes of siltation in Australia's waterways.

  Excess silt in rivers smothers aquatic plants and animal habitats. Native plants help stabilise the banks and provide food and shelter for native fish and animals.

Bare, eroding soil in paddocks is generally a sign of a problem in the way the area is used and managed.

A healthy pasture will be fairly even in height without any patches of bare earth or tall grass and will be largely free from weeds.

Weeds and grass spreading from a pasture are frequently a sign that nutrients are being washed from the property.

How is the Property Laid Out?

A well laid out property will be easier to look after and avoids damaging the surrounding environment.

With a water trough in the paddock, horses can be kept from trampling stream banks.

- If you need to store chemicals such as herbicides or fuels on the property, are they secure? What would happen if there were spills? Think about where liquids would flow if not stopped. Have some absorbant material available such as sawdust to soak up any spills. Ask your council about ways to manage these storage areas.

- Can your horses get to water without trampling on the edges of your dam and creek banks? Heavy horse hooves on wet soils compacts the ground, suffocating plant roots, preventing water from soaking into the ground and making the establishment of new plants difficult.

  Loose soil and manure can easily be carried into nearby streams or lakes. Muddy areas also create an unhealthy environment for horses.

Swales can be used to direct runoff to a dam or sediment trap.

- When it rains, where does the water flow? Locating potential pollutant sources such as stables, yards and manure bins on high ground makes it easier to treat runoff before it leaves the property. Treatment can be achieved by directing runoff to a dam or other sediment trap rather than straight into a natural channel or waterway.

- Is there a buffer between your paddocks and yards and any creeks on or adjacent to your property? The best way to protect a creek from erosion is to maintain a buffer area along the bank where horses and vehicles do not have access.

The area around gates where horses, vehicles and people enter and leave a paddock tends to become worn as the soil is compacted.

- Where do horses tend to congregate? Horses will gather near shelter, other horses, water troughs and food bins. The ground cover in these areas will tend to wear down, exposing bare soil. Heavy traffic areas such as pathways out of stables and between paddocks and arenas can also lose ground cover and form eroded channels that can rapidly become a problem.

The rest of this guide provides more detailed information on how you can manage your property to keep it and your horses healthy.

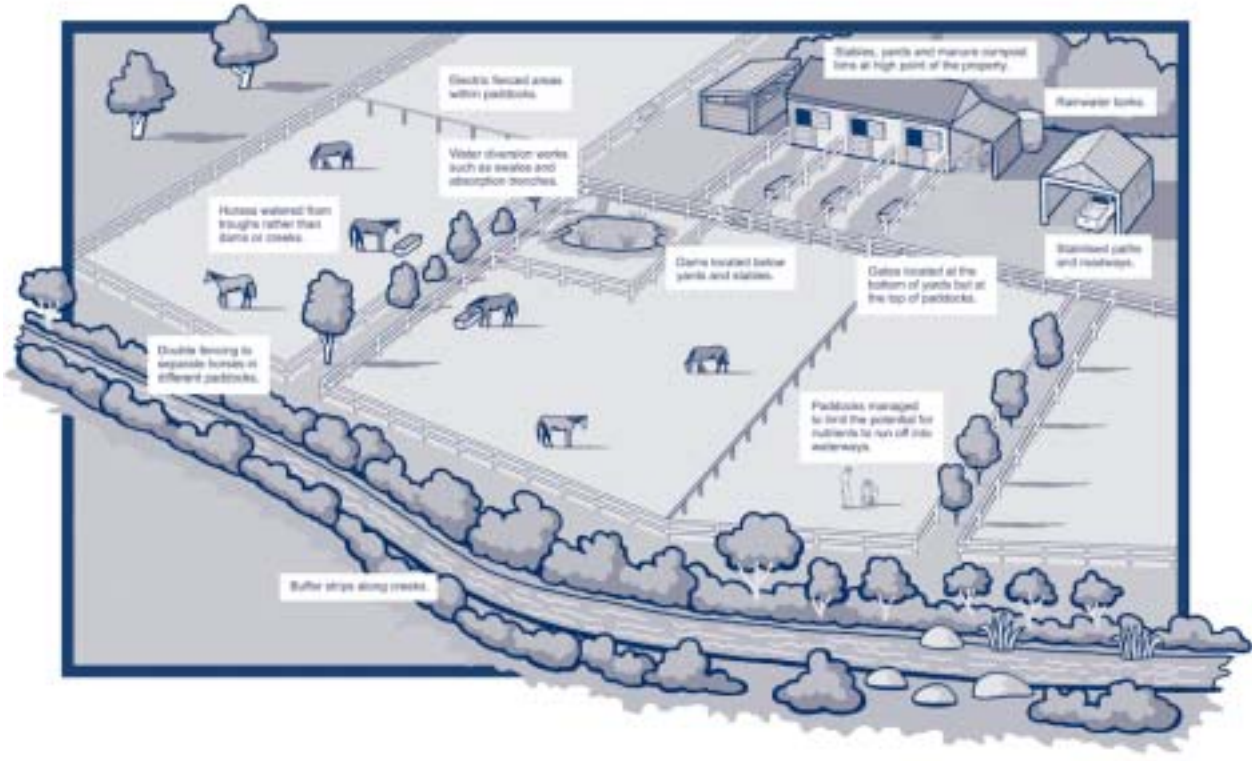
Property Management Plans

Writing a Property Plan is a good way to start organising your property. Having a plan will help you ensure that your property is easy to manage without causing environmental degradation in the surrounding area. Some local councils and State Government Agencies may require a property management plan when seeking approvals for development or water access or to demonstrate how existing environmental impacts will be reduced. When developing a plan, you will need to consider aspects such as:

- The physical features of your property such as soil type, vegetation, climate topography, drainage and any existing erosion (or potential for erosion)
- What the property is or will be used for
- Landscaping and water supplies
- Where you will put houses, sheds, yards, stables, windbreaks, dams, roads and fences
- Methods for preventing erosion and controlling water movement
- Ways of reducing the hazard of bushfires, conserving soil, preserving trees and disposing of effluent
- Legal and planning requirements.

Advice and assistance with property management planning can be obtained from a number of sources. A list of useful organisations and references is provided at the end of this guide.

Healthy Property at a glance



Place stables, yards and manure compost bins at high point of the property.
This provides the most opportunity for pollution to be contained before it reaches a waterway. Alternatively, divert runoff around stables, yards and compost bins to minimise the amount of pollution washed from these areas. Compost bins should also be covered.

Locate dams below yards and stables but away from drainage lines so that they can be used to trap sediment and nutrients before they reach other water bodies.

Water diversion works such as a swale or diversion bank can help ensure that any pollution will be trapped in a dam or sediment trap below the stables and yards or dispersed across a paddock before leaving the property. In some areas, absorption trenches may also be feasible.

Electric fenced areas within paddocks can be used to ensure that the horses are grazing where you want them. This allows rotational grazing to be employed and smaller areas of paddocks can be spelled as required.

Double Fencing can be used to separate horses in different paddocks. This discourages them from congregating and fighting over fences and provides opportunities to plant wind breaks. Where you have single fences a double fence can be constructed by adding electric fencing along one side. Where there are no existing fences it is also relatively easy to install double electric fences.

Water horses from troughs rather than dams or creeks. Horses can destabilise creek banks, leading to erosion. Constant trampling can also turn dams into muddy bogs and eventually cause them to leak.

Gates should be located at the lowest point of yards, and on the upslope side of paddocks. Access for vehicles and horses between paddocks can develop bare patches which become muddy when it rains. Placing gates at the highest point possible in a paddock means that these areas will drain more easily and the sediment they generate will be trapped on the paddock. Placing gates at a low point of a yard will ensure that the yard drains more easily and eliminates boggy corners.

Buffer strips along creeks. A buffer zone of healthy vegetation will increase creek bank stability and will help filter out nutrients washed from surrounding paddocks. Allowing horses or vehicles into the buffer zone is a sure way to encourage erosion.

Manage paddocks to limit the potential for nutrients to run off into waterways. If additional nutrients are required, use a well-composted organic mulch, chicken manure or minimum amount of fertiliser. Get some specialist advice on what will work best for your property.

Ensure that paths and roadways are stable and are aligned so that they do not become channels for water.

Rainwater tanks make a good additional water supply and help control runoff from roofs.

Paddocks

Many horses are kept in a paddock or a combination of paddocks and stables with connecting yards. In either case, if a pasture on a small property is going to provide a significant food source for horses it will need to be actively maintained to provide the maximum amount of feed while avoiding any off-site environmental impacts. The main potential environmental impacts of pasture are erosion and runoff rich in nutrients, sediment, weed seeds and, potentially herbicides and other chemicals.

Achieving a healthy paddock with minimal off-site impact generally requires the right combination of pasture preparation, grazing management, composting and fertiliser use and paddock layout.

The benefits of good pasture management

- Increase productivity of pastures
- Reduce feed costs
- Decrease risk of colic and respiratory problems
- Reduce poisonous weeds and the chances that horses will eat them
- Protect water quality by preventing erosion, and using the nutrients in manure

Pasture Preparation

Establishing a pasture with the right species and soil properties is a basic part of pasture management and will benefit from expert advice on what is best for your local area. This type of information is available through NSW Department of Primary Industries extension officers or private consultants. Some useful references are included in the Further Reading section at the end of this document.

Grazing Management

Controlled grazing is one of the best tools for maintaining maximum ground cover with the "pasture crop". Calculating the feed requirement for horses to determine the amount of hand feeding needed to supplement the available pasture is an important step to assist with economy of feeding. Where substantial supplementary feed is required, horses should be removed from paddocks for part of the day to reduce grazing pressure. On some highly stocked properties this may result in horses spending much of their time in yards or stables. However this may be necessary to sustain pasture cover and hence, the quality and quantity of feed for the horse at the minimum expense.

If pasture is eaten down to the ground and soil patches are showing there could be a number of causes and solutions:

1. The number of horses being kept is more than can be fed from the available area of pasture.

   If the number of horses cannot be reduced, they will require supplementary feed to spare the grass cover. A horse receiving supplementary feed will continue to graze and if managed this way will need to be removed from the paddock for a period of time each day.

2. Selective grazing, will leave long rank areas as well as bare patches.

   Grazing opportunities should be "rationed" to ensure that even grazing occurs and pasture height is maintained. This strategy will usually require feeding yards, and necessitate the use of electric fencing as an economical means of dividing the available paddock area into uniform grazing blocks. Such an approach can overcome selective grazing ("lawns and roughs") by minimising pasture availability at any one time. This strategy will also assist in managing parasites such as worms.

Uneven pasture provides less feed and can lead to soil erosion.

Another strategy commonly used is to remove manure from the paddock for composting and later redistribution on the paddock or use elsewhere. Horses will then be able to safely graze areas of longer grass. If manure removal is impractical or infrequent, spreading manure by harrowing should be practised where possible to help distribute plant nutrients and organic matter, and to avoid patchy pasture growth. Rotational grazing greatly assists the effectiveness of this practice by resting areas for a period after harrowing. This allows pasture to freshen and aids in worm control.

Electric fences provide a very flexible way of controlling where horses graze.

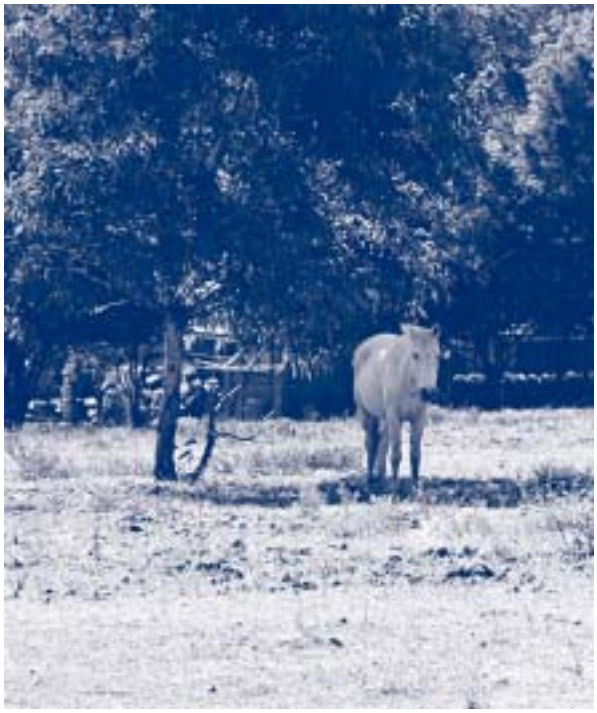
Rotational Grazing

You can approach pasture management as if you were a grass farmer using horses to keep an even healthy crop of grass. By dividing a pasture area into smaller areas and rotating horses through them, you can encourage your horses to graze more evenly. Once horses have grazed a pasture area down to around ten centimetres, move them on to the next pasture area. This keeps pasture grasses from becoming overgrazed and discourages selective grazing. It also gives worn patches of pasture a chance to regenerate.When using a rotational grazing system, you can separate grazing paddocks with permanent or temporary (usually electric) fencing.
It's generally easiest to establish as many permanent paddocks as you need to manage the property and then subdivide these with temporary electric wire or tape as required to restrict grazing. If you want to keep fencing costs down you can also move temporary fencing with the horses as you switch them from one grazing area to another.

Paddock Layout

Shelter

Horse paddocks should provide horses with sufficient protection against sun, wind, rain and extremes of temperature. Shade trees, roofing and windbreaks may be necessary. Horses will tend to congregate in these shady areas and create bare patches so plan to have them away from drainage lines. Rows of native plants between paddocks protected by double fencing make effective shelter.



Horse paddocks should provide horses with sufficient protection against sun.

Protecting Existing Vegetation

While isolated trees in a paddock can provide good shelter for horses, they may also need some protection as horses will tend to chew the bark and rub against trunks, damaging and possibly killing the tree. This is particularly the case for smaller trees. Smaller trees can be protected by encircling them in a chicken wire cage while simply wrapping wire around the trunk of larger trees will protect them. Just remember to loosen or remove the wire as the tree grows. Making a fence from rope or electric tape around the tree can also work. In addition, if there are areas of native plants you could regenerate, fencing off a larger area around mature tree/shrubby areas and protecting their seedlings will help regrowth and create additional habitat for native fauna.

Isolated trees in a paddock can provide good shelter for horses but they need some protection, as horses will tend to chew the bark and rub against trunks.

Frequently used areas

The area around gates where horses, vehicles and people enter and leave a paddock tends to become worn from use. Placing gates on the higher side of the paddock will ensure that sediment washed from around the gate will stay on the paddock.

Heavy traffic areas such as gates and pathways can become significant erosion problems if not planned properly.

By placing gates on a high side of a paddock, loose soil is trapped by the grass and kept within the paddock.

Nutrient Management

Australian soils are frequently deficient in nutrients such as phosphorous, nitrogen, sulphur, potassium and molybdenum and this may limit your ability to grow a healthy pasture. Grazing horses also remove nutrients and so, over time, even a productive paddock will become nutrient deficient without proper management. However, a pasture that is overloaded with nutrients is also likely to become a pollution source when nutrients are washed into nearby watercourses. Before treating your paddocks to increase nutrients, be sure about what you are trying to achieve and plan your pasture management accordingly. In particular, you should have your soil tested and seek advice from local, professional sources such as NSW Department of Primary Industries or commercial agricultural consultants. They can assist in determining requirements for optimum plant nutrition and ways to introduce/ implement new management practices for various land uses and general pasture management.

A pasture that is overloaded with nutrients is also likely to become a pollution source when it rains. In this case runoff flows into a small dam, keeping any nutrients on-site.

Options for maintaining the nutrient content of your soil include applying compost or a well-composted mulch. This also has the advantage of increasing the organic or carbon content of the soil which will aid in moisture retention. Horse manure is ideal for this purpose but it must be well composted to remove parasites and retain nutrients. Chicken manure is also commonly used.

Inorganic fertilisers such as super phosphate may also have a role in some situations where paddocks are deficient in specific minerals. Be aware that applying this type of fertiliser will not increase the content of organic matter in the soil and may leave you with acidic soils requiring remediation in the longer term. Such fertilisers can also be expensive.

Hand feeding horses that are spending time in the paddock will also help maintain the nutrient content as you are effectively importing nutrient, which the horses will obligingly distribute on the paddock.

Weeds

Weeds need to be controlled, as they compete with edible species and will eventually take over a paddock. Regularly survey your property for weeds, particularly those that are poisonous to horses. Weeds can spread rapidly and prevent the growth of grass species you desire. Good pasture management is the best weed control. Healthy grass will prevent weeds from pushing their way in and will also keep horses from being tempted to nibble on weeds when they do pop up. Mowing or slashing pastures with weed infestations before the weeds flower and seed can reduce their rate of spread over the area.

Whenever possible, and especially near streams and wetlands, remove weeds by hand rather than with chemicals. Chemical herbicides may be harmful to horses and can be very toxic to fish and other aquatic life. It is also easy for chemicals sprayed on weeds to wash off in the rain and travel to nearby streams or other sensitive areas. If you decide to use herbicides, be sure the product you're using is effective for the weed you are trying to control. Use the minimum amount possible and only spray areas with weeds and be aware of wind drift. Always read and follow directions carefully and apply strictly in accordance with the manufacturer's instructions.

Weeds can spread rapidly and prevent the growth of grass species you desire.

Environmental weeds are the non-indigenous (or not locally indigenous) plants that become established in bushland areas. Many good pasture species such as Kikuyu tend to require higher nutrient levels than are available in most natural Australian topsoils. This means that they will spread to become environmental weeds if growth is not controlled and nutrients are allowed to escape from the paddock. If unchecked, Kikuyu can grow to a degree where it can choke waterways and take over some disturbed environments (that is, changed from a natural state) to the exclusion of all other plants. If pasture species are spreading into surrounding areas, it can indicate that valuable nutrients are being washed off site. This needs to be addressed for both environmental and financial reasons.

For more information on environmental weeds in your area, contact your local council, NSW Department of Primary Industries office or Rural Lands Protection Board.

Things to do in Paddock Management

For your horse	For your environment
When pasture is available but supplementary feed is necessary, horses should be fed at least once a day. Consult horse experts on proper care and feeding.	Supplementary feeding can be used to reduce grazing pressure on pasture and so maintain a healthy ground cover.
Rotating the areas horses graze within paddocks will help control worms. Depending on your approach to manure management, paddocks or sections of paddocks may need to be spelled for around two months.	If areas of paddock are becoming over grazed, rest them and spread manure from the rank areas so that they do not become nutrient deficient.
As horses are social animals, keep your horse with or in sight of other horses.	Limit your stocking rate to the number that can be sustainably supported by the available pasture area.
Use fencing material that is clearly visible to horses such as post and rail fencing using timber or steel piping and steel or concrete posts. Add caps to cover star posts used in fences (and elsewhere) to protect your horses.	Use soil tests to determine the quantities of nutrients in your soil. This will help you avoid over use of fertilizer and potential water quality and soil degradation around and outside your property.
Keep paddocks free of noxious plants and rubbish that may injure horses.	Make sure that your property is not a source of weeds for surrounding areas.
Paddock trees can provide horses with shelter from the sun and wind.	Plant native trees and shrubs to provide habitat for wildlife such as birds and small animals and help stabilize soil.

Double fencing such as this stops horses congregating along the fence line which would cause serious erosion on a site like this. It also provides an opportunity to establish a row of trees and shrubs for shelter.

Stables and yards

A common arrangement on horse properties is to have a stable with adjoining yard in which the horses can exercise outside and socialise to some extent. Many agistment properties have a number of yards or small paddocks, each with a stable or shelter shed. Stables and yards allow you to confine horses for hand feeding when grazing paddocks need to be rested.

A significant proportion of the ground in a yard will be bare, introducing erosion and sediment control as a significant property management issue. Erosion from yards can be minimised by careful management and planning of the yard layout.

Ideally, yards should be about 100 square metres in area and have a well-drained surface that resists erosion, such as fine rubble, sand or wood chips.

The ground in small yards will often be bare, making erosion and sediment control a significant property management issue.

Locating Stables and Yards

Ask yourself these questions about your stables and yards. If building or renovating, consider these questions when choosing the location of your stables and yards:

- Will they be near the manure pile, bedding and feed storage, making your life easier?
- Can deliveries be made without having to drive through a pasture to get to your stables?
- Can you move horses to pasture areas or elsewhere with ease?
- Does your local council require stables and wash down areas to be connected to the sewer?
- Is the site close to a water body or drainage line so that pollution control will require significant earthworks?

Paths and roads should have a stable surface and be alighned so that they do not become channels for water.

Drainage and Water Management

Soil will build up along the fence lines surrounding a yard and will trap water at the lowest point, even in moderately sloped yards. This is not ideal for the horse and will break down any non-erodible surface that has been laid, encouraging mud and erosion in wet weather and dust when it is dry. One solution to this is to ensure that gates are placed at the lowest point on the boundary of the yard. The movement of horses and people through the gate will ensure that there is a minimum of soil built up along the boundary and water can drain out.

Nonetheless, runoff from stables and yards carries a high load of nutrients and sediment and needs to be properly managed to avoid pollution.

Described below are two basic courses of action that can be taken to manage runoff from these areas.

- Where there are paddocks or other large vegetated areas down slope from the yards, allow runoff to disperse over this area. This will only be effective if the area has a healthy ground cover to trap sediment, and the runoff can be distributed so that it does not travel as a stream, which increases its potential to cause erosion.

- Direct runoff into a constructed sediment trap such as a dam or swale. This approach can be implemented on a smaller area of land. However, the sediment trap needs to be large enough to cope with the expected volume of water and extensive earth works may be required to put this into practice. In some areas, absorption trenches may also be an option.

This yard has a low silt fence to limit erosion and the small dam will catch runoff before it leaves the property.

Trapping water from wash-down areas limits the amount of mud generated and allows the water to be re-used on gardens or paddocks.

Waste Management - Manure and Bedding

When horses are kept in a stable, bedding and manure need to be removed on a daily basis. A stabled horse may produce up to a barrow load of manure and soiled bedding each day. This may be stockpiled and composted, put onto the paddock that can be spelled or bagged and sold. However this material is disposed of, it is potentially a significant nutrient source, and must be stored in a way that prevents any rainwater from carrying it - or dissolved matter from it - off site.

Stockpiling and composting is a common solution and most effectively done using three bins. One will be composting while one is being filled and one emptied. Each bin needs to be able to hold a three-month supply of manure. The size of bins will depend on how many horses are kept and for what proportion of the day they are stabled.

A stabled horse may produce up to a barrow load of manure and soiled bedding each day and this material needs to be disposed of.

Nutrient rich liquid from this stockpile is directed to a drain (bottom of picture) and dispersed over paddocks.

Composting Essentials

Horse manure makes an ideal base material for a nutrient-rich compost that can be applied to paddocks. The microorganisms that make composting happen need food, in the form of carbon and nitrogen from the manure, oxygen, and water.

Nitrogen and carbon

Your pile will compost a lot faster if you've got the right carbon to nitrogen ratio. The more bedding you have mixed in with the manure, the more you offset this ratio and the longer the pile will take to compost. If you want to speed up the process, adding materials with a high nitrogen content can help balance out the difference. Some examples of materials that are good sources of nitrogen include grass clippings, chicken manure, urea, or nitrogen fertiliser.

Oxygen

The microorganisms in your pile need oxygen to breathe while breaking down the material. If your compost pile smells bad, it probably means you're not getting enough air into the pile or that the pile is too wet. Periodically turning the pile over will loosen it up and allow air to penetrate.

Water

Compost should stay about as damp as a wrung-out sponge, damp but not dripping. It's easier to add moisture than it is to remove it so don't let it get too wet. Cover your compost pile with a tarpaulin so that you can regulate the amount of water it contains.

Temperature

As the microorganisms break material down, heat is given off which can destroy worm eggs, pathogens, weed seeds, and fly larvae. At least several days of pile temperatures around 50° Celsius is recommended to destroy pathogens and weed seeds.

Things to do in Stable and Yard Management

For your horse	For your environment
Provide appropriate stable bedding that is clean and sufficiently thick. Urine affected bedding and manure must be removed at least once a day.	When manure and bedding are stockpiled or composted on site, ensure that it is kept away from drainage lines and covered to prevent rainwater from leaching nitrogen from the pile into the surrounding environment.
Divert water away from yards using structures such as swales (grass-lined channels) or diversion banks. A horse standing on wet ground will develop a range of health problems.	Install rain gutters and roof runoff collection systems (e.g. rainwater tanks) on all stables, sheds and outbuildings and divert the clean rainwater away from high traffic areas.
Provide floors (of yards, sheds and stables) with surfaces that permit adequate drainage such as gravel, woodchips or sawdust.	Make sure that any chemicals or fuel are properly stored and that any spills can be easily contained.
	Ensure that runoff from yards, compost stock-piles and wash down areas is treated before it leaves the property.

Environmental regulation

Section 120 of the *Protection of the Environment Operations Act 1997* deals with water pollution.

It is an offence to pollute waters for any reason, pollution includes things such as: litter, wash water, soil, debris, detergent, paint or building materials. Local Councils have the authority to issue fines for water pollution offences, to commence prosecutions and to issue notices requiring remedial or preventative action (clean up and prevention notices). However, local council officers generally approach this responsibility by negotiating appropriate remedial actions to be taken and will be willing to assist you in solving problems that you see on your property.

Local Councils are also responsible for managing the orderly development of their local areas. In order to achieve this, they use Local Environment Plans and other instruments that identify the land uses that are acceptable for each location.

Development Control Plans include requirements such as the distance from property boundaries to structures such as stables, changes to drainage on a property to protect water quality, flow and building design and landscaping requirements. Councils will also have policies on tree preservation, on-site sewage disposal and bushland protection.

Further reading

The following documents provide more detailed information on several of the topics covered in this guide. They can be obtained from CB Alexander Agricultural College, 'Tocal'. Patterson NSW 2421 Australia. Phone 1800 025520 Internet: www.tocal.nsw.edu.au/reader/tocal-publications

Brouwer, D. (1997) Managing Waterways on Farms. NSW Agriculture, Patterson.

Brouwer, D. (2003) Put Yourself in the Picture - Caring for your small rural property. NSW Agriculture, Patterson.

Brouwer, D., Clowes, A. & Thompson, B. (1999) Physical Property Planning. NSW Agriculture, Patterson

George, D.& Brouwer, D. (1996) Nature Conservation on Farms. NSW Agriculture, Patterson.

NSW Agriculture (2000)
Fact Sheet 16: Guidelines for minimum standards for keeping horses in urban areas
www.agric.nsw.gov.au/reader/17101

Stubbs, A. (1998) *Healthy Land, Healthy Horses A Guidebook for Small Properties*
Rural Industries Research and Development Corporation (RIRDC) Barton ACT Publication Number 98/137.
www.rirdc.gov.au/reports/Index2.htm#Horses

Guidelines for Erosion & Sediment Control on Building Sites (2001)
Department of Land and Water Conservation. This booklet provides guide to best on-site practice for erosion and sediment control. It is primarily aimed at building sites but many of the erosion control concepts are just as relevant to horse properties.

Landcom (2004) *Managing Urban Stormwater: Soils and Construction*
Vol 1 4th edition. A comprehensive guide to erosion and sediment control from building construction sites, which may provide useful information.

A range of research reports of interest to horse owners can be found on the internet at:
www.rirdc.gov.au/reports/Index2.htm#Horses
www.usyd.edu.au/su/rirdc/articles/research/research.htm

Other sources of information

NSW Department of Primary Industries

NSW Department of Primary Industries can provide technical documents and advice on a wide range of aspects of horse property management such as stock management, disease control, noxious weeds and property planning. Local regional extension officers can also be a good source of contact and information.

A selection of relevant documents from NSW Department of Primary Industries can be found on the internet at:
http://www.agric.nsw.gov.au/reader/1005

NSW Department of Primary Industries
161 Kite Street,
Orange NSW 2800
Telephone 02 6391 3100
www.agric.nsw.gov.au

Local Councils

Local councils have responsibility for many aspects of environmental management including environmental planning and development policies and guidelines, on-site sewage systems, water pollution and noxious weeds. Your local council should be contacted before undertaking work on your property.

Council staff can also provide advice and assistance on best management practices, bushcare and bushland protection and sources of local expertise.

Department of Infrastructure, Planning and Natural Resources (DIPNR)

DIPNR can provide advice and a range of publications on; soil assessment, conservation and sediment control strategies, water use and quality, buffer zones for waterways, designing, building and managing farm dams. Many of these publications are available on their Internet site. They are also responsible for regulating water extraction, dams and land clearing.

Head office
23-33 Bridge St
Sydney NSW 2000
GPO Box 39, Sydney NSW 2001
Telephone 02 9228 6111
http://www.dipnr.nsw.gov.au

DIPNR also maintain a network of regional offices across the state.

Landcare

Landcare refers to a network of people in Australia who are committed to the more sustainable management and use of our natural resources. It is led by the community, frequently people working together as landcare groups, in partnership with government, community organisations, business and others. In most areas, this network represents a significant resource of local knowledge and support for sustainable land management. The Department of Infrastructure Planning and Natural Resources host and support regional Landcare in New South Wales.

State Land Facilitator
Telephone: (02) 9228 6552
http://www.landcarensw.org
http://www.landcareaustralia.com.au

Department of Environment and Conservation (NSW), (DEC)

The Environment Protection and Regulation Division of DEC is responsible for regulating pollution and addressing environmental issues including use of chemicals, stormwater management and waste management. Their bookshop and internet site can provide a range of technical documents on these topics. They also maintain a network of regional offices that can be contacted for advice.

Head Office
59-61 Goulburn Street, Sydney
PO Box A290, Sydney South 1232
Telephone: 131 555
http://www.environment.nsw.gov.au/

Commercial Farm and Agricultural Advisory Services

Commercial agricultural advisory services are established in most rural areas and can provide assistance and advice with property planning, establishing and managing pasture and soil and water testing.

Glossary

Absorption Trench or Infiltration Trench
A shallow trench designed to intercept and reduce surface runoff by holding it long enough to allow it to enter the underlying soil. They usually include layers of coarse gravel, sand or other filtering media to filter the runoff before it infiltrates the soil.

Algal bloom
Sudden growth of algae in aquatic ecosystems. Algal blooms may occur due to nutrient enrichment of waters from polluting activities.

Buffer Strip or Zone
Strip of erosion resistant vegetation located between a waterway and an area of more intensive land use. The key to a successfully functioning buffer strip for pollution removal is the use of dense vegetation and allowing only overland sheet flow to cross the strip, avoiding concentrated flows.

Catchment
The area of land from which rainfall flows to a waterbody.

Diversion Bank
A channel with a supporting ridge on the lower side constructed across or at the bottom of a slope for the purpose of intercepting and redirecting surface runoff.

Drainage line
A natural or artificial channel or depression in the ground along which water tends to flow.

Erosion
When land is diminished or worn away due to wind or water. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally, but can be greatly accelerated where land is cleared for activities such as farming, building construction, road building, and timber harvesting.

Harrowing
Mechanically breaking up and scattering manure on a paddock. Often done by dragging a chain or sheet of weld mesh over the ground with a tractor or vehicle. This assists in decomposing the manure, spreading nutrient from manure and when combined with good stock rotation practices, can help reduce parasite infestations.

Infiltration
the percolation of water into the ground.

Nutrients
Nourishing substances, e.g. phosphorus and nitrogen, that enhance plant growth (including algal growth in water).

Retention Basin
A structure used to halt the downstream progress of stormwater runoff by containing it either for reuse or infiltration into the ground via percolation over a period of time.

Rotational grazing
A process of planned grazing that encourages pasture growth, benefits animals and prevents overgrazing. A rotational grazed pasture provides better ground cover to prevent erosion. Involves a number of paddocks that undergo a short grazing period (days to weeks) followed by a longer rest period (weeks to months). Layout of paddocks will vary from property to property depending on topography, available water, the number of horses and the owner's management concerns.

Runoff
Drainage or flood discharge that leaves an area as surface flow or through a pipeline.

Sediment
Soil, sand, and materials washed from land into water, usually after rain. Sediment can destroy fish breeding areas, smother animal habitats, and cloud water so that sunlight does not reach aquatic plants.

Sediment Trap
A device for removing sediment from water flows, usually installed at points of outflow.

Sedimentation
The process of depositing soil, clay, sand, or other sediments that were moved by the flow of water.

Stormwater
Rainwater and meltwater (in snowy/icy areas) running off a surface.

Swale
A wide shallow channel or low bank, often lined with grass (grassy swale) used to direct stormwater flow and, at the same time promote pollutant removal by filtration through the use of properly selected vegetation and settling.

Silt Fence
A fence built across the direction of water flow, usually made of a textile with relatively small mesh or pore size that will allow water to pass through while trapping sediment.

Windbreak
Row or clumps of trees and shrubs planted at right angles to the prevailing wind direction to protect stock and property, improve soil moisture retention, reduce evaporation and wind erosion and protect pastures.

Notes

Environmental management on the Urban fringe

Urban fringe

stormwater TRUST
A NSW Government initiative