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**LAND
MANAGEMENT
GUIDE**



This guide was compiled by the
Economic and Environmental
Planning Unit.

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Owning a small property is the dream of many Australians. The peace and quiet, fresh air and beautiful scenery attract people to areas like Manningham where they can enjoy the balance between city and country living.

Some people want to run a few horses for the kids, others plan to grow vegetables or just sit back and enjoy the bush.

Owning a small property can bring a great deal of pleasure, but it also brings responsibility. Landholders must ensure their land management practices do not cause land and water degradation on neighbouring

properties, or elsewhere in the catchment. There are also legal requirements for the control of weeds and rabbits.

Close attention to pastures is vital. The overgrazing of horses can lead to severely eroded and weed-infested paddocks in just a few months. It is much easier, and less costly, to prevent land degradation than to repair it.

This guide aims to help you improve the management of your small property. It will not provide all of the answers and we encourage you to seek out more detailed information and advice.

There is no simple formula for successful land management, but learning the basics will have benefits for you, and for the whole Manningham community.



A pony can bring a great deal of pleasure but not all properties are suitable for grazing.

Soil is the basic building block of life. Without soil there would be no vegetation, no animals and consequently no people. If you own a small property your soil is your most valuable asset.

Soil is living matter. It is made up of mineral particles, organic material, water, air and living organisms.

The weathering of rocks and the breakdown of organic material forms soil. It is a very slow process – a centimetre of topsoil can take several hundred years to form. Soil is a dynamic medium. Physical, chemical and biological processes are constantly underway within the soil.

Soils are generally classified according to their depth and structure. The surface soil, rich in organic material and critical for plant growth, is called topsoil. Topsoil is typically between 5-30 centimetres deep.

Soil structure refers to the arrangement of the soil particles and the stability and resilience of the soil. Soil structure is very important for land management. A well-structured soil will easily take in water; excess water will drain away and be replaced with air. Plants need both air and water near their roots to grow well. When surface soils lose their structure they have lower water infiltration rates and are more easily eroded.

Australian soils are some of the oldest and shallowest in the world. They have generally low organic matter and poor surface structure. Most Australian soils contain very little nitrogen and phosphorous.

Soil organisms

Soil organisms help to keep the soil healthy and fertile. These organisms range from tiny bacteria, protozoa and fungi to larger soil animals like beetles, mites, crickets, centipedes, earthworms, spiders, earwigs, springtails and termites.

Each soil organism plays an important role in cycling carbon, nitrogen, sulfur and phosphorous through the soil and in maintaining good soil structure.

One hectare of good quality soil could contain around 1000 kilograms of earthworms, 100 kilograms of other soil animals and millions of fungi, bacteria and protozoa.

Healthy soil is full of earthworms and other soil organisms.



Soil erosion

Erosion is a natural environmental process but activities like farming (especially the grazing of hard-hoofed animals), road building and housing development has accelerated erosion to potentially disastrous levels.

Soil erosion occurs wherever the soil surface is exposed to water, wind or gravity.

When vegetation is lost the soil surface is exposed to the force of the wind and wind erosion increases. The dramatic dust storms of 1983 saw priceless topsoil from the Western districts dropped on Melbourne. An average of nine kilograms of topsoil was dropped on each suburban block.

When there is less vegetation to intercept falling raindrops and surface runoff, water erosion increases. A single drop of rain hitting a bare, wet, soil surface acts like a bomb blast. The force of the impact breaks the soil into particles that splash into the air. If the splashed particles are on a sloping surface they will be transported down the slope – often for considerable distances. This surface runoff fills drains, streams and rivers with sediment. Sediment degrades water quality and may carry polluting chemicals.

Soil erosion causes damage in three places: it damages the land where the soil is removed; it degrades the water that transports the soil; and it damages the site where it is deposited.

Types of erosion

Tunnel erosion is the washing away of subsurface soil while the surface soil is mainly intact. Tunnels start when water moves in soil cracks, root holes and rabbit burrows and when the surface soil is saturated. Tunnel erosion produces long cavities beneath the soil surface. The cavities enlarge until the surface soil is no longer supported and collapses. If the process is allowed to continue the soil surface collapses further and forms open gullies which continue to grow.

Rill erosion is the formation of numerous small channels by concentrated runoff. Rills can often be seen on road batters and after earthworks. Rilling increases with the length of slope and steepness. Severe rill erosion can lead to the formation of gullies.

Gully erosion is the washing away of soil by running water which causes large channels to form. Gully erosion can be caused by relatively small changes in land management – increased discharge to a minor drainage line can be sufficient to start the gully erosion process. Much more effort is required to treat gully erosion once it is underway than to maintain a stable system and prevent it forming.

Treating gully erosion involves changing the flow of water over the land, excluding grazing animals, fencing off and revegetation. If large gullies have formed earthworks are often required.

Streambank erosion is caused by changes in water flow and the loss of streamside (riparian) vegetation. Riparian vegetation stabilises streambanks.



The clearing of vegetation along this stream has caused severe erosion.

Where erosion is severe and the bank collapses this changes the water flow which leads to more erosion. Fencing out and revegetating riparian areas is the key to controlling streambank erosion.

Soil salting

The clearing of trees and vegetation from hillslopes (recharge areas) is a common cause of soil salting. Trees act like pumps. They draw the water they need for growth up by the roots. When trees are removed more water makes its way down to the watertable. This causes the watertable to rise, bringing leached salts up to the surface.

The damaging effects of soil salting are often seen in low-lying areas where the saline water discharges.

The use of deep-rooted perennial pastures and the planting of native vegetation on higher, 'recharge' areas can help prevent waterlogging and soil salting at lower, 'discharge' sites.

Soil compaction and pugging

Constant trampling from livestock and tyre track damage from machinery and off-road vehicles can severely degrade soil structure.

When hard-hoofed animals like horses are fed and watered in a confined area they exert huge pressures on the soil. Horses and cattle are very social animals and will often congregate in one area. Their hooves can make deep holes or 'pugs' in wet soils.

Some soil types, especially clays, can form dense, compacted layers up to several metres below the surface.



Horses can cause severe pugging when they are kept on wet soils.

These compacted layers can cause waterlogging, and other drainage problems which reduce plant growth and increase the likelihood of soil salinity.

Local soils

The soils of the Manningham area are mainly bleached duplex soils.

The topsoils are dark, grayish brown, hard-setting loams. Underneath this is a bleached layer (A2 horizon) which usually contains ironstone nodules and gravel. The next layer (B horizon) is clay. It is tightly structured, sodic and usually grayish yellow but it can be red or brown.

Bleached duplex soils present some specific land management problems. The soils generally have a low nutrient level. The subsurface soil (A2 horizon) is subject

to waterlogging in winter. The cemented A2 horizon makes it difficult for plant roots to penetrate during summer. The tightly structured clay layer in the upper B horizon makes it difficult for plant roots to penetrate during winter.

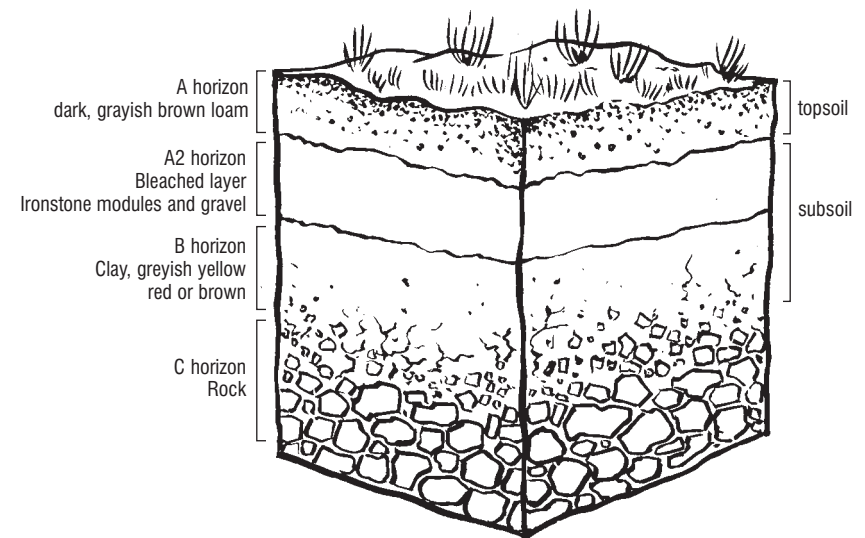
Soils in the bleached duplex group are particularly susceptible to gully erosion. They are sometimes called 'tin-roof soils', as once the topsoils become saturated there is a low rate of infiltration and a high rate of surface runoff. Soil salting is also a common problem.

Warrandyte and Wonga Park are erosion hot spots in the Yarra Catchment. Urban development, unmade roads, rural living and tunnelling dams are contributing to the erosion problems. Warrandyte and Wonga Park are particularly vulnerable areas as they are located on land systems which are highly susceptible to soil erosion.

What to aim for

A good soil on which to maintain sustainable pastures has an open porous structure and a high level of organic matter.

Soil with an open structure is well aerated and allows water to percolate down into spaces that can hold moisture. High levels of organic matter assist in maintaining soil structure and fertility.



A simplified soil profile from the Manningham area. This is what the soil profile should look like. In some areas the topsoil and even some layers of subsoil have been completely eroded away.

Tips for healthy soils

- Maintain ground cover, promote natural regeneration and revegetate any bare areas.
- Fence along the natural contours of the land.
- Protect steep sites, streams and waterways.
- Take care when earthmoving and road building.
- Keep stock movement and feeding sites off wet soils and away from drainage areas.
- Do not overgraze or use heavy machinery on wet soils.

Water is a finite and precious resource. Water cycles through the environment – it moves from the ocean, to the atmosphere, to the land and back to the ocean again. Along the way water is stored in the soil, in dams and wetlands and flows through rivers, streams and creeks.

An eroded creek choked with weeds and rubbish often points to poor water quality.



The waterways in the Manningham area are a vital part of the environment. They provide habitat for plants and animals and recreation and enjoyment for all. Waterways reflect the health of the surrounding land.

A healthy waterway usually means the land around is in good condition, while a degraded and unhealthy waterway points to problems in the catchment.

Hydrology

The way water moves over the land and soil is called hydrology. It is important to understand the hydrology of your land. Watch to see where the water goes after a high rainfall event. Does it drain away completely or does it pool in low-lying areas?

Grading, earthworks and the construction of roads, drains and manages will alter the movement of water across the land surface. These works will have consequences at the site of construction and further away.

Poorly planned drainage of grey water, roof, road and stable runoff can create serious land management problems. Excess water will encourage the growth of weeds which will attract pest animals like rabbits and foxes. Constantly wet soils are prone to erosion and waterlogging. Changes in the water flow and soil levels around established trees can kill them.



Alan Noy's small wildlife dam at Warrandyte has been designed to collect grey water runoff from the house, and stormwater runoff from the roof and road. The water is filtered through native reeds and sedges before it reaches the dam.

Runoff

Runoff doesn't stop at property boundaries. Your land is part of a catchment and the way you manage it impacts on the water quality of local creeks, rivers and streams.

Soil erosion caused by land clearing and overgrazing is causing increasing sedimentation of waterways. Sedimentation is a major hazard for native fish, water creatures, plants and algae, as it reduces light and fills up holes and crevices that provide shelter and breeding sites.

The use of pesticides and herbicides to control pest plants and animals can seriously damage water quality. Spray drift can deposit chemicals in waterways and

they can leach through the soil and runoff into creeks and streams. Some chemicals can persist in the environment for many years and actually increase in toxicity as they move through the food chain.

Chemicals must be used with extreme caution. The smallest possible amount of chemical at the lowest possible toxicity should always be used. Outdated and unwanted chemicals must be disposed of safely.

Nutrients from fertilisers, runoff from intensive grazing and seepage from septic tank systems can cause eutrophication and algal blooms in waterways. Algal blooms are toxic to humans and can cause the death of fish, invertebrates and aquatic plants.

Water supply

Land managers need to plan their water supply and storage needs. Estimating yearly water use is a good place to start.

APPROXIMATE RATES OF ANNUAL DOMESTIC WATER USE:

Use		Water in litres
House	With septic system	65,000 per person
	Without septic system	50,000 per person
Garden	Native garden (no lawn)	0-1000 per square metre
	Lawn with shrubs	3000 per square metre
	Vegetable garden	5000 per square metre
Stock	Horse in work	20,000
	Horse grazing	13,000
	Cattle	20,000
	Sheep	3,000
	Hen	120
Fire fighting reserve	Buildings	1200 per square metre
	Grass areas	750 per square metre

On house blocks and very small properties a rainwater tank and/or the mains water supply may be sufficient. All residents need to be vigilant in reducing water consumption and recycling water wherever possible.

On properties of up to eight hectares rainwater collected in tanks off a clean roof will provide a cheap, good-quality water supply. The amount of runoff from a roof can be calculated by multiplying the annual rainfall with the area of the roof

(in square metres). In a location with a 600-millimetre yearly rainfall average and a roof area of 250 square metres the runoff would be around 150,000 litres a year.

Tank installation must be carried out by a licensed plumber who can issue a certificate stating that the tank has been correctly installed and is operational. Manningham residents may be eligible for rebates when they purchase a new rainwater tank. Contact Council for further information.

Dams

It is important to remember that even small dams have an effect on overall water availability. Dams reduce the amount of water in the catchment and the water flowing into rivers and streams.

Building a dam is a major engineering task with important safety issues to consider. Dams that have a wall of five metres or more and a capacity of 50 megalitres or more are classified as potentially hazardous. Property owners must consider the safety of downstream neighbours in the event of a dam collapse and the safety of children around the dam. New dam construction requires Council planning approval.

Both new and existing dams require regular monitoring and maintenance. Leaking dams waste water and contribute to erosion. One of the keys to keeping a dam healthy is to prevent stock access to the water. When stock drink directly from a dam they cause erosion, foul the water and risk drowning. Dam water should be piped to planned drinking points.

Dams can provide important wildlife habitat. Making your dam wildlife friendly can reduce losses from evaporation, improve water quality, provide shade and shelter for stock and humans, assist with natural pest control in pastures and greatly improve the appearance of the dam.

The first step in improving a dam is to exclude stock by fencing. Fencing should not prevent vehicle access for fire fighting.



Stock trampling at the edge of this dam is causing soil erosion and reducing water quality.

It is important that access tracks are kept clear of vegetation and gates work properly.

Fencing will help native vegetation regenerate around the dam. This can be supplemented with planting. Native trees, shrubs and groundcovers typical of local wetlands are suitable. However, trees should not be planted on the dam rim as their roots can cause tunnelling and leakage.

Dense vegetation provides breeding habitat for a range of species. A log, dead tree or an island in the dam are excellent roost sites. Islands provide security from predators like foxes.



Waterbirds like this Great Egret are attracted to dams.

Vegetation also works as a sediment and chemical filter for the dam and will improve water quality.

A wildlife dam can greatly improve the look of your property and provide a real sense of satisfaction as you enjoy the birds, frogs, bats, mammals, lizards, fish, butterflies and dragonflies that will soon move in.

Wetlands

Over the past 150 years Victoria has lost around a third of its wetlands. As the area of wetlands is shrinking many plants and animals are now under threat. Victoria's wetlands are home to over 100 species of water birds.

A wetland is any area that is covered with fresh or salty water for at least part of the year. Billabongs, river flats, saltmarshes, farm dams and duckponds are all wetlands. Low-lying areas that have seasonal water cover are called ephemeral wetlands.

Wetlands are not always obvious. You may have a seasonally wet, low-lying area on your property that is already functioning as a wetland and providing important habitat for rare wetland plants. Areas like this must be fenced and protected.

Wetlands play an important role in flood mitigation. After heavy rain wetlands absorb runoff which reduces the flow into rivers and the chance of flooding.

Creating and/or protecting wetlands can provide many benefits to the overall health of your property.



These native reeds and sedges provide good nesting material for waterbirds around a small wildlife dam.

Tips for managing water

- Get to know the hydrology of your property.
- Remember that runoff doesn't stop at property boundaries. It can have serious impacts for your neighbours and on local waterways.
- Estimate your water needs and plan appropriately.
- Consider the installation of rainwater tanks – rebates may be available.
- Be aware that dams reduce the overall water available to the catchment.
- Dam management should focus on fencing out stock and piping water to watering points.
- Wildlife dams have many benefits for the environment, the appearance of your property and water quality.
- Protect and conserve wetlands, including sites that have only seasonal water cover.

Pastures are a valuable commodity. They provide feed for grazing animals, prevent weed infestation and protect the soil from erosion.

Good pasture management requires skill and attention to detail. There are no exact recipes to follow as each property and paddock is different and, to complicate matters further, the pastures in each paddock are continually changing.

A good land manager is a student of their pasture – constantly checking and recording the length, condition, species balance and weed threat.

Successful pastures depend on healthy soils. Most pasture varieties require well drained soils and few will survive in waterlogged areas. Shallow soils, where the clay is close to the surface, are especially poor for growing perennial pastures. Soil fertility is crucial. The degree of alkalinity or acidity of the soil as well as the organic material present will have a big impact on the ability of pastures to thrive. Pastures will also do better when they are sheltered from frosts and wind by belts of trees and native vegetation.

Types of pasture plants

Good pastures are a blend of different plant species so that fresh, green feed is available for as long as possible during the year. Pastures are made up of both annual and perennial plants.

Annual plants grow only from seed. They germinate quickly and strongly, grow

to maturity, flower, set seed and die within 12 months. Some early maturing annuals take only a few months to complete the cycle while others take the full year. The life cycle of the plant is linked to the length of the growing season where it is found.

Perennial plants live for longer than two years. Some perennials grow from vegetative parts as well as from seed. They do not grow as quickly or strongly as annuals and take longer to establish. Once they are mature they continue to flower annually until they die.

Perennial plants generally require areas of good rainfall to be successful. They establish strong, deep, root systems and are better at out-competing weeds and withstanding the soil pugging and compaction problems of hard-hoofed animals like horses. Tussocky perennial grasses with upright growth habits provide hardy ground cover but have a lower nutritional value than low-growing clovers.

Perennial pastures have a number of advantages over annuals.

- They are deep-rooted and help control salinity as they use more water.
- They help control erosion by reducing runoff.
- They grow for a longer period than annual pastures.
- They help with weed control by out-competing some weed species.
- They are active in summer and respond quickly to rain.

Good pasture blends can be difficult to achieve as the more dominant pasture species will out-compete the less dominant species.

Close attention to grazing management will help keep the pasture blend in balance. The decline of perennial plants and the domination of annuals should be avoided, as it will result in very bare paddocks each autumn.

Native pastures

Native pastures consist of a variety of perennial grass species including Weeping Grass, Kangaroo Grass and Wallaby Grass. Native grasses are very hardy and persistent and can even survive on soils with low fertility.

In the past 150 years 99% of Victoria's native grasslands have been lost. Native grasslands are now a severely threatened plant community and protection of even small patches of remaining grasses is essential.

Every effort should be made to encourage the persistence of native pastures. They will not withstand such heavy grazing as introduced pastures but, if managed properly, they can provide ground cover for up to 80% of the year.

Many native grasses are perennial so they also help in the control of salinity and erosion. Research on grazing of native pastures is still underway but early recommendations suggest native grasses should not be grazed in spring so as to allow plants to set seed, or after the autumn rains so as to allow seeds to germinate and establish.

Common native pasture grasses:
Kangaroo Grass (*Themeda triandra*)
Wallaby Grass (*Danthonia spp*)
Weeping Grass (*Microlaena stipoides*)
Tussock Poa (*Poa spp*)
Spear Grass (*Stipa spp*)

Kate Sutherland studying a stand of native grasses on a Warrandyte property. This paddock is thick with orchids and native wildflowers each spring. It is lightly grazed by two horses for short periods.



Pasture weeds

A quick drive through Wonga Park or Warrandyte will reveal many hectares of pasture that has been invaded by Cape Weed (*Arctotheca calendula*), Dock (*Rumex crispus*), Sweet Vernal Grass (*Anthoxanthum odoratum*) and other pasture weeds.

A pasture weed is any plant that is toxic to grazing animals, unpalatable or unproductive. Pasture weeds compete with pasture plants for light, moisture and nutrients. Close inspection of paddocks throughout the year is essential for effective control of pasture weeds. Weeds occupy a lot of space when green and can make a paddock look healthy and lush. When they dry off over summer and set seed bare patches become evident and the true state of the paddock is revealed.

Cape Weed has the potential to invade horse paddocks leaving them completely unproductive.



Many pasture weeds were once valued plants of home gardens. Soursob (*Oxalis pes-caprae*) and Spanish Heath (*Erica lusitanica*) are examples of garden escapees. This is also a problem in pastures. Pasture plants like Kikuyu Grass (*Pennisetum clandestinum*) and Phalaris (*Phalaris spp*) are considered serious weeds of bushland and roadsides when they escape from pastures.

Land managers must work to keep weeds out of their pasture paddocks and to keep the introduced pasture species that can cause weed problems elsewhere, in the paddock. This is not an issue when the main grazing species are native pastures.

Some weed seeds can survive dormant in the soil for long periods, others can be introduced with hay. Weed seeds can drop out of the hay before it is eaten or pass through the digestive system and be deposited in manure. Hay should be fed out in the same area so if weed seeds do germinate they will be easier to control.

Other weeds can be present in the paddock in small numbers but will invade when the area is selectively grazed or overstocked.

Effective control of pasture weeds centres on constant monitoring, grazing, slashing and mowing and, as a last resort, herbicides. See page 30 for further information on weed control.

Pest control in pastures

Invertebrate pests like aphids, grubs, caterpillars and cockchafer can damage pasture plants by stunting growth, reducing seed production, weakening plant condition and chewing through leaf matter. Many pests eat all of the green matter leaving only a skeleton of plant membranes intact. Some larvae have a preference for buds and flowers and can prevent plants from establishing and reproducing.

Chemical control of insect pests is both costly and hazardous to stock and the environment. Many insect problems can be controlled with good grazing management, for example, wingless grasshoppers mainly attack annual clovers. In a pasture which has a mixture of perennial as well as annual plants grasshopper damage will not be as severe. Avoiding bare patches and controlling weeds will also assist in controlling pasture pests.

Insect-eating birds are very effective pest controllers. Magpies will eat around 40 scarab grubs from pasture each day. They will also feed on weevils, shield bugs, grasshoppers, beetles and earthworms. Ibis feed mainly on crickets and grasshoppers, eating up to 250 insects each day.

To attract birds to your property you will need to provide native vegetation where they can shelter and breed. A wetland or wildlife dam will greatly increase the number and diversity of different bird species that visit your property. See page 13 on creating a wildlife dam.

Managing horse pastures

How horses graze

An understanding of horse grazing behaviour is important for good pasture management.

Horses are herd animals. They depend heavily upon the herd for a sense of security and prefer to graze, sleep and play as a group. A horse on its own will suffer from boredom which leads to fretting. Solitary horses are more likely to develop 'walk the fence' syndrome which causes soil damage and erosion. Solitary horses are also more likely to strip the bark from trees and to panic during storms and run into fences. A large horse doesn't require a companion of a similar size. A small pony or donkey can make a good companion for a horse.

Horses select which grazing plants they are going to eat by smell, touch and taste. Horses have excellent sideways vision but they are unable to see directly in front of them, or see what they are eating. Smell is their most powerful sense. This is why horses won't eat plants near their own manure.

Touch is also an important sense. The horse sorts out the good grasses from the bad with the tactile hairs on its lips and nose. It is important that these hairs should not be cut as they play an important role in protecting the grazing horse from eating potentially dangerous weeds and grasses. Taste is the last line of defence. Horses have a highly developed sense of taste



Horses will avoid grazing around Sweet Vernal Grass.

and it is not unusual to see them spitting out pasture plants they have just eaten.

Horses are very fussy grazers. They are extremely selective about what they will eat and will graze some areas of a paddock heavily but leave others untouched.

There are three main reasons for this:

- Horses do not like certain grasses such as Fog Grass and Sweet Vernal Grass and will avoid areas where they grow.
- Horses will not eat longer grasses (over 15 centimetres). Unlike sheep and cattle who use their tongues to break off grasses, horses use their teeth. They find it difficult to nip the tops off long grasses and are better adapted to grazing shorter grasses (under 15 centimetres) which are closer to the ground.

- Horses will not eat pasture that has been contaminated with their own manure.

This grazing behaviour results in untouched pastures becoming long and rank and infested with thistle. On heavily grazed areas Cape Weed and Sorrel can take over. Some areas of the paddock, near gates, shelter and the feed and water containers, will be bare from constant hoof pressure. In wet weather these areas will become compacted and boggy. This is known as a horse sick paddock.

It is much easier to avoid a paddock becoming horse sick than to repair it once it has reached this state.

The management aim for horse pastures is to take care of the soil, encourage pastures to persist, and discourage weeds from establishing. The grazing capacity of pastures is constantly changing. It reduces during summer, to early autumn, is low in winter and increases in spring. However the demand for grazing is constant all of the year round. Good management depends on a number of different factors.

A horse sick paddock at Wonga Park. The ground is bare and heavy with manure. The horses have started stripping the bark from gum trees.



Rotational grazing

Having several smaller paddocks rather than one large paddock and moving your horses between them is called rotational grazing. Rotational grazing can help prevent the 'under/over' grazing pattern seen in many horse paddocks.



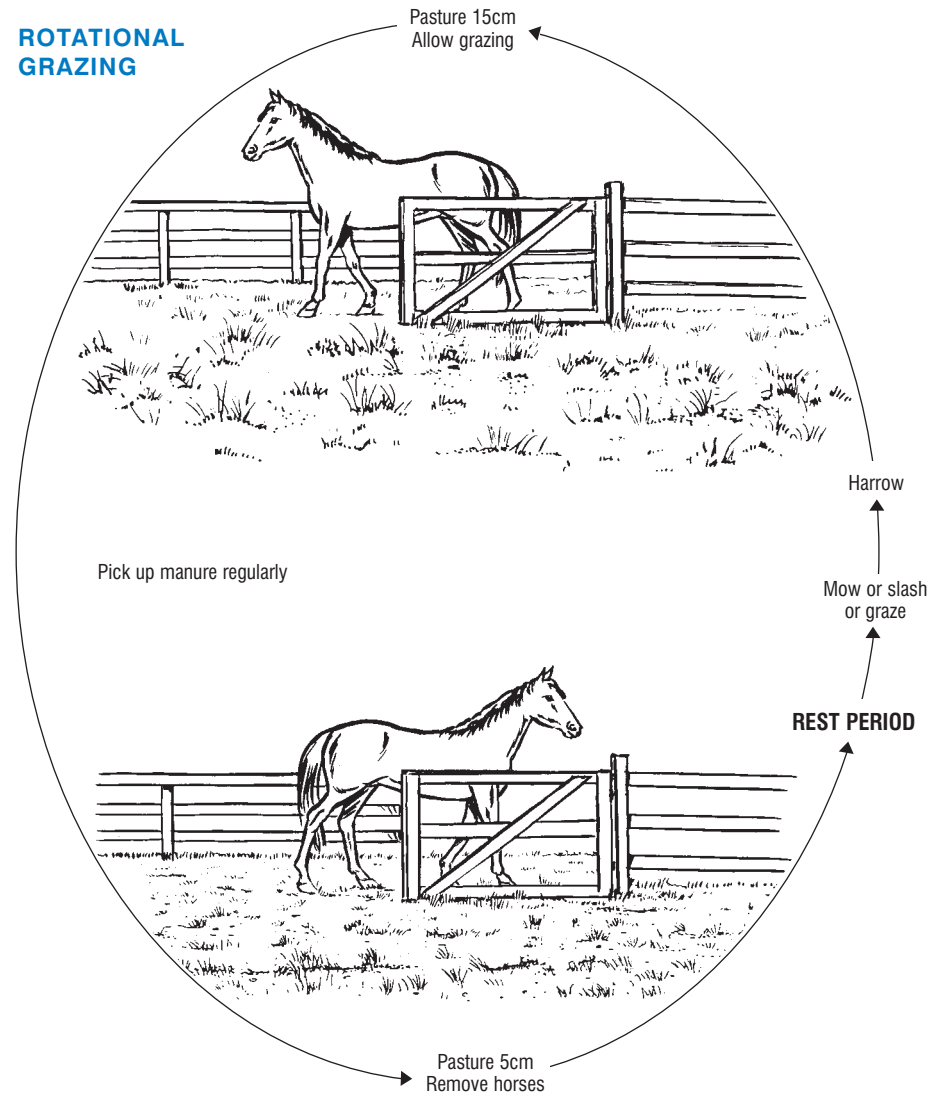
Overgrazing is a serious problem in the Manningham area. Overgrazing weakens plants and may prevent them from setting seed. This leads to bare patches that are quickly invaded by weeds.

Undergrazing leads to selective grazing and a change in the composition of the pasture. More favoured species are grazed out while less favoured species become tall and rank, then flower, set seed and proliferate.

Research has shown that rotational grazing can maintain ground cover, improve the persistence of perennials, improve pasture root growth and water use and reduce the patchy selective grazing habits of horses.

Pastures should be monitored continually but a good guide is to allow grazing down to a height of around five centimetres, remove the horses, allow the pasture to recover to around 15 centimetres in height and then allow grazing again. This pattern should be continued as growth allows.

ROTATIONAL GRAZING



A 5-15 centimetre rotational grazing system. Horses are moved out of the paddock when the lowest plants are around 5 centimetres, and back into the paddock when the lowest plants are around 15 centimetres. Managing the rest period through harrowing, mowing and slashing or follow-on grazing is crucial.

When paddocks are being rested pasture growth improves and parasites die off. The rest period is critical for the survival of perennial plants. Perennials need the rest periods to rebuild root reserves that are essential for growth and vigour.

When pasture growth is slow (dry period, winter) the rest period will need to be longer. When pasture growth is fast (spring) the rest period can be shorter.

Fencing is an important consideration when rotational grazing. The choice between permanent or temporary fencing must be made. Fence placement should consider the slope of the land and the runoff and erosion risks. Fencing with the contour of the land is recommended, as is the fencing out of wetter areas, streams and creeks. See page 61 for guidelines on fence placement.

Electric fencing can provide a relatively low cost fencing option that works well with rotational grazing.

A landholder monitors pasture growth before reintroducing horses to a paddock.



Rotational grazing with sheep or cattle

Grazing horses on rotation with other livestock like sheep and cattle is an effective way of maintaining good production from pastures. Sheep and cattle eat a much greater range of pastures than horses and will graze areas that they have avoided. Sheep will eat most weeds found in horse paddocks.

In a cattle and horse rotation it is best to graze cattle first as they will eat the longer grass while horses prefer shorter grass. Even when horses are grazed first cattle are effective in cleaning up the areas of long grass that have been left. Cattle and horses will not graze near their own dung but they will graze areas near each other's dung.

Alternating cattle or sheep with horses also helps to control parasitic worms in the pasture. Most worms that live in horses cannot survive in cattle or sheep.

Small property owners not wanting to purchase sheep or cattle could consider leasing, or the joint-ownership of stock which can be moved between neighbouring properties.

Mowing or slashing

If cattle or sheep are not available to eat down the long growth in the paddock, mowing or slashing can produce similar benefits.

Mowing or slashing during rapid spring growth can help to keep all of the pasture

short and available for grazing, which will prevent weeds becoming established. However, some broadleaved weeds like Cape Weed will not be controlled by mowing as they grow outward rather than upward.

Mowing or slashing can also be of assistance in removing dry, tough grasses and encouraging young, greener plants. Immature plants have more leaves than stems and are more nutritious than older, stemmy grasses.

Manure removal

Stallions tend to manure in one area but mares and geldings will drop manure throughout the paddock and then avoid grazing near it.

Regular removal of manure will increase the amount of pasture available and discourage patchy grazing and weed competition.

Removing manure will assist with parasite control and reduce the breeding of blowflies.



Harrowing

During the rest period harrowing the paddock can assist the pasture to recover. Harrowing breaks up manure pats, exposing and killing the parasitic worm larvae and reducing the breeding ground for flies.

Harrowing hastens the process of the breakdown of the manure and enables it to be used by the soil as fertiliser.

Harrowing during a cold or dry period will kill worm larvae but harrowing during warmer, wetter weather may increase worm problems by spreading them out and increasing horse exposure to them.

Harrowing can be done by hand on small areas or by pulling an attachment behind a ride-on mower or tractor.

Spraying herbicides

If paddocks become badly overrun with weeds and other control methods have been ineffective, they may need to be controlled by the spraying of herbicides.

Chemical control may also be required where there are infestations of toxic weeds like Paterson's Curse (*Echium plantagineum*). Most horses will avoid eating plants that are poisonous to them but they may do so if they are extremely hungry or unfamiliar with the plant.

Eating large quantities of some plants like St John's Wort (*Hypericum perforatum*) and Storksbill (*Erodium spp*) can cause extreme sensitivity to sunlight while Paterson's Curse (also known as Salvation Jane) can cause irreversible liver damage. Professional veterinary assistance should be sought immediately in cases of suspected poisoning.

Extreme care must be taken when using herbicides. The product label will state a grazing exclusion period that must be strictly adhered to. The label will also recommend the best time to spray. Following this direction will maximise results and minimise the amount of follow-up herbicide required. See page 33 for more information on weed control methods and the use of herbicides.

Tips for managing pastures

- Healthy pastures rely on healthy soil.
- Pasture management requires regular monitoring and recording.
- Aim for a mix of annual and perennial plants.
- Encourage the persistence of native pastures.
- Monitor and control pasture weeds.
- When running horses practise the 5-15 centimetre method of rotational grazing and remove manure regularly. Harrowing, mowing and slashing may also be useful.

However well you manage your pastures, if you have too many horses on a small area you will run into trouble.



Weeds cost Victorian agriculture an estimated \$360 million a year. The weed problem in Australia is so severe it threatens to completely change the face of the landscape. All landholders, including suburban gardeners, have a responsibility to control weed invasions on their land and to prevent them spreading and occurring elsewhere.

A weed is simply a plant growing in the wrong place. Many weeds are attractive and people are often unaware of the harm they cause. Weeds invade and degrade pasture, poison stock, contaminate produce, provide harbour for rabbits and foxes and seriously damage the health and biodiversity of our native vegetation.

Weeds are spread by wind, water and animals, but the main weed spreading agents are humans.

Humans:

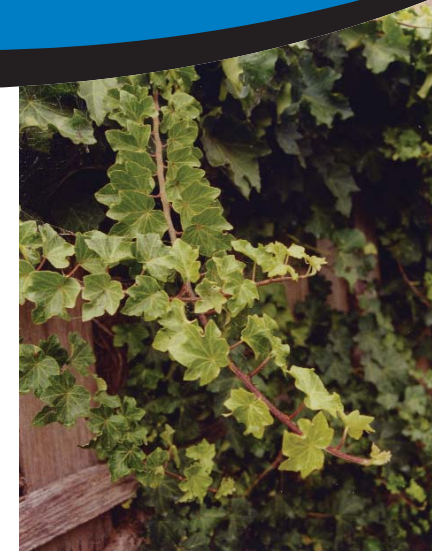
- plant weeds in their gardens;
- dump garden refuse into bushland;
- spread weed seeds on car tyres, clothes and shoes and through mowing;
- spread weed seeds through the movement of soil and fill; and
- allow pasture plants to escape from paddocks into roadsides and bushland where they create huge weed problems.

Weeds can be both plants that have been introduced from overseas or native plants that are growing in the wrong place.

seed collected in another area.

A native, indigenous, local provenance plant has been grown from local seed. It is best suited to Manningham conditions and helps to preserve a strong gene pool of local plant strains.

Consult Council for a list of indigenous native plants for the Manningham area and visit a specialist indigenous nursery that grows plants from local provenance seed.



English Ivy (Hedera helix) was introduced as garden plant. It had a wide appeal for those feeling nostalgic for English country homes and gardens, but in Australia it has become a serious weed and is often seen in bushland smothering native plants.

TYPES OF WEEDS

Term	Meaning	Examples
Introduced or exotic weeds	Plants brought to Australia from overseas either accidentally or on purpose	Paterson's Curse, English Ivy, Blackberry, Cape Broom, Sweet Vernal Grass, Large Quaking Grass
Native weeds	Plants naturally occurring in Australia which have spread or been planted outside of their natural range	Sweet Pittosporum, Cootamundra Wattle, Willow Hakea, Sallow Wattle

Native, indigenous and local provenance plants

Landholders can prevent future weed problems on their properties by planting indigenous native plants that have been

grown from local provenance seed.

When you buy a plant with the term native on the label you could still be buying a weed. A native indigenous plant is the right species, but it may have been grown from



Cootamundra Wattle (Acacia baileyana) may be a native plant but it is not local to this area and is considered a serious environmental weed.

Classes of weeds

The Catchment and Land Protection Act 1994 lists the declared noxious weeds in Victoria and governs weed control. Landholders can face legal action if they fail to control noxious weeds on their land.

There are two main classes of weeds:

Noxious weeds. Noxious weeds are classed as either State Prohibited, Regionally Prohibited or Regionally Controlled. Landholders are responsible for eradicating these weeds on their properties and controlling their growth and spread to other areas.

Environmental weeds. Environmental weeds threaten native vegetation. They invade bushland and out-compete indigenous species which reduces the habitat available for native animals.

Environmental weeds can be either introduced or native to Australia. Sweet Pittosporum (*Pittosporum undulatum*) and Cootamundra Wattle are native plants that are serious environmental weeds in the Manningham area. Landholders should make every effort to control these weeds on their land and to prevent their spread to other areas.

Weed biology

Effective weed control depends on knowing your weed before you decide on a control method. There are three main types of weeds.

Annual weeds grow to maturity, set seed and die within one year. The roots of annuals are usually shallow. Annuals rely heavily on annual seed production for their survival. Cape Weed and Large Quaking Grass (*Briza maxima*) are annual weeds.

Biennial weeds live for two years. They germinate and grow to a small plant in the first year then flower and set seed in the second year. Many species of thistles are biennials.

Perennial weeds live for many years. They usually flower and set seed in the first few years and continue to do so until they die. Some perennial plants reproduce by sending up shoots from underground roots or stems. Blackberry, Sweet Vernal Grass and Cat's Ear (*Hypochoeris radicata*) are perennial weeds. Perennial shrubs and trees are often referred to as woody weeds.

Weed control methods

Prevention and plant competition

Weeds are always more of a problem in areas that have been disturbed by grazing or earthworks or are subject to soil erosion. Simply keeping the soil in good condition will mean plants can strongly compete with weeds and help to control them.

Grazing

Well-planned rotational grazing regimes can assist in the control of pasture weeds. Following up with mowing and slashing will ensure that weeds not eaten by stock do not gain an advantage and crowd out the preferred plants.



Sweet Pittosporum invades the shrub layer of local bushland and out-competes indigenous species.



Agapanthus (*Agapanthus praecox*) commonly escapes from gardens into bushland. The flowers of garden plants should be cut before they seed.

Hand pulling

Hand pulling is the preferred weed control method in small areas and where the weeds are scattered. It is suited to areas of native bushland as it causes little disturbance. Hand pulling provides a good opportunity to get close to plants and to increase your knowledge of identification and biology.



Watsonia (*Watsonia meriana*) is a popular garden plant that has invaded large areas of bushland and roadsides. It reproduces by vegetative corms.



Panic Veldt Grass (*Ehrhata erecta*) is native to South Africa. It out-competes native groundstorey species.

Hand pulling can be assisted by tools such as knives, trowels and forks but should always aim to cause the least possible disturbance to the soil. Hand pulling should be done before plants drop their fruits or seeds. Care should be taken to ensure all of the plant is removed and that it is disposed of without causing a potential weed threat elsewhere.



Hand pulling is time consuming but can be very effective in small areas and in larger areas where the weeds are sparse.

Mowing and slashing

Regular use of a brushcutter, whippersniper or mower (a push mower with grass catcher attached) can help keep weeds under control. Timing is important. Annual weeds should be cut before they drop seed. Cutting the weeds close to the ground does more damage to the weeds than cutting them high.

Perennial weeds may need to be mowed or slashed several times over the growing season to limit growth and prevent fruits or seeds from developing.

Mulching

Mulching involves smothering the weeds with a layer of impenetrable material.

The weed seeds are denied access to the light which prevents them from germinating. Mulching preserves the moisture in the soil which can assist the more desirable plants to establish. It is also useful when revegetating areas that have been badly disturbed.

Many different materials can be used as mulch. These include commercial mulch, wood chips, newspaper and plastic. Care must be taken when purchasing commercial mulch or using organic mulches as they often contain weed seeds. **Mulching should never be used where there are indigenous groundstorey plants as it smothers them and prevents germination.**

Burning

Burning is a complex weed control method that should only be used by those with experience. When used carefully fire can destroy mature weeds, exhaust weed seedbanks and stimulate the growth of indigenous native species. Fire can be used to open up larger areas infested with woody weeds or to spot-burn smaller invasive weeds with a hand-held flame-thrower.

The impact of a fire must be closely considered. Burning can hasten erosion by removing groundcover and not all indigenous species are adapted to survive fire. Burning will stimulate the germination of both weeds and indigenous plants, so follow up weed control will be necessary.

It may be possible to dovetail burning for weed control with fuel reduction burning being carried out for bushfire prevention. Fire always poses some risk to people and property. Bans must be observed and a Council permit is required. See page 54 for further information

Chemical control

Chemicals designed to control weeds are called herbicides. The use of herbicides in the environment is a cause of great community concern. Spray drift, the persistence of herbicides in the soil, damage to non-target species and the health risks involved in handling and storing herbicides are some of the potential problems associated with herbicide use. But when used selectively by an experienced operator, herbicides can be highly effective.

Herbicides can be either specific – meaning they target a particular type of plant but not others – and non-specific – meaning they have the potential to kill any type of plant.

Herbicide manufacturers are required by law to provide application rates and

methods and safety information on product labels.

It is important to choose both the right herbicide and the right method of application. The most common methods of application are spraying using a pump pack or spray can, wiping and dabbing using specialised applicators and painting with a brush or sponge.

The smallest possible amount of herbicide at the lowest possible toxicity must always be used. Some chemical weed control can only be undertaken by contractors as the herbicide required can only be legally handled by the holder of an Agricultural Chemical Users Permit. There are many experienced weed control contractors in the Manningham area. A list of contractors is available from Council.

Tips for effective weed control

- Plan ahead. It may take years to completely eradicate certain species. Set realistic, achievable goals.
- Correctly identify the weed and the indigenous species growing around it.
- Choose a safe and appropriate control method.
- Consider environmental impacts. Are there waterways nearby? What are the risks to indigenous species?
- Minimise disturbance at the site so the weeds don't spread further. This includes limiting vehicle access and checking tools, clothing and footwear.
- Time treatments to get maximum results.
- Remove weeds carefully to avoid re-infestation.
- Encourage the spread of local species or revegetate with indigenous species.
- Record and evaluate all treatments. Modify if necessary.
- Work co-operatively with your neighbours.

Contact Council for a copy of the Manningham Weed Identification Guide.

Pest animals wreak havoc on the environment. They cause huge losses for farmers, degrade bushland, prey on and out-compete native animals and cost the community millions of dollars each year.

Pest animals are a living reminder of the mistakes of history. Rabbits, foxes, deer and trout were brought to Australia by the early white settlers for sport and food. Cats and goldfinches were pets that escaped and established wild populations.

Landholders must be vigilant in controlling existing pests on their land and preventing the release of new pest species.

Rabbits

Under the Catchment and Land Protection Act 1994, landholders are required to control rabbits on their land and legal action can be taken if they fail to do so.

Rabbits are the most serious of Australia's pest animals. They compete with native wildlife for food and shelter and have contributed to the extinction of numerous native species. They compete with livestock for food, and damage native vegetation. Rabbits graze selectively. They feed heavily on palatable grasses and herbs and avoid weeds like Sweet Vernal Grass and Montpellier Broom (*Genista monspessulana*). This leads to the loss of native species and the spread of weeds.

Rabbits are prolific breeders and reproduce throughout most of the year. Under ideal conditions one pair of rabbits can increase to 180 rabbits in around 18 months.



Woody weeds provide cover for rabbits.

When the rabbits reach maturity they fan out from the family burrow seeking new territory. Survival rates of young rabbits increase significantly when they have safe harbour.

In autumn and winter rabbits feed on newly germinated seedlings. In spring they eat the seed heads of grasses and the green leaves of broadleaf plants. Over summer, when the grass dies off, they eat the seed heads of weeds. In drought conditions they will eat leaves, roots and bark. Eight rabbits will eat as much as one sheep.

Rabbit control methods

The key to effective rabbit control is planning and persistence. Tolerating even small numbers of rabbits is unacceptable – one rabbit is too many and action should be taken. Monitoring is important. Take a walk around your property with a torch at dusk or early in the morning (2-3 am) and count how many rabbits you see. Observe what the rabbits are feeding on and where they run to when disturbed. Record your findings.

Several of the following control methods used together will give the best results.

The rabbit population was significantly reduced in the 1950s with the release of the Myxoma virus. The recently released Rabbit Calici virus also reduced numbers but in the Manningham area they have already recovered to pre-Calici levels.

Calici virus does not affect all rabbits and it cannot be relied upon for effective rabbit control.

Destroying harbour

Rabbits do not need burrows or extensive warrens to survive. They can live amongst thickets of weeds and native plants, under buildings, in sheds, woodpiles and even abandoned car bodies.

Trimming around hedges and controlling weeds will help to destroy rabbit habitat. Fences can be built around woodpiles and wire netting installed around the base of buildings.

Take care when trimming or slashing in bushland areas. Contact Council before clearing any indigenous vegetation on your property.

Cathy Willis checks rabbit burrows in old soil fill at Wonga Park.



Rabbit proof fencing

Well-constructed and maintained fences can keep rabbits out of your property for the long term. Working with adjoining neighbours to fence a larger area can also be worthwhile.

Rabbit proof fences require special construction. A section of wire mesh must be buried beneath the fence or angled across the ground in the direction of possible rabbit entry.

Once an area has been securely fenced other control methods (poisoning, fumigation, and warren destruction) must be used to remove rabbits within the fenced area.

Fence maintenance is essential. Fences will need to be regularly patrolled and checked for damage and incursions. Rabbit proof fences cause problems for some native animals by preventing their movement. Wildlife can also become entangled in the fences – another reason for regular checking.

Fumigation and warren destruction

Fumigation involves placing a poisonous fumigant in warrens and burrows and blocking all exits. Running dogs over the area or creating loud noise will scare rabbits into their burrows before fumigation. Every hole or burrow must be treated and then securely blocked.

Fumigation of warrens must be undertaken by contractors as the fumigant can only be legally handled by the holder of an Agricultural Chemical Users Permit.

Destroying warrens after fumigation will prevent re-infestation. Warrens can be destroyed by digging them out with a shovel, mattock or pick. Backhoes are very useful but care must be taken to avoid excessive soil disturbance which can cause erosion.

Check the area regularly so any newly-constructed burrows can be quickly closed up.

Baiting

Carrot or oat baits laced with Pindone, an anti-coagulant poison, are effective in controlling large rabbit infestations but there are some risks to native animals and pets. The safety and handling directions on the product label must be strictly adhered to. An antidote is available from veterinarians if pets accidentally consume baits.

A baiting program must be carefully planned and will include the notification of neighbours and the erection of warning signs.

Baiting has the most impact during the late summer and early autumn period when rabbit feed is at a premium and they are foraging for food. Providing a 'free feed' of untreated carrots before baiting helps the rabbits to acquire a taste for the carrots and increases the effectiveness of baiting. It also allows for monitoring and re-adjustment of the amount of bait that is required.

Several poison feeds are then given, generally a few days apart. Carcasses must be collected daily. Fresh carcasses may still be found up to 12 days after the last baits were laid. Carcasses must be properly disposed of so there is no risk to non-target species.

Thorough monitoring and early action is essential if new rabbit activity is found.

Baiting is a complex and potentially hazardous procedure and is best carried out by a group of landholders working together, or a registered pest control contractor.

Ferreting

This technique is useful for clearing a few remaining rabbits once numbers have been reduced by other methods. Ferreting is effective inside fenced off areas or under buildings where access is difficult. Care must be taken to ensure that any native animals using rabbit burrows are not threatened or injured by ferrets.

Working together

There is no quick-fix solution for rabbits. Landholders must be patient and persistent. The most effective control programs use a combination of different methods and involve co-operation with neighbours.

Rabbit control on your property will be wasted if rabbits can quickly re-colonise from neighbouring areas. Talk to your neighbours about rabbits. They may be unaware of the problem and what to do about it.

See page 68 for information on Community Rabbit Control Groups in the Manningham area.

Foxes

Melbourne has one of the highest densities of urban foxes in the world with around 14 foxes per square kilometre. Fox dens can be found underneath houses, schools and factories and in bowling clubs, cemeteries, railways, golf clubs, creekbanks, drains and rubbish heaps.

Foxes prey heavily on rabbits but around a quarter of their diet is native wildlife. Ground-dwelling mammals are easy targets, as are birds, possums, lizards, beetles and other insects. Researchers have estimated that one fox can eat around 32 kilograms of native wildlife each year and can range over 20-30 kilometres a night. With an estimated one million foxes in Victoria the impact is staggering.

Foxes carry a variety of canine diseases and would be a prime carrier of rabies if it were to enter Australia.

Fox control methods

Controlling foxes in an area of rural/urban interface like Manningham is difficult. The range of treatments is limited for safety reasons. Effective control should centre on making your property less attractive to foxes.

Control rabbits and weeds

Foxes prey heavily on rabbits and reducing rabbit numbers will impact directly on foxes, however, it will also force foxes to meet the rabbit shortfall with native species. For this reason it is critical that fox and rabbit control programs are co-ordinated.