

MOORABOOL

HEALTHY

Hectares



A guide for small landholders
to create productive and
environmentally sustainable
properties in Moorabool Shire



National
Landcare
Program



Rotary
Bacchus Marsh

We respectfully acknowledge the Traditional Owners of the land which includes the Wurundjeri Woi Wurrung, Wadawurrung and Dja Dja Wurrung people. We pay our respects to the Elders past, present and emerging.

This Moorabool edition of Healthy Hectares is supported by the Department of Agriculture and Water Resources, through funding from Australian Government's National Landcare Program and the Bacchus Marsh Rotary Club.

Healthy Hectares Moorabool 2023

Text: Green Gecko Publications, Euroa Arboretum and Helena Lindorff.

Cover: Fox Gully, Rowsley by Chloe Lindorff

Photographs: Mary Trigger (all photos unless otherwise attributed), Helena Lindorff (HL), Chris Lindorff (CL), Chloe Lindorff (ChL), Cath Olive (CO), Kate Stothers (KS), Janet Hogan (JH), Bridget Springer (BS), Kim Wilson (KW), Ian Moodie (IM), Kerri Robson (KR), Nikolay Volik (NV), David Whelan (DW), Mark Williams (MW), James Booth (JB), Jenny Maclean (JM), iNaturalist photographers (CC BY-NC-SA 4.0) via inaturalist.ala.org.au: Sarah2813 (SH), Peter Watts (PW), jrolland (JR), wattlife (WL), Russell Best (RB), Andrew Allen (AA) and Rose Wisemantel (RW).



CONTENTS

Introduction	2
Planning	6
Soil	15
Water	22
Biodiversity	33
Pests	51
Pasture	66
Useful resources	80



(JH)

INTRODUCTION

The rural lifestyle attracts people to the region for a number of reasons:

- A vast landscape of mountains and plains and slow and fast moving waterways.
- A beautiful natural environment of graceful gums and unique and diverse wildlife.
- A slower lifestyle where you can watch the sunset and see the stars.
- Space for children to ride horses, run some livestock or grow vegetables.
- Communities that represent a rich blend of established rural families and newcomers seeking a change of pace from city living.



(ChL)

Owning a small property comes with a lot of expectations and responsibilities.

- What attracted you to the area?
- What do you love about your property and what do you want to do with it?
- Do you want a weekender, a hobby farm or a bush retreat?
- How will you manage it and how will those actions affect the area around you?
- Is your property capable of sustaining what you want to do?

This guide is designed to assist you in assessing your land and managing it in a way that protects and enhances the natural environment, provides a healthy and safe environment for animals and is appropriate for the time you have available. It will not provide all the answers and we encourage you to seek more detailed advice listed in the reference sections within this guide. We also encourage you to talk to experienced locals to learn from their trials, errors and successes.

Being part of a bigger catchment area

Moorabool Shire is largely a rural, peri-urban municipality centrally located between Melbourne, Ballarat, Bendigo and Geelong covering an area of 2,111 square kilometres with a population of 37,002 (2021). The Shire is rich in natural values with more than 74% of the area protected within national and state parks and water supply catchments.

Moorabool is characterised by a great diversity of environments, from rolling plains to rugged river gorges and forests that provide spectacular scenery. The Shire encompasses significant areas of public land including the Brisbane Ranges National Park, the Lerderderg and Werribee Gorge State Parks, Lal Lal and Wombat State Forests as well as numerous reserves.

The rivers are also an important source of potable water with significant areas of the shire in special water supply catchments with large reservoirs including Lal Lal, Pykes, Moorabool, Bolwarrah and Merrimu. Three major rivers, Lerderderg River, Moorabool River (East and West Branches) and Werribee River and their tributaries are recognised for their important ecological values, supporting an array of aquatic flora and fauna, many of which are endangered.

The rugged and steep landscapes around the headwaters of the Lerderderg and Werribee Rivers provide breeding habitat for Peregrine Falcons and Wedge-tailed

Eagles and house significant species like the Powerful Owl, Common Bentwing Bat and Brush-tailed Phascogale. The Moorabool River is recognised for its important habitat values for native fish including river blackfish, Australian smelt, common galaxias and southern pigmy perch. The waterways also provide important cultural indigenous heritage sites, recreational opportunities, amenity value and economic values for the local community. Agriculture across the Shire is underpinned by access to fresh water and the fertile floodplains at the confluence of the Lerderderg and Werribee Rivers at Bacchus Marsh support productive horticultural enterprises.

Moorabool Shire is predominately located within two catchment management areas. The Port Phillip and Westernport catchment extends across the eastern half of the municipality, and the Corangamite catchment occupies the western half. A small area in the northeast of the shire is within the North Central catchment.

Outside the main townships and the protected natural areas, much of the rural area is used for agriculture, including horticulture, sheep and beef farming, cropping, timber production, and more recently, viticulture (ABS 2011). There is also some clay, mineral and coal mining undertaken in the Shire. Grazing and cropping dominate large areas and intensive horticulture occurs where there is access to irrigation water and fertile soils, such

as the alluvial soils on the floodplain of the Lerderderg and Werribee Rivers at Bacchus Marsh. There are also

potato-growing areas in the western region of the Shire.

Reading the ecological landscape

To understand more about your property and how it might function, it is important to understand where it sits in the surrounding landscape. Take a walk around your property and observe the natural features. Are you on top of a hill or on a slope? Are you on the north or south side? Or, are you on a floodplain? Do you have a creek or river running through your property? Are you close to a public conservation reserve? Find your property on Google Maps and turn on the satellite view to see where

your property sits in the landscape www.google.com/maps. Using the aerial map of your property, start drawing the attributes that you have observed and make notes. Where on the property is it rocky, highlight areas of native vegetation, and are there existing fences, and waterways? Take plenty of photos of the landscape and the plants and animals you find during the year. It's a great way to explore the changes and reflect on your achievements as a property manager.





PLANNING

Planning can help you identify your goals, understand the processes taking place and put into action efficient and sustainable management practices to support a healthy and productive property.

Statutory planning

Every municipality has its own planning scheme that determines land use and development within its shire. A planning scheme will contain State and local planning policies, zones and overlays and other provisions that will affect what you can and cannot do on your property. In some cases you will need to obtain a permit from council.

Two areas of planning that you should be aware of are:

Zone – indicates the land use of an area and corresponding conditions of use. Residential, industrial and rural zones are all straightforward, but you need to also be aware of other zones such as Rural Living, Farming, Rural Activity, Green Wedge and Rural Conservation Zone. The zone your property is in can, for example, restrict the number of animals you are permitted to stock.

For further information visit: www.agriculture.vic.gov.au and search 'rural zones'.

Overlay - provides another level of control to protect a specific and important aspect of land. Examples include Environmental significance, Wildlife management, Heritage, Floodway, Vegetation protection and Erosion management. Your property may have one or more overlays that you will need to be aware of. Contact your local council planning department.



For further information visit: www.dtpli.vic.gov.au and search 'Planning - a short guide'.

Property management planning

As with any successful enterprise, it all comes down to good planning! A property management plan requires you to undertake a stocktake of your assets – (buildings, fence lines, water sources and outlets, steep slopes, rocky outcrops, areas of waterlogging, soil quality, erosion points, stands of remnant vegetation and pasture areas). What are the risks to these assets and how will you manage them sustainably?

Most property plans are developed using an aerial photograph of your land and often include clear overlays to depict various features such as:

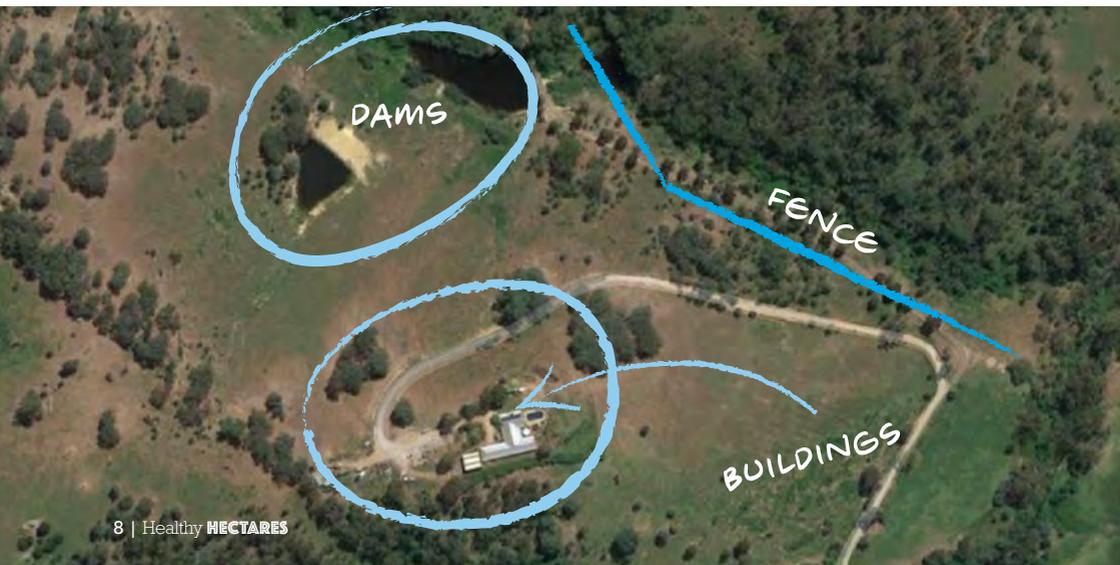
- permanent physical features including boundary fences, buildings, water sources and remnant vegetation
- land management units such as different soil types that will require different management strategies
- your desired management options e.g. establish a vegetation corridor, fence off a dam, establish a windbreak or add a vegetable garden.

A property plan will help you focus your goals, solve problems and allow

you to plan your expenditure and time. It gives you something to work towards and ideally is prominently displayed and frequently referred to, and will change over time. A property plan doesn't have to be sophisticated and can change as items arise, the most important thing is that you have one and you use it.

Further information: www.landcarevic.org.au/resources/ and search Farm Plan 21 Manual

Property Management Planning courses require a commitment of time and effort. Typically you will work through a different topic each week building your individual property plan as you progress.



Land capability

A component of property management planning requires you to look at the different features of your land and assess its capability for land use. Most properties have a range of different soil types and slopes across their land. Each of these areas has different potential risks and needs to be managed differently. For example, steep slopes are more prone to soil erosion than moderate slopes and can dry out quickly depending on wind direction and aspect.

In determining land capability of sections of your property you will need to determine the different land classes. There are five different land classes.

Land class	Description	Livestock access
1	Little risk of degradation and able to support a wide range of uses (e.g. gentle slopes, well-drained soil, good vegetation cover).	All year
2	Some risk of degradation under certain conditions (e.g. prone to waterlogging in winter).	Restricted
3	Land with moderate risk of degradation and will require active management (e.g. sloping land with poor soil structure).	
4	Land with severe degradation potential (e.g. steep slopes, erosion potential, poor soil structure).	Prohibited
5	Land that, if not already degraded, would be at serious risk of degradation (e.g. extreme slopes, prone to erosion or area of high value native vegetation).	

Once you have determined and mapped your land classes and corresponding land capability of your property, using your property management plan, you can assess whether the current or proposed land use is appropriate.

Land capability



Class 5
Steep rocky remnant

Class 1
Gentle slope, well-drained soil

Class 2
Waterlogged in winter

Land class fencing

Land class fencing is used to control grazing pressure around your property by being able to manage stock from, say, good grazing country to those areas that cannot cope with high stock pressure.

It involves putting in a fence between two different land class areas allowing stock in one area, but not in a vulnerable area. While boundary fences need to be strong and stock proof, land class fences are often lighter or electronic fences that are cheaper and more flexible. For example, in winter you may put an electronic fence around a section of low-lying paddock that is prone to waterlogging, but in summer allow stock to access that area once it has

dried out. In steep hill country, land class fencing is the best way to save your hills from soil erosion while allowing some grazing. Fencing steep slopes from lower slopes, north and west sloping slopes from south and east-facing slopes allows grazing to be strategic and, reduces potential soil and pasture damage.

For further information visit: www.gbcma.vic.gov.au, search 'Striking a Balance' and 'Erosion to Production'

Land class fencing allows you to better manage the different areas of your property.





(JH)

Bushfire planning

Fire is a natural part of the Australian landscape and Victoria is one of the most fire-prone areas in the world. Climate change is increasing the length and intensity of the bushfire season. The risk of bushfire is very real and you need to ensure you have a well-developed and up-to-date bushfire plan for your property. It is also important to ensure emergency vehicles have clear access on to and around your property for fire-fighting purposes.

Ensure you know what Fire District your property is in and are familiar with the Fire Danger Ratings - www.cfa.vic.gov.au/warnings-restrictions

If you plan to burn-off on your property, remember you can only do so outside the Fire Danger Period. Check with your local council to see what local laws apply, register your burn-off on 1800 668 511 and notify your neighbours.

The Country Fire Authority has excellent information and resources on how to plan and prepare your property for bushfire. We strongly advise you to read the information, develop your bushfire plan and include the actions in your property management plan.

Further information: www.cfa.vic.gov.au



(KS)

Drought planning

Australia is the driest inhabited continent on earth. Drought has always been part of our history and will most likely occur more frequently according to climate change predictions. Drought is a time of crisis for the land, its animals and its people.

To minimise the impact, drought needs to be planned for well in advance and incorporated into your property management plan (Refer to pg 25). Strategies such as maintaining water budgeting, soil health, retaining stubble, encouraging deep-rooted perennial pasture plants, maintaining groundcover and rotational grazing are discussed in other sections of this booklet. It's also a good idea to talk to your neighbours about their drought experiences and strategies.



Surviving drought requires planning for it.

Suggested drought-planning strategies:

- Develop a water budget of the inputs and outputs of your property and monitor closely (Refer pg 25).
- Install as many rainwater tanks to buildings as possible.
- Regularly check your regional weather and climate forecasts.
- Monitor rainfall on your property.
- Identify sacrifice paddocks that have the best potential to recover.
- Create a feed budget if you intend to keep stock. Visit www.mla.com.au and search 'Feed Demand Calculator'.
- Check troughs daily.
- Monitor your groundcover carefully and remove stock as soon as it goes below 70% cover.
- Investigate the availability and cost of trucking in water and feed.
- Identify which stock use the most water e.g. horse = 40-50L/head/day versus sheep = 2-6L/head/day.
- Implement a destock strategy.
- Identify clear trigger points and actions e.g. "If no rain by October, I'll agist the horses at Smiths".
- Ensure your stock is fenced off from dams and you have sufficient water troughs to maintain water quality.
- Ensure native animals have access to water during drought.
- Plan for the humane culling of suffering animals.

Small landholder responsibilities

If you do not permanently reside on your property, or are going away on holidays, you need to ensure that your property is as self-managing as possible while you are not there.

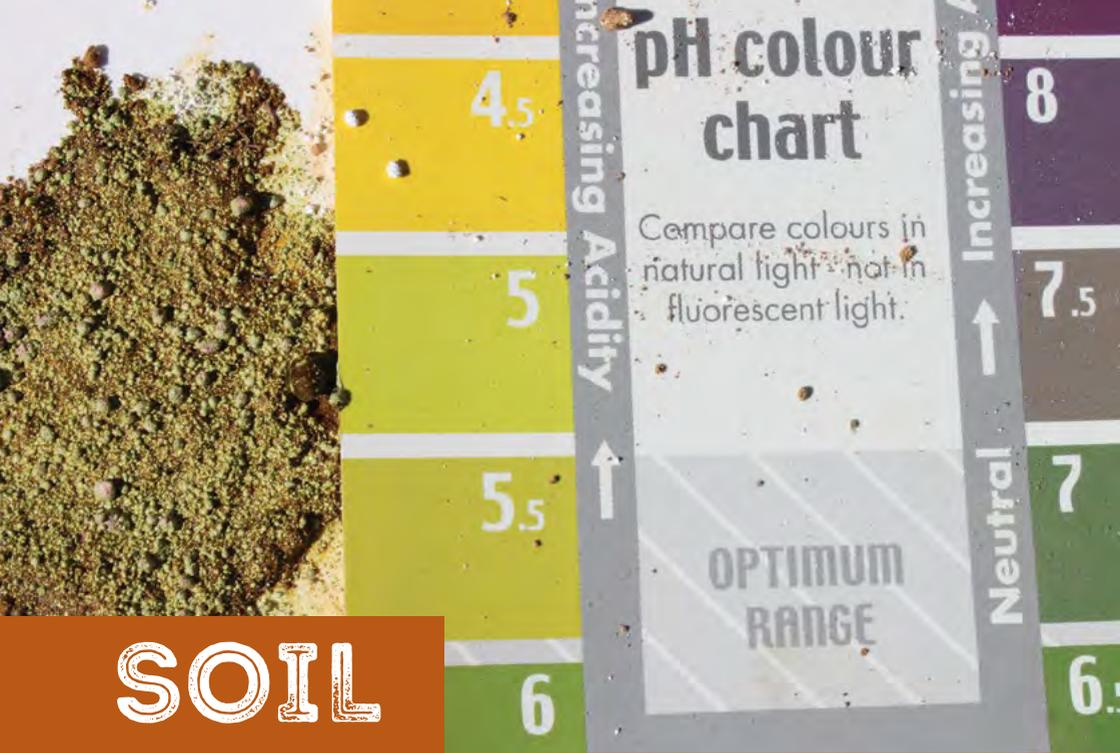
Potential management issues may include:

- boundary fence maintenance
- straying or injured stock
- pest plant and animal control
- contamination of water
- erosion control
- fuel build-up.

These problems can affect neighbours and cause tension. Local council may impose notices and fines. To avoid these problems, if you are away from your property for any period of time, consider including the following actions in your property management plan:

- visit your property on a regular basis
- develop a maintenance schedule with local contractors to check fences, water courses, fuel loads, weeds and pest animals
- negotiate with surrounding landowners to check on your property, perhaps in exchange for something you can offer
- where possible monitor your water supply remotely
- identify and tag all livestock.





SOIL

Soil is a hugely valuable asset. Time and effort spent improving the health of your soil will have multiple benefits. Understanding, protecting and improving the soil health of your property is fundamental to productivity and environmental sustainability.

Soil is living matter that will respond to the way it is treated. It is made up of minerals that come from the rock below or nearby, organic matter which is the remains of plants and animals that use the soil, air, water, and living organisms that reside in the soil. The proportion of each of these will determine the type of soil that is present. Other factors

such as climate, vegetation, time, the surrounding terrain and human activity will also determine the type of soil that occurs in a landscape. The formation of soil varies depending on local conditions, but generally it takes 1,000 years to form 20mm of soil. That's incredibly slow, and in many areas greatly exceeded by the rate of soil loss.

Soil types

If you have a bush block it is important to know your soil type to determine what indigenous species to plant. If you are running stock you need to know your soil type to determine what pasture grasses and legumes to plant, the stocking rate and how to manage the nutrient inputs. Your soil type and structure will also have implications for its susceptibility to compaction, waterlogging and erosion.

Soils are generally classified according to their depth and structure. Soil forms between the ground surface and the underlying rock. If you cut straight down you will find varying horizontal layers that form the soil profile. These layers differ in colour, texture, chemical composition and biological characteristics. A soil profile has three major horizons: the topsoil (5-30cm), the subsoil and the parent material.

Typically we tend to focus on the topsoil as this is the horizon we can most directly influence. However, the roots of plants extend to much greater depths in the soil profile and the health of the soil down the profile has a major impact on the health of native plants and pasture plants.

The soil type across your property may vary. Soils can be quite complex and knowing what you have and how to improve it is essential for managing your property sustainably.

For further information visit:

www.nccma.vic.gov.au/resources/publications/soil-health-guide-north-central-victoria

www.agriculture.vic.gov.au/agriculture/farm-management/soil-and-water/soils/soil-formation

www.healthysoils.com.au

www.soilsforlife.org.au/soil

www.soilhealth.ccmaknowledgebase.vic.gov.au/index.php

www.agriculture.vic.gov.au/farm-management/soil



Soil structure

Soil structure is very important for land management. It refers to the way soil particles group together and the pore space around them. Soil structure affects water and air movement through the soil. Good soil structure allows water to soak into the soil and excess water to drain away. It also allows air movement through the soil. Soil, air and water are vital for healthy plant growth.

Poor soil structure can often be identified by the presence of rill, tunnel and sheet erosion, surface crusts, water pooling on the surface after rain, a very hard surface when the soil dries out, poor infiltration (after rain, dig down to see how far the water has reached) and a pale colour to the soil. The biggest threats to soil structure are compaction, cultivation and lack of vegetation.

Organic matter is critical for maintaining good soil structure. It essentially binds soil together to act as a sponge, releasing retained moisture and nutrients slowly for plants and animals to maintain production over a much longer period. Organic matter is a food source for soil biology which creates nutrients for the soil. A soil with low organic matter readily collapses when wet, reducing infiltration of rain and increasing runoff. With no organic matter to bind them, soil particles readily break down under raindrop impact and are more easily carried away causing break down.

On bush blocks or remnant vegetation areas of your property it is important to let nature run its course. Let the leaf litter build up and leave branches and logs on the ground. If you are revegetating in a remnant area try to minimise disturbance by digging small planting holes.

Strategies to improve soil structure in pastures:

- Maintain 100% groundcover to provide a protective cover to control evaporation and soil loss through wind and water erosion and to add organic matter to the soil.
- Encourage soil microbes and invertebrates by avoiding pesticides and herbicides.
- Maintain stubble by removing stock when long-rooted perennial pasture plants are eaten down to around 4cm in height.
- Exclude stock and vehicles from wet areas.



Increasing soil carbon through restoration of degraded soils could play a major role in slowing climate change.

Soil carbon

Carbon is held in the soil in the form of decomposing plant and animal material and living microbes, fungi, roots and worms. Soil organic carbon is the basis of soil fertility. It releases nutrients for plant growth, promotes the structure, biological and physical health of soil, and is a buffer against harmful substances. The carbon derives primarily from plant materials created through the capture of atmospheric carbon dioxide via the process of photosynthesis. These organic materials are cycled through the soil and used by organisms as a source of energy and nutrients.

Soil organic carbon is part of the natural carbon cycle, and the world's soils hold around twice the amount of carbon that is found in the atmosphere and in vegetation. This makes soil the world's largest carbon sink! Healthy soil with high organic-matter content will not only produce healthier plants but will help reduce global warming.

For further information visit:

www.necma.vic.gov.au/About-Us/Projects/Biochar

Soil texture

Soils are broadly classified by the size of particles they contain as to whether they are sand, silt or clay.

Sandy soils consist of large particles that provide good aeration and allow water to drain freely. This can mean plants dry out quickly and nutrients are leached away. A potential problem with sandy soils is that once they have dried out they can become water repellent and water will bead on the surface rather than soaking in.

Silt soil has higher moisture retention, slower drainage and less aeration than sand. They are slower to drain and so hold water and nutrients well.

Clay soil consists of very fine particles that stick together. They tend to absorb and hold water and nutrients well. The downside of clay soils is that they can hold water a little too well creating poor drainage and compaction. Also, when they dry out they can become hard, making it difficult for water to penetrate.

A loam soil is a mix of sand, silt and clay. Loam soils vary, but tend to have excellent drainage, nutrient content and organic matter.



Spiny Rush (JR)



Barley Grass (WL)

Testing soils

It is well worthwhile investing in soil laboratory tests to gain a better understanding of your soil and how to manage it. Tests of soil samples from across your property will indicate the level of soil acidity (pH) and the nutrient status of your soil. Summer and autumn are the best times to test soils, while they are dry, since this is when the nutrient level is most stable. For further information: agriculture.vic.gov.au/farm-management/soil/sampling-soils-for-soil-testing

Soil testing services:

Nutrient Advantage
www.nutrientadvantage.com.au

SWEP Analytical Laboratories:
www.swep.com.au

Or local agronomists.

Soil problems in the region

Two soil problems that exist across the region are soil acidification and soil salinity. Soil testing will reveal soil acidification if you have a low topsoil pH reading (below pH 5.5). Nutrient imbalances occur with acid soils, often leading to difficulty growing pastures or crops. Saline soil will produce stunted plants with patchy growth in vegetation and often the appearance of salt-tolerant plants such as Spiny Rush (*Juncus acutus*) or Barley Grass (*Hordeum glaucum*).

Soil erosion

Soil erosion is the washing or blowing away of topsoil. It is a natural process that occurs whenever the soil is exposed to the force of wind or water. Factors such as soil type, slope, rainfall intensity, wind intensity and direction, and vegetation cover influence natural erosion rates. However, activities such as vegetation clearing, over-grazing, earthworks and road building can accelerate erosion to an alarming rate.

Whether you have a bush block or run stock it is important to regularly walk over your property checking for erosion points. It is a good idea to go out when it is raining to observe where water flows over your land. On a windy day take notice of any areas where soil is being picked up. Once you are aware of an erosion problem, the quicker you act the better.

Soil erosion 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.



Erosion at Werribee Vale Road, Bacchus Marsh (HL)

Erosion control

The best protection against erosion is adequate groundcover. Remnant native vegetation and deep-rooted perennial pastures provide the most durable protection for your soil.

Other considerations include:

- exclude stock from vulnerable areas such as drainage lines, riparian zones and waterlogged areas
 - plant windbreaks of native trees and shrubs along the north and north-west boundary of open pastures
 - on hot days stock tend to congregate under trees for shade, compacting the soil. Plant several shade tree areas in your paddock to dilute the impact
 - when designing new roads, fences or drains try to follow contours where practical
 - ensure runoff from tracks is evenly distributed across paddocks through a series of small drainage trenches
 - regularly maintain tracks to reduce erosion
 - lay branches across bare slopes of remnant vegetation areas to build up leaf litter to slow water movement
 - revegetate bare areas with indigenous plants or perennial pasture grasses
 - carefully manage grazing of stock to ensure a maximum of 100% or minimum of 70% groundcover, or 90% on hills with a minimum of 5cm grass height
- livestock tracking along fence lines can create serious gully erosion on sloping land. Try placing obstacles along a fence track to prevent it scouring out and position fencing on the break of slope
 - plant vegetation strips along contour lines in sloping paddocks to slow water flow down
 - use your land according to its capabilities.

If you believe an erosion problem is getting out of hand and you need advice, Agriculture Victoria has soil extension staff to assist, talk to your neighbours or your local Landcare group.

For further information visit: agriculture.vic.gov.au/farm-management/soil/erosion





WATER

Australia is one of the driest continents on the planet and climate change predictions suggest there will be lower rainfall and more severe weather conditions in the future. Water is one of our most precious and finite resources. We need to use it as efficiently as possible and protect the water quality for downstream users.

Water moves through a cycle from the ocean, to the atmosphere, to the land and back to the ocean. Along the way it is stored in the soil, in dams and wetlands and flows through rivers, streams and creeks. Plants, animals and people all need water for survival.

When managing a small property you need to be aware of the amount of water you will need for your family, stock, the environment, fire fighting and the activities you undertake that may affect the quality and quantity of water leaving your property. Your land is part of a catchment and how you manage water will impact beyond your property boundary.

Assessing the amount of water you have access to throughout the year can determine what activities you undertake on your land. For example, if you have a limited supply and storage of water it is pointless considering running a large herd of thirsty stock.

Sources of water

Tank water

This is the cleanest and cheapest source of water. Rainwater is captured from roof surfaces and stored in covered tanks to reduce evaporation and contamination.

Water moves from the tank by gravity feed or by pump for household usage or to fill stock water troughs. The amount of water available will depend on your local rainfall, roof surface area and tank storage

capacity. You may need to consider and budget for water cartage in the summer months. New rainwater tanks must be installed by a licensed plumber.

A good calculation to remember is 1mm of rain = 1 litre of water per square metre of roof area, then allow for 15% wastage factor.



Mains water

If your property is close to a town you may be on mains water. This source provides a guaranteed supply of drinkable water, but it is usage-based and may be subject to restriction in times of water shortage and is a cost to your farm.

Assessing the amount of water you have access to throughout the year can determine what activities you undertake.

Dams

Many properties have dams of varying size and quality. Dams capture surface water runoff but are very inefficient as they can lose large volumes of water due to sun, wind, seepage and leakages. The diversion of water into dams can have a significant impact on the volume of water entering natural waterways. If you plan to construct a new dam or enlarge an existing dam contact your local council, Southern Rural Water or Melbourne Water to find out if you need a permit.

It is a good idea before constructing a dam on your property to estimate the water you will need and what will be more cost effective e.g. having one large 5 megalitre dam in a good catchment area with good land fall could mean you build one dam and place water pipes to paddocks and troughs leading to less evaporation and cost.



Stream water

If you own and occupy land that has stream frontage you may be able to pump water to a header tank that then gravity feeds to stock water troughs. You may require an annual diversion license to pump from a stream. Refer to Melbourne Water or Southern Rural Water for clarification. Pumping water from a living ecosystem can be quite detrimental to flow rates and water quality. You may also find that water does not flow all year round or may dry up when rainfall is low, resulting in an unreliable source of water. You are not permitted to dam a watercourse. If you are unsure if your proposed dam is on a watercourse, you need to contact Melbourne Water or Southern Rural Water to organise an inspection to complete a waterway determination.

Groundwater

If you have groundwater on your property at a reasonable depth, quantity and quality you could sink a bore to access water for stock. Removal of groundwater can reduce stream flow or cause land to collapse. You will need to apply for a Bore Construction License from your water authority. Salinity can be an issue with bore water, so check to make sure the EC (electrical conductivity) level of your water is suitable for stock consumption.

Irrigation access

There is an irrigation season that generally runs from 15 August to 15 May. Domestic and stock water is only available in the irrigation season. You should ensure you have sufficient on-farm storage water during the non-irrigation season. If you purchase land with a channel, you will need irrigation rights.

Water budget

As with any finite resource it is helpful to develop a water budget for your property across the seasons. To do so you need to calculate your water input, output and storage capacity.

A good calculation to remember is 1mm of rain = 1 litre of water per square metre of roof area, then allow for 15% wastage factor.

For further information visit:
www.agriculture.vic.gov.au/farm-management/water
www.agriculture.vic.gov.au/farm-management/water/farm-water-solutions

For further information on Stream water, Groundwater and Irrigation access visit: www.melbournewater.com.au/ or www.srw.com.au/

For detailed information on your legal obligations and required permits for accessing water visit:

www.melbournewater.com.au/water-data-and-education/waterway-diversions/dam-safety-licences-and-registration

Water usage

Stock

The type of stock you have will impact on water usage. While a sheep will require around 3.5L/day, a horse will need around 35L/day. Lactating stock will require more water when feeding their young, particularly during hot weather. In summer a cow has a daily water intake of around 100L/day that

increases to 210L/day when feeding a calf.

Wildlife

Native animals will also consume water from dams, streams and water troughs. An Eastern Grey Kangaroo for example, will drink 1.1L/day. If large animals such as kangaroos, have access to your water sources, you will need to factor in this impact on your water storage.

Household

Household water usage will vary depending on the size of your house, if you have a septic system, the number of family members, how frequently you are in residence or have friends visit, if you have a pool or a large garden.

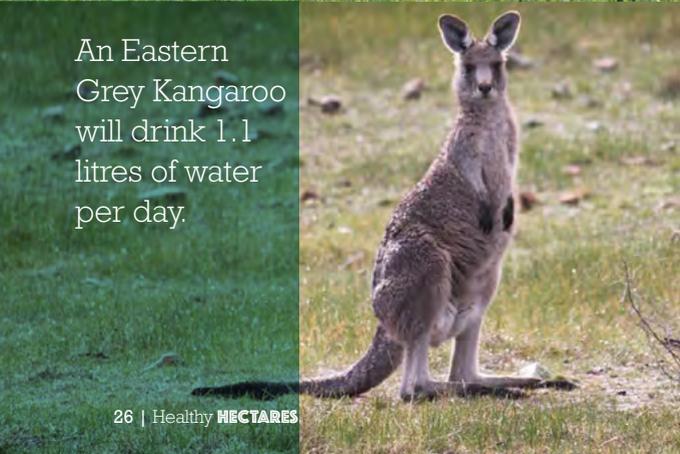
Sheep will require around 3.5 litres of water per day.



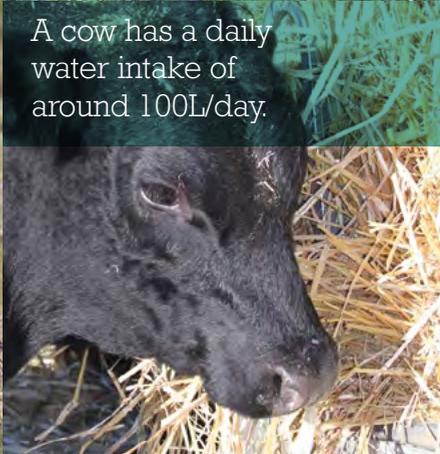
A horse will require around 35 litres of water per day.



An Eastern Grey Kangaroo will drink 1.1 litres of water per day.



A cow has a daily water intake of around 100L/day.



Garden

Water usage will vary from high water usage for vegetable gardens and lawns to low usage for indigenous gardens that are well mulched.



Fire-fighting reserve

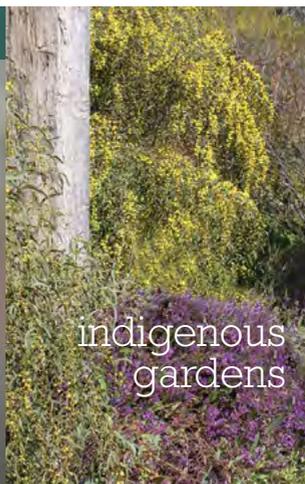
Councils specify that if you live in a fire-prone area you must have a minimum amount of water available and accessible for fire-fighting purposes. Check with your local council.

If you plan to stay and defend during a bushfire, the CFA recommends

you establish a water supply of at least 10,000 litres (independent of the mains supply).

For further information visit: www.cfa.vic.gov.au/plan-prepare/how-to-prepare-your-property/farms/fire-safety-on-the-farm

Black-anther Flax-lily



indigenous gardens



Clustered Everlasting (CL)



Runoff

How water moves over your land and soil will affect water quality, water capture and drainage. When you have a high rainfall event, does the water drain away or pool in low-lying areas? Do you notice a high sediment load washing into watercourses running through your property? Activities such as earthworks to construct a road or drain on your property will affect the flow of water. Constructing a dam will reduce the amount of water flowing into natural watercourses impacting on your downstream neighbours and the plants and animals that depend on a fresh, healthy waterway.

If your soil is exposed because of clearing or over-grazing, a rainfall event may cause soil erosion, washing sediment into waterways. Sedimentation is a major hazard for native fish, frogs, invertebrates, plants and algae. It reduces light and covers holes and crevices that provide shelter and breeding sites. Maintaining good groundcover and controlling erosion on your property will help reduce sedimentation.

Runoff can carry fertilisers, either applied or from animal manure, into waterways. This nutrient loading can cause excessive plant growth (eutrophication) and algal blooms in waterways. Algal blooms in particular, are toxic to plants and animals as well as humans. Managing animal manure in your pastures and using organic fertiliser that combines readily with the soil will assist in reducing eutrophication of waterways.

Chemical sprays such as pesticides and herbicides can seriously damage water quality. Spraying near a waterway or on a windy day can result in spray drift of chemicals into a waterway. Runoff will also carry chemicals through the soil and into creeks. If you are going to apply pesticides or herbicides, avoid spraying near waterways and on windy days or when rain is predicted. Read the label to check for suitability of use near a waterway.



(KW)

Timber in streams

Woody debris such as branches, logs and trees can end up in a stream. While they can be a little frustrating at times, woody debris is a vital component of healthy rivers and streams. The presence of fallen trees and logs in waterways assists with the formation of pools, scour holes and channels in the stream that creates a diverse range of flow rates and habitats for fish and other aquatic

and terrestrial plants and animals. Woody debris offers protection from currents and sunlight, shelter from predators, a vantage point for hunting, a safe breeding place and a source of food. Woody debris cannot be removed from streams without a permit from the Corangamite Catchment Management Authority and Melbourne Water.



(11)

Messy streams are
healthy streams!

Protecting creeklines and waterways

The riparian zone is a narrow strip of land adjacent to a river, stream or creek. This area can be characterised by plant species that are adapted to a wetter environment such as reeds, sedges, tussock grasses and mat-rush. Riparian zones are extremely important as they help slow down the flow of rainwater runoff allowing filtration of nutrients and sediment before it enters a watercourse. Streams and rivers are dynamic systems, their path and flow constantly changes with time. Riparian vegetation helps stabilise stream banks, reducing the incidence of erosion and maintenance of stream channels. Riparian vegetation can also shade a waterway, reducing water temperature and provide critical habitat for a multitude of organisms.

Apart from ensuring your riparian zones are not inundated with weeds, one of the most important steps you can take to maintain this valuable ecosystem is to prevent stock from accessing the area. Damage caused

by stock can be detrimental to the waterways. Stock damage the stream bank with access tracks, consume and trample the vegetation that would normally filter the water entering the waterways and stabilise the banks. In addition to causing erosion, stock pollutes water through their faeces which contains high nutrient loads.

Whenever possible, fence off your riparian zones to exclude stock access. The wider your protected riparian zone the better. A 40m corridor is ideal but as a minimum, aim for about a 10m setback from the stream bank edge. This should allow enough room for vehicle access for ongoing maintenance and any future bank loss due to erosion.

For further information visit: www.melbournwater.com.au and search Liveable Communities, Liveable Waterways grant information Waterway Incentive visit: www.ccma.vic.gov.au/waterways/waterway-management/waterway-protection/



Dam maintenance and enhancement

Dams require regular monitoring and maintenance. Leaking dams and waste water can contribute to erosion. Pack any weak points with clay and topsoil. Ideally dams should be fenced off to exclude stock (and rabbits that tunnel into dam walls). Aim to construct your fence a minimum of 10m from the high waterline. If you are depending on dam water for stock, ensure you have the appropriate infrastructure in place to either gravity feed water to troughs directly below the dam or pump water from the dam to stock water troughs. If this is impractical for your situation and you need stock to access the dam water, provide one small access point to the water and exclude the remainder of the dam. Make sure you stabilise the walkway to the water's edge with rocks to prevent erosion.

Dams can be an important water source for fire-fighting purposes, so remember to allow for vehicle access via a gate in your fence design.

Fencing off a dam can also allow natural revegetation of terrestrial and aquatic plants. This can be supplemented by planting suitable native species. If planting on a dam wall or rim, use low-growing plants,

as large shrubs and trees drive their roots into the wall creating a potential seepage point. Ideally you want your dam to be a combination of shallow water and deep water to allow a range of aquatic and semi-aquatic vegetation to grow.

Dams can provide important habitat for wildlife. Fencing off and revegetation generally results in a dense growth of vegetation in and around your dam. Perfect habitat for a range of birds, frogs, bats, lizards, butterflies and dragonflies. A log, dead tree or an island in the dam can provide excellent roosting sites.

Making your dam wildlife-friendly by revegetating can reduce water loss from evaporation, improve water quality, provide shade, assist with natural pest control in nearby pastures and create a beautiful, restful place for you to enjoy.

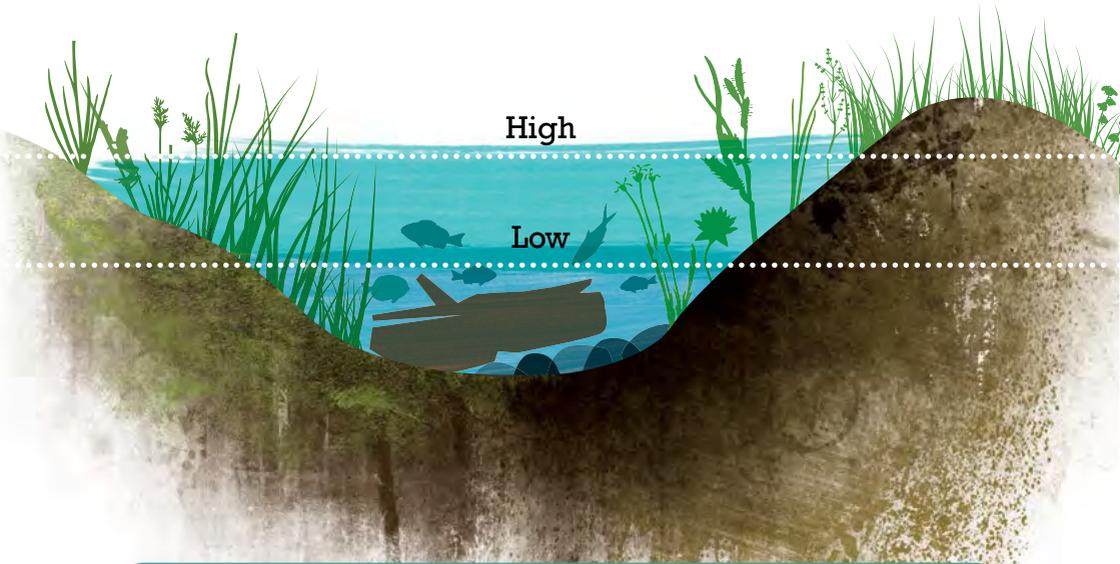
For further information visit:

<https://agriculture.vic.gov.au/farm-management/water/managing-dams>

<https://agriculture.vic.gov.au/farm-management/water/farm-water-solutions/managing-farm-water-supplies>



Dam cross section



Examples of plants suitable for planting in and around a dam. Many more plants are appropriate. Consult your local indigenous nursery for advice.

Low water line (30cm-70cm depth)	High water line (0cm – 30cm)	Dam edge to 5m distance (ground periodically wet through winter)
Upright Water Milfoil (<i>Myriophyllum crispatum</i>)	Jointed Twig-rush (<i>Baumea articulata</i>)	Swamp Wallaby Grass (<i>Amphibromus nervosus</i>)
Water Ribbons (<i>Triglochin procerum</i>)	Tassel Sedge (<i>Carex fascicularis</i>)	Pale Rush (<i>Juncus pallidus</i>)
Floating Club-sedge (<i>Isolepis fluitans</i>)	Water Pepper (<i>Persicaria hydropiper</i>)	Tall Sedge (<i>Carex appressa</i>)
Tall Spike-sedge (<i>Eleocharis sphacelata</i>)	Loosestrife (<i>Lythrum hyssopifolia</i>)	River Lomatia (<i>Lomatia myricoides</i>)
Floating Pondweed (<i>Potamogeton tricarlinatus</i>)	Green Rush (<i>Juncus gregiflorus</i>)	Woolly Tea-tree (<i>Leptospermum lanigerum</i>)
Common Reed (<i>Phragmites australis</i>)	Common Spike-sedge (<i>Eleocharis acuta</i>)	Swamp Paperbark (<i>Melaleuca ericifolia</i>)



BIODIVERSITY

Biodiversity refers to the variety and interaction of all living things: plants, animals, micro-organisms and people and the ecosystems that they function within. We can identify many individual organisms, but our understanding of the millions of different interactions between them is poor.

The consequences of the loss of a single species, whether it is a tree-dwelling glider, an aquatic plant or a soil fungi, is not always known or understood. What we do know is that Australia is setting world records for biodiversity loss and species extinction.

The topography of the Moorabool Shire is characterised by ranges, plains and rugged river gorges that provide spectacular scenery. These areas contain many significant flora and fauna species; in particular, Brisbane Ranges National Park is one of Victoria's most significant reserves, with over 20% of the State's plant species.

Moorabool Shire spans two bioregions: the Victorian Plains Bioregion occurs predominately in the south where there is highly productive agricultural land, which also contains highly valuable grasslands and grassy woodlands. The Central Victorian Uplands Bioregion extends across the north of the Shire and includes grassy woodlands and forests.

Bioregions are a landscape-scale approach to classifying the environment using a range of attributes such as climate, geomorphology, geology, soils and vegetation. Each Bioregion has a number of Ecological Vegetation Classes (EVC) which are the standard unit for classifying vegetation types in

Victoria. You can view this information in relation to your property in a special mapping tool called NatureKit. <https://www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks>.

There are 17 threatened fauna species, such as the Golden Sun Moth, 15 threatened flora species including the Spiny Rice-flower and five Ecological Vegetation Communities (EVCs) are listed as either critically endangered or endangered under the EPBC Act 1999. These are Grassy Eucalyptus Woodland of the Victorian Volcanic Plain, Natural Temperate Grassland of the Victorian Volcanic Plain, Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and the Grey Box Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.

As a landholder, you have an opportunity to improve the biodiversity of your property because every little piece counts.

Koala (CL)



Grey Fantail (CL)



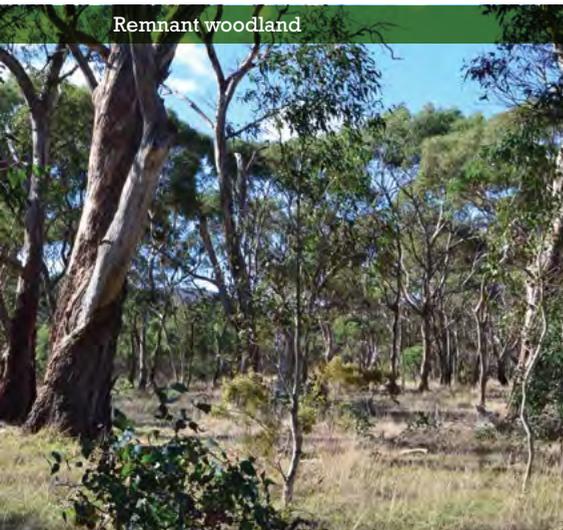
Superb Fairy-wren (CL)



Habitat diversity

A habitat is the place or type of site where a species naturally occurs. For example, the Speckled Warbler likes a good quality remnant woodland environment that has a grassy understorey of native tussock grasses and a sparse shrub layer. The trees (dead or alive) of this habitat provide safe roosting places for the birds and the grassy groundcover provides a foraging area to feed on seeds and insects with most foraging taking place on the ground around tussocks and under bushes and trees. They build a rounded domed nest of dry grass and strips of bark located in a slight hollow in the ground or at the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside.

The key to maintaining the biodiversity of an area is protecting and enhancing the habitat of the fauna/flora that naturally live or occur there. Loss of habitat can result in species extinction. Most plants and animals are specifically adapted to a particular habitat whether it be woodland, freshwater or grassland. They typically only survive within that habitat. The range of habitats directly affects how many species will be present in the landscape. The more types of habitats you can protect and restore on your property, the better. If you can expand native grassland in your pastures, protect and enhance wetlands and create more woodland habitat, you will increase biodiversity on your property.



Remnant woodland



Speckled Warbler (RW)

Habitat structure

How you manage habitat restoration is important. Habitats are generally made up of different vegetation layers.

Upper storey – mainly consists of tree species. Trees have a vital role in stabilising the soil, providing oxygen, storing carbon and providing food and shelter for countless organisms. Flowering trees provide nectar for insects, possums, gliders, bats, parrots and honeyeaters. Hollows in large, old trees provide shelter for small mammals, parrots and owls. Bark provides shelter for countless insects and spiders that Brush-tailed Phascogales and treecreepers feed upon.

Mid storey – shrubs and bushes. This layer provides food and shelter for many insects, gliders, small birds and honeyeaters. Prickly or dense shrubs, such as Hedge Wattle (*Acacia paradoxa*), provides welcome protection for small birds that forage on the ground and lower levels of vegetation. The mid storey also provides shade and protection to ground storey plants and emerging seedlings of upper storey plants.

Ground storey – herbs and grasses. This level tends to have the greatest richness of plant species. Ground storey plants are important because they provide a food source and shelter for reptiles such as the Common Bearded Dragon, insects such as the Varied Dusky-blue Butterfly, seed-eating birds such as grass parrots, thornbills and finches. Ground storey plants create suitable conditions for larger plants to grow (e.g. shelter, shade and maintenance of soil moisture and nutrients). Unfortunately they are often the most easily impacted upon by disturbance, nutrient enrichment and compaction, and are the hardest to re-establish.

Tawny Frogmouth



Eastern Spinebill



Hedge Wattle



Red-rumped Parrot



Lichen thrives in undisturbed sites where nothing else will grow. They grow on rocks, barren soil and the bark of trees. They enrich the soil by trapping water and silt, holding the soil in place and preventing erosion. Lichen are amazing 'resurrection plants' that dry out in extreme heat and flourish with the first sign of moisture. When lichen die they contribute organic matter to the soil so that other plants can grow there.

Moss is brilliant at trapping nutrients, water and soil and will break down to contribute to organic matter. In dry conditions moss, together with lichen, can form extensive soil crusts which help maintain the underlying soil structure and moisture.

Fungi are vital for breaking down dead plant material. Mycorrhizal fungi that live in the soil are important for a number of local plants, but particularly for orchids. The fungi colonise the orchid's root system and aid in the uptake of soil nutrients.

Leaf litter consists of fallen leaves, twig and bark. It is important because it provides shelter and food for creatures such as insects, spiders and small reptiles. Leaf litter can reduce moisture loss from the soil, breaks down to provide soil nutrients, influences the soil microclimate and enhances plant germination and survival.

Dead trees (also referred to as stags) play an important role. Hollows can take up to 100 years to form. Many old, dead trees contain numerous nesting spaces for hollow-dwelling animals. Large, dead trees are a favourite of Wedge-tailed Eagles and other raptors as a hunting vantage point.



Lichen



Fungi



Moss



Leaf litter



Logs whether they are small, large or rotting provide shelter and nesting places for a range of different animals from echidnas, antechinus, reptiles, spiders and insects. Logs also provide a food source for insect-eating birds such as robins and wrens that forage around fallen logs and are an important habitat for frogs as they retain moisture. Logs trap soil and leaf litter reducing the impact of soil erosion and assisting in building soil health.

Rocks are another important component of a habitat as they provide shelter and protection for animals such as the Striped Legless Lizard, and they can provide structure and nutrients to the soil over long periods of time.

Artificial habitats such as nest boxes or insect hotels could be considered.

For more information visit:
www.ari.vic.gov.au/research/people-and-nature/use-of-nest-boxes-in-victoria

Some vegetation communities such as Plains Grassland are dominated by ground storey plants and have few if any trees; others such as Box Ironbark have an open canopy of upper storey trees, a scattered mid storey and sparse ground storey. If you are revegetating a section of your property to recreate the original habitat you need to take into account the structure of the vegetation community.



Yellow-footed Antechinus (SH)



Short-beaked Echidna



Nature at work

Native invertebrates such as butterflies, bees, ladybirds, ants, gnats, beetles, spiders, wasps and dragonflies benefit the environment in many ways. They are our plant pollinators (together with bats and birds), our waste recyclers, our pest eaters, our soil conditioners and an important source of food for many native birds, frogs, reptiles and mammals.

The food chain cycle of the insect kingdom is much the same as the animal kingdom. There are more herbivores than carnivores. In a balanced system, populations of leaf-eating and sap-sucking insects such as grasshoppers or aphids are controlled by predatory insects such as ladybirds, ants and dragonflies.

With a range of different habitat types and a biodiversity of insect groups the natural system can work well at balancing itself.

Spray a broad acting insecticide or herbicide and the natural balance of the food chain can be disturbed as prey and predators alike are killed. Herbivore insects then breed quickly compared to carnivore insects. Consequently after the spraying of a non-specific insecticide it is the surviving herbivores that fill the gap and rapidly build numbers as their predators have a slower breeding cycle and are never as numerous as the prey species. Potentially you have a cycle that decreases the beneficial insects and increases your unwanted insects.

The roles of invertebrates

GROUP 1 CARNIVORES

Ladybirds, Ants, Beetles, Bugs, Dragonflies, Earwigs, Lacewings, Praying Mantis, Spiders & Wasps



Fiddler Beetle



Spiny Spider

GROUP 2 HERBIVORES

Grasshoppers, Leaf Hoppers, Aphids, Katydid, Saw flies, Stick-insects, Weevils, Butterfly & Moth Caterpillars



Caterpillar



Katydid (RB)

GROUP 3 POLLINATORS

Bees, Wasps, Butterflies,
Moths & Hover Flies



Hover Fly



Chequered Cuckoo-bee

GROUP 4 RECYCLERS

Cockroaches, Dung
Beetles, Termites, Ants
& Earthworms



Earthworm



Cockroach

GROUP 5 SOIL CONDITIONERS

Bacteria and microbial
activity, Nematodes,
Micro biology & Fungi



Puffball Fungi



Fungi

Invertebrates can be an indicator of the health of your property. High diversity of invertebrates across a range of groups reflects a healthy ecosystem. Low diversity of invertebrates, and especially large numbers of certain pests such as mites, lerps, locust, crickets or aphids, indicates poor health.

Because so many invertebrates interact closely with plants for food and shelter, there is often a strong correlation between the richness of indigenous plant cover and the richness of native invertebrate

populations. A remnant woodland will support a large number of diverse invertebrates compared to a grazed paddock dominated by a small number of pasture plants.

Planting certain plant species can also be beneficial in managing invertebrates that can become pests. For example, Sweet Bursaria nectar attracts predatory Thynnid Wasps. These insects parasitise Christmas Beetle larvae that normally love to over-chomp on Eucalyptus leaves.

Threats to invertebrates include:

- the clearing of native habitat and subsequent loss of plant diversity
- disturbance through continuous grazing and weed invasion
- burning stubble
- removing fallen logs
- reduction of leaf litter
- spraying of non-targeted chemicals;
- increasing soil salinity and acidity.

Having a rich and diverse range of native invertebrates indicates healthy hectares.

For assistance in identifying invertebrates visit:

www.backyardbuddies.org.au/explore/bugs-and-insects

www.australianmuseum.net.au/insects

www.cesaraustralia.com/sustainable-agriculture/identify-an-insect/insect-gallery/

www.wildpollinatorcount.com

Birds as indicators of healthy hectares

Birds are attracted to different habitats for food, water and shelter. Different birds have different needs and can be indicative of the health of various aspects of your property.

Open pastures will vary depending on whether they are native grasses or introduced pasture grasses. Ground foraging birds will be more common on native grass pastures than introduced pasture grass that has been fertilised. Typically pastures have a scattering of remnant trees. The more the better as they can act as stepping stones across open farmland or roosts to survey the farmland for prey. Open pastures usually have little shrub and log cover.

This is ideal habitat for the large predatory birds such as the Wedge-tail Eagle, Laughing Kookaburra and the Australian Magpie. These larger birds are generally more aggressive and drive off the smaller

birds. Pasture grass can also attract seed eating birds such as the Little Corella, Sulphur-crested Cockatoo, Galah, Red-rumped Parrot, Eastern Rosella, Singing Bushlark, Diamond Firetail and Red-browed Finch. Insect eaters such as Willie Wagtails and Australasian Pipit can often be seen flitting about pastures catching insects. Pest birds such as Noisy Miners tend to increase in number in open habitats that lack understory shrubs.

Woodland habitat is dominated by trees, but with a relatively low canopy cover of less than 30%. Eucalypts dominate the canopy and the understorey is relatively open, often containing native grasses.

Woodlands greater than 10ha and connected to vegetation corridors are ideal to encourage a wide diversity and number of birds.

Woodland birds need the protection of shrubs and trees to hide from predatory birds, shelter from the weather and to build nests and raise their young. They are some of our greatest natural pest controllers reducing insect attack, such as psyllids, on trees and shrubs.

Woodland specialists include Eastern Yellow Robin, Superb Fairy-wren, Pardalotes, Thornbills, Golden Whistler, White-throated Treecreeper, Grey Shrike-thrush, Rufous Whistler, Diamond Firetail and Red-browed Finch.

Woodland edges are popular with birds that are attracted to the relative safety of the woodlands but also forage in the more open pastureland. This includes birds such as Gang Gangs, Red Wattlebird, Black-faced Cuckoo-shrike and New Holland Honeyeater.

Wetlands are low lying areas that are at least periodically inundated with water. They include rivers, lakes and dams. Wetlands are important bird habitats, and birds use them for breeding, nesting, and rearing young. Birds also use wetlands as a source of drinking water and for feeding, resting, shelter, and social interactions. The Sacred Kingfisher for example is a woodland bird that nests in large tree hollows, but hunts in waterways for fish and shrimp.

Birds commonly found around wetlands include the Pacific Black Duck, Australian Wood Duck, Blue-billed Duck, Purple Swamphen, Dusky Moorhen, White-faced Heron, Pied Heron, Grebes and Cormorants.



Vegetation communities

A vegetation community is made up of various plants that grow in that particular habitat. There are numerous Ecological Vegetation Communities in the Moorabool Shire. Vegetation communities are influenced by the soil and topography around them, the aspect and micro-climate. Each vegetation community is distinct, although some species can be found in a number of communities. Identifying vegetation communities that exist, or formerly existed, on your property and planting the appropriate plant species according to that habitat structure is important.

It's no point planting Grassy Woodland species on your property if it was originally covered with Riparian Shrubland species as the plants, generally, are not suited to grow in the same soil with the same rainfall and weather conditions.

To learn more about some of the species and features of different Vegetation Communities in Moorabool Shire visit:

www.environment.vic.gov.au/biodiversity/naturekit

www.environment.vic.gov.au/biodiversity/bioregions-and-evc-benchmarks



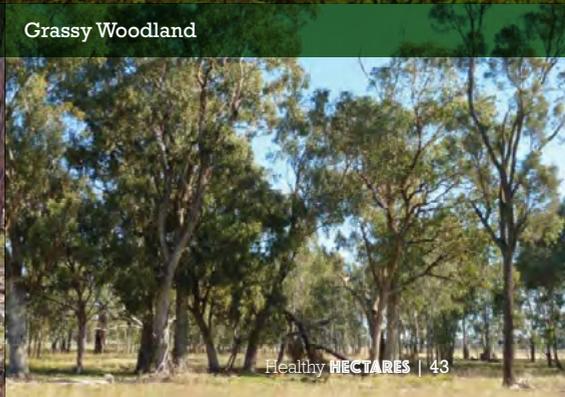
Grassy Dry Forest (HL)



Wetland



Lowland Forest (HL)



Grassy Woodland

Management of native vegetation

Vegetation management centres on retaining the existing remnant vegetation and allowing it to regenerate, and revegetating areas that have been degraded or would be strategic for animal movement across your property. Revegetation can be expensive and time consuming. Fencing off a remnant area and allowing natural regeneration from the soil seed bank is generally preferable.

Protecting and restoring

remnants Remnant refers to any original indigenous plants left in a particular area. A single mature Grey Box (*Eucalyptus microcarpa*) in a paddock is as important a remnant as is a large swathe of indigenous shrubs, herbs, grasses, lichen and fungi. Remnants may contain rare and threatened flora and fauna or habitat for nomadic and migratory birds. They can be a valuable source of local seed for regeneration and revegetation. The location and size of remnants on your land and neighbouring land is important.

Clearing land for agriculture or building has tended to break remnant vegetation into small parcels. This fragmentation of vegetation isolates many plant and animal species from other remnant stands, limiting genetic diversity resulting in biodiversity decline and species extinction. However, if these remnant pockets are large and connected or close to one another, the impact of isolation is reduced, as pathways for wildlife and seed movement are created.

Larger patches of vegetation are valuable because they can support a greater diversity of habitats and therefore species. Where a remnant stand meets a cleared paddock there is a habitat edge. Species living in these habitat edges are often affected by increased light penetration, winds, increased rates of predation, competition, weed invasion, noise, and adjacent land use including chemical spray drift and soil disturbance. To reduce the effect of these edges on biodiversity it is therefore important to have stands that have a large core area. Try coordinating with neighbours to create a larger core remnant area across property boundaries.

Corridors and stepping stones between remnant patches allow species to safely move from one stand to another. Some animals need large patches of vegetation to enable safe movement through the landscape. Narrow, linear remnants should be avoided as they tend to favour certain species such as the aggressive Noisy Miner.

(KS)

If you are fortunate enough to have some areas of remnant vegetation on your property your first priority could be to fence around them to protect the area. This will limit the number of grazing animals entering the site and causing degradation of vegetation by causing physical damage and spreading of weeds. Once you have fenced off your remnants you can then actively manage pest plants and animals to exclude them from the area and allow natural regeneration to occur.

Remnant trees in paddocks benefit greatly from large logs being strategically placed around them to deter stock camping under them

and prevent soil compaction and weeds growing. With grazing and weed pressure removed natural regeneration can occur to create a larger, more resilient area that provides valuable habitat for wildlife. If your stock requires shade or shelter consider creating a limited access area to the south or east of the tree.

If your remnant area is too narrow or too isolated you may need to consider revegetating on the edges to expand your remnant area or revegetating to create stepping stones between your remnants.



Natural regeneration around a fenced off remnant



Trees as stepping stones across a paddock



Remnants fenced off from stock



Fenced off wildflowers flourish (JH)





(HL)

Revegetation

Revegetation projects, regardless of aim and size, require planning. Focus on one area at a time so you are not overwhelmed. Remember planting doesn't all have to be done immediately, but rather according to a well thought-out plan.

Where to plant?

You may decide to revegetate an area on your property for many reasons e.g. remnant enhancement, to create a shelterbelt for privacy, shade for stock or to control erosion. You may want to plant to attract more birds to your property or to turn your dam into a wetland paradise. Once you have decided where you want to revegetate, you need to think about the size and shape of your planting.

Ideally, plantings of two or more hectares are better for biodiversity than smaller ones because they create a more resilient core that supports a greater numbers of species. This may not always be possible on a small property and establishing small stepping stone

plantings may be a more practical approach.

Broader plantings are preferable to long, narrow plantings less than 30m wide. Wildlife needs a fairly broad area of vegetation to feel safe enough to nest. Narrow plantings along fence lines will provide a pathway for wildlife and are therefore of value, but if you want bird populations to expand you need to widen narrow plantings to encourage nesting.

For further information visit:

<https://growwest.com.au/publications/> and scroll down to Grow West Revegetation Guide



Shelterbelts

A strip of vegetation along a fence line or to fill a small space can be a good way to screen your house from neighbours, create a windbreak or provide shade for livestock.

Shelterbelts typically are planted out with a mix of local shrubs and small trees that grow to a height of around 3m and a width of 2m.

Plant a minimum of 4 rows wide with the tallest species in the centre. The species you plant will depend on what naturally grows in your area and what soil type you have. Examples include: Lightwood (*Acacia implexa*), Drooping Sheoak (*Allocasuarina verticillata*), Red Stringybark (*Eucalyptus macrorhyncha*), Golden Wattle (*Acacia pycnantha*), Common Cassinia (*Cassinia aculeata*), Hedge Wattle (*Acacia paradoxa*), Prickly Current-bush (*Coprosma quadrifida*) and many more!

For further information visit:
<https://www.mln.org.au/mln-nursery>

Ideally ensure your shelterbelts are as wide as possible and provide a corridor to connect with remnant vegetation. If you want a shelterbelt to act as a windbreak plant your shrubs and small trees at right angles to the direction of the most damaging wind and stagger plants across 3 to 5 rows. Depending on the length of your shelterbelt you may need to leave a gap for fire-fighting vehicle access.

For further information visit:
www.gbcma.vic.gov.au/land_and_biodiversity/resources_publications/shelter-belts-on-farms

What to plant?

A key issue is to choose plants that suit your soil type and climate. Find out what vegetation communities existed on your land and look at the habitat of where you want to revegetate. (Refer to the web references on pg 47). Plants that grow naturally on a rocky hillside will be different to those that thrive on an open plain. Select a range and ratio of species to represent the original vegetation association as closely as possible. Your local indigenous nursery can help you work a good mix of tree, shrub and understorey plants. Many councils also have good species guides.

Plants should be sourced from a local specialist indigenous nursery that grows plants from seed collected locally. This is known as local provenance and is important in maintaining the biodiversity of the area. Plant seedlings are usually available in 15cm tall plastic tubes known as tubestock. In general, tubestock is more successful as the roots are less likely to girdle and the plant establishes more readily. Tubestock is also a cheaper option than buying more mature plants. You will need to contact your nursery around 8 months prior to planting to discuss species and numbers of plants required.

Direct seeding can be a useful alternative for large scale plantings. Your local landcare group may have advice on what and when to plant or have some equipment such as Hamilton tree planters for hire.

When should you plant?

Planting should be timed to avoid extremes in weather such as frosts or hot, dry conditions. Generally planting in the winter months (unless you have a very wet site) meets these requirements and allows the root systems to establish.

Pre-planting

Weeds should be controlled prior to planting to reduce competition and post-planting maintenance. Some weeds such as Sweet Vernal-grass (*Anthoxanthum odoratum*) release chemicals into the soil that suppress plant growth. Ideally reduce weeds around 6 months out from planting and then again 2-3 weeks from planting time.

Your young plants will need watering when you plant them, and supplementary watering until they become established. Plan how you will get water to your planting site. This may be a problem on very steep sites and you will need to rely on local rainfall. Ideally you want your new plants to get their roots down into the soil as quickly as possible.

Protection of plants from grazing animals will be needed for three to six years. You will need to either fence the area, or factor in the cost of individual tree guards available from your local indigenous nursery.

Planting

Make sure you plant the species of plant according to the recommendations of the nursery. Groundcovers do best if planted close together and trees more widely separated.



Step 1 – Pre-soak plants

Give your plants a thorough pre-soaking in a bucket of water prior to planting. For larger scale plantings, water your plants the evening before.

Step 2 – Dig a hole

Using a mattock or a Hamilton Tree Planter (if the soil is soft), dig a hole approximately twice the width of the plant container and slightly deeper.

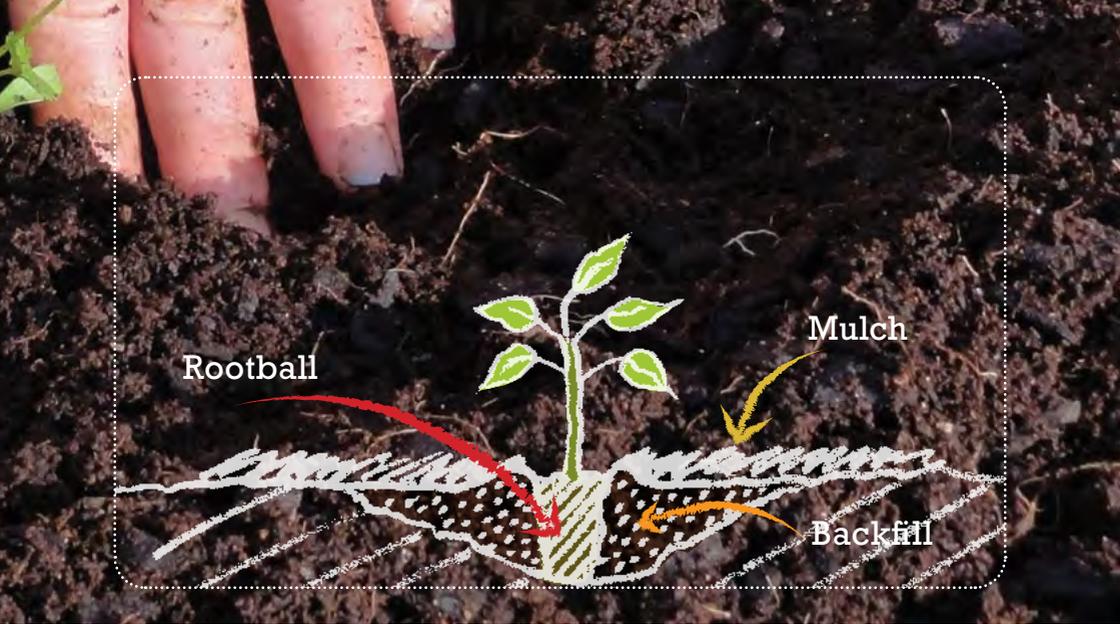
Step 3 – Prepare the plant

Gently support the base of the plant while you tip it upside down and tap the corner of the plastic pot gently against a solid object to knock the plant out.

Step 4 – Place the plant

Take care not to damage the roots as you place the plant a little lower than the original soil level. Firmly replace the soil around the plant, breaking up any clumps as you go and creating a saucer of soil around the base of the plant. This should create a lip so the water is directed down to the roots rather than running off. Make sure you cover the soil on top of the seedling with new soil. Evaporation and drying out occurs if the potted soil is exposed.

Plants may require a good, deep soaking (2 litres) on a regular basis during the first summer.



Step 5 – Protect the plant

Tree guards are held in place by hammering hardwood stakes into the ground. There are a number of guard options available including plastic, corflute, cardboard or polymesh. Plastic sleeves tend to be displaced by kangaroos or wind, while stock will eat milk cartons. Tree guards offer a good level of protection against rabbits and hares. If larger grazing animals such as kangaroos and wallabies are an issue, tall wire guards may be necessary. Remember to remove your guards once the plant outgrows them.

Step 6 – Water

Water to the base of the plant to settle the soil around the root system and remove air pockets. Plants may require a good, deep soaking (2 litres) once a week when establishing. With large plantings this can be challenging. Planting in

winter may suffice. Monitor them during hot weather and give them a good soaking if they show signs of wilting.

Plastic drink bottles upended with the bottom cut out and dug in next to the plant can be used to deliver water to your seedlings. It takes more effort initially but is a reliable method of ensuring your plants get a long, slow drink in the hot weather. Simply fill up the bottles with water from a watering can and let it percolate into the soil. Avoid using plastic bottles if you live in a windy area.

Step 7 – Replacement planting

In most plantings there will be some loss of seedlings – up to 20% is not unusual. Some replacement planting of dead seedlings may therefore be needed.



PESTS!

Rabbits feasting on your pasture, foxes killing your prized chickens, Gorse (*Ulex europaeus*) popping up all over the place, deer eating out your new revegetation and Cape Weed (*Arctotheca calendula*) spreading like wildfire across your paddocks! Pests are the bane of every landholder's life. Controlling them takes patience, resources, time and commitment. Pests don't observe property boundaries. Working together with your neighbours or as part of a community group will have the most effective long-term outcome in managing pests.



Blackberry infestation



Blackberry flower

Pest plants

When a plant invades an area where they do not naturally occur they are known as an invasive plant, weed or pest plant. In doing so, they threaten agricultural production, biodiversity, water quality and soil health.

Pest plants may be an exotic (introduced from another country) e.g. Paterson's Curse (*Echium plantagineum*) from Europe. Or they may be a native Australian plant that has spread outside their natural range e.g. Cootamundra Wattle (*Acacia baileyana*) from NSW. They often have a high level of seed production with efficient dispersal, are highly competitive and lack natural controls.

Pest plants invade natural ecosystems and threaten biodiversity. They out-compete indigenous plants for light, space, water, nutrients and pollinators. By limiting the growth of indigenous plants, pest plants reduce the food and habitat available for local wildlife, resulting in more

degraded natural environments with fewer species. Pest plants such as Blackberry (*Rubus fruticosus*) provide protection for pest animals including rabbits and foxes, while others such as Broom (*Genista* spp.) can alter the fuel loads in our bushland and increase the fire risk.

Pest plants can invade and reduce the carrying capacity of pastures or they can poison or cause injury to livestock or contaminate fleece. Agricultural weeds can be indicators of past poor grazing practices.

Some water weeds, such as Water Hyacinth (*Eichhornia crassipes*) degrade the quality of waterways.

Spread

Weeds and weed seed can be introduced and/or spread on to your property in a variety of ways, including:

- lack of awareness and inability to identify weeds
- deliberate introduction (e.g. planting willows to stabilise creek banks; non-indigenous species as wind breaks or garden plants)
- accidental introduction (e.g. in stock feed, on or within animals, on machinery and vehicles, in water, or blown in by the wind)
- poor land management (e.g. overgrazing and erosion)
- herbicide resistance due to over-reliance on particular chemicals.

Your first step in pest plant management is to know your weeds.

Visit the following sites for assistance:

www.agriculture.vic.gov.au/biosecurity/weeds

www.weeds.org.au

www.agriculture.vic.gov.au/biosecurity/weeds/weeds-information

What is my responsibility?

All land managers are responsible for managing pest plants on their land, irrespective of whether the land is public or privately owned. There are two main classes of weeds:

1. Noxious Weeds that you are legally responsible for managing.

Under the Catchment and *land Protection Act 1994* (CaLP Act) certain plants are declared as Noxious Weeds in Victoria. These plants cause environmental and economic harm or have the potential to cause harm. The *CaLP Act* defines four categories of Declared Noxious Weeds:

- State Prohibited Weeds
- Regionally Prohibited Weeds
- Regionally Controlled Weeds
- Restricted Weeds

Prickly Pear



Montpellier Broom



The Victorian Government is responsible for eradicating State Prohibited Weeds. Information and accompanying photographs of these 16 weeds can be found at www.agriculture.vic.gov.au and search 'state prohibited weeds'. If you think you have seen a State Prohibited Weed, telephone Agriculture Victoria on 136 186. Please do not attempt to control or dispose of these weeds yourself. Fines can apply if these weeds are not controlled on your property.

All land managers are responsible for taking all reasonable steps on their land to:

- eradicate Regionally Prohibited Weeds, and
- prevent the growth and spread of Regionally Controlled Weeds.

For assistance visit: agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds.

Restricted weeds such as Chilean needle grass (*Nassella neesiana*) are not to be sold or transported. This means vehicle hygiene is most important to minimise spread.

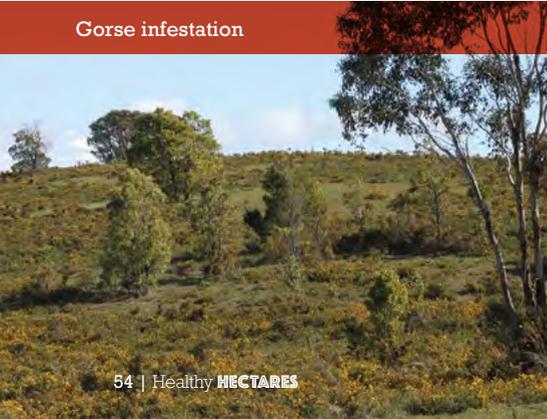
2. Environmental Weeds which you should make every effort to control to protect your unique local ecosystems.

These are plants that threaten native ecosystems and reduce biodiversity. Landholders should make every effort to control these weeds on their land and to prevent their spread to other areas.

As a small landholder, it is important to be able to identify and control all weeds posing a threat to your land or neighbouring land. Weeds don't observe property boundaries, so coordinating weed management with your neighbours or participating in a Landcare, Friends Group or other environmental group will increase your chance of success, while spreading the benefits beyond your property.



Gorse infestation



Gorse flower



Weed types

Once you have identified the weeds on your property it is important to know what type of weed you are dealing with in order to effectively control it. There are three main types of weeds.

1. Annual weeds grow to maturity, set seed and die within a year. They usually have shallow roots and rely on heavy seed production for survival. They can be controlled by hand removal, mowing, applying herbicide to prevent them setting seed or well-timed crash grazing. Examples of annual weeds include Cape Weed (*Arctotheca calendula*), Paterson's Curse (*Echium plantagineum*) and Large Quaking Grass (*Briza maxima*).



Cape Weed

2. Biennial weeds germinate and grow in one year, then set seed and die the following year. They have taproots which store food from the first year and can re-shoot if slashed. They can be controlled in the first year the same as annual weeds to prevent seed set. In the second year they need to be dug up to remove the taproot or sprayed with a herbicide, depending on the size of the infestation. Examples include Scotch Thistle (*Onopordum acanthium*) and Spear Thistle (*Cirsium vulgare*).



Spear Thistle

3. Perennial weeds live longer than two 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 and stems. Seedlings can be controlled in the same way as annuals, but thereafter control becomes more difficult particularly if they produce bulbs. Examples include Blackberry (*Rubus fruticosus*) and Gorse (*Ulex europaeus*). Perennial shrubs and trees are often referred to as woody weeds.



English Broom

For assistance on control techniques visit:
<https://agriculture.vic.gov.au/biosecurity/weeds>

Weed control methods

Hand pulling

This weed control technique is particularly useful with small, scattered infestations and within remnant vegetation as it is targeted and causes minimum disturbance. Knives, garden forks and trowels can also be used, with care being taken to remove the whole plant. You should aim to remove the pest plants before they set seed.



Grazing and slashing pasture

Rotational grazing and slashing can assist in the management of pasture weeds. Refer to pg 68 on pasture weed management.

Revegetation

If your weed control method exposes the soil, it is important to plant or encourage indigenous plants to fill the space which would otherwise be re-colonised by pest plants.

Chemicals

There are a wide variety of herbicides available on the market to control pest plant infestations. There are a number of safety and environmental issues associated with herbicide use.

Some herbicides are specific for certain weeds, meaning they only kill those plants. For example, herbicides that target broad-leaved plants can be used to kill Cape Weed, but they will not kill grasses. Other herbicides are non-specific, meaning they will kill any plant they come in contact with. Spray drift or overspray may affect indigenous plants or desired pasture plants. Whenever possible choose selective herbicides.

Herbicides are toxic and can persist in the environment for a long time. Take care when spraying around waterways and use environmentally friendly options. Do not spray on windy days, in high temperatures, if rain is forecast within 24 hours.

All pest plants have weak points in their lifecycle when herbicides will have the most impact. For the best results, apply herbicides when plants are actively growing and before seed set, unless otherwise specified.

For all pesticides (herbicides, insecticide, drenches, vaccines etc), always follow the manufacturer's application rates and safety guidelines by reading the entire label. Use appropriate safety equipment and store your chemicals safely. All pesticides require that the users of those products have done an Agricultural Chemical Users Certificate. There are some pesticides that require the user to hold an Agricultural Chemical Users Permit. There are some areas where the use of certain chemicals are restricted during various periods of the year

due to the presence of sensitive crops. If you are in doubt or you do not have a certificate or permit, there are experienced and qualified weed control contractors available for hire.

For further information visit:

<https://agriculture.vic.gov.au/farm-management/chemicals>

Cut and paint

Use a hand saw to cut down small trees and large shrubs a maximum of 10cm from the ground. Paint on an application of herbicide that will prevent the stump from re-shooting. Commercial wick applicators are available or use a paint brush - another direct method for controlling larger woody weeds.

Scrape and paint

Use a sharp knife to scrape a thin layer of bark from about 10cm of the stem of shrubs or vines. Apply herbicide to the exposed soft tissue underneath.

Drill and fill

Drill a series of downward angled holes, about 5cm apart, into the truck of large woody shrubs or trees. Inject herbicide immediately into the holes, ideally 15 seconds after drilling. Some environmental weeds are best treated in this manner. For example, Holly (*Ilex aquifolium*) has a waxy leaf and penetration of herbicide through the foliage is difficult. Drill and fill is a more effective treatment on many larger woody weeds, uses less chemical and minimises environmental impact. Factor in the consideration that you may need to remove the dead tree at a later stage.



Herbicides are most effective when the plant is actively growing.

Weed control in creeklines

The land on either side of any waterway (the riparian zone) is a very sensitive area prone to weed invasion that requires careful consideration when managing weeds. Generally the soil is susceptible to compaction from foot traffic or erosion when disturbed. Wildlife, such as frogs, fish and nesting birds, are sensitive to herbicides and the waterways can easily become contaminated by herbicide spray drift or runoff. Some formulations of Glyphosate are registered for aquatic situations. Labels of these products carried detailed instructions for aquatic use and should be followed carefully.

For further information visit:

<https://www.drummuster.org.au/>

<https://weeds.org.au/>

https://www.water.vic.gov.au/__data/assets/pdf_file/0028/52678/DELWP-willows-fact-sheet-FINAL-October-2016.pdf

<https://www.environment.vic.gov.au/invasive-plants-and-animals/early-invaders>

Amphibians have permeable skin that is highly absorbent, making them extremely susceptible to herbicides.



Prioritising pest plant management

Controlling weeds on your land can be a daunting prospect. However, a small amount of work in the short term to prevent weed spread, and control of new and small infestation can save time and money in the future.

The following approach can help you prioritise your time and effort:

1. prevent weeds spreading
2. protect valuable environmental and agricultural land
3. contain established weed infestations to limit spread.

Prevention

It is generally more cost and time effective to prevent weeds coming onto your property in the first place. Consider the following:

Good hygiene – weeds often spread on machinery, vehicles, tools, equipment, clothing and footwear. Livestock and pets can also transport weeds on their fur or through manure. Appropriate hygiene practices, particularly when moving from a weed-infested

area to a cleaner area can make a big difference. This might include cleaning down machinery in a designated clean-down area. (For further information refer to www.agriculture.vic.gov.au and search 'WeedStop'.) Try to ensure soil, gravel, stock feed and mulch introduced to your property is weed free. If you are feeding stock hay or silage that may contain grass-weed seed, feed them in the one area and monitor for weed seedlings. If introducing new stock to the property, a good idea is to keep them in the stock yards for 2-3 days so any weeds brought in through manure remains in the yards.

Reduce disturbance – most weeds are opportunistic and will readily colonise a newly disturbed area. Weed seed can also lie dormant in the soil for many years (up to 20 years for some species) until disturbance exposes it to sunlight and water. Maintaining a healthy and competitive cover of plant species (indigenous plants in remnant areas, pasture species in paddocks) will provide the greatest deterrent to weeds. If you've dug up bulbous weeds or pulled out woody weeds, check the area regularly for germinating weed seedlings and remove by hand.

Disturbances include the effects of vehicles including trail bikes, floods, burrowing and grazing animals and salinity from rising water tables.

Other considerations to reduce disturbance include:

- controlling rabbits
- limiting vehicle and stock movement
- controlling erosion
- excluding grazing in remnant areas
- preventing overgrazing in pastures.

Manage nutrient inputs – pest plants tend to prefer high nutrient environments. On a small property high nutrient sources can include stock manure, plant fertiliser or runoff. Manure can be collected and composted for the farm garden, or rotating stock out of a paddock and then slashing the area will spread the manure thinly and aid its drying. Avoid fertilising pastures if heavy rain is predicted.

Dispose of weeds appropriately – some weeds can be composted on site, but in many situations compost is not hot enough to destroy the viability of weed seeds. Incineration, particularly of woody weeds can be effective if the fire is hot enough to destroy seed and fire restrictions are not in place. Check the fire scar regularly for weed seed germination. Covering weeds with pegged out black plastic in the sun until they have broken down can be effective. Another alternative is to collect weeds in mesh bags before they have set seed and submerge them in water in a drum or other container. The resulting ‘tea’ makes an excellent fertiliser.



Hawthorn



Serrated Tussock



Pattersons Curse



Bridal Creeper

Protection

Identify the areas of your property with the greatest environmental or agricultural value that are at the highest risk of damage from pest plants. This may be a remnant stand or an area of native grass in a paddock. Consider fencing the area to prevent stock or pest animals disturbing the area. Focus your

weed control in these areas by first removing weeds from the best areas before they set seed and moving outwards. Use less invasive methods like hand weeding or 'drill and fill' in the more sensitive vegetation. Gradually work to expand the weed-free area and monitor regularly to maintain.

Containment

In areas where pest plants are established your focus is to contain the infestation and prevent further spread.

Remove isolated infestations – small or isolated infestations should be removed as quickly as possible before they disperse and spread.

Reduce the size of large infestations – removing a large dense infestation can be impractical and could result in large areas of bare ground where new pest plants can readily reinfest. Start your weed control at the edge of an infestation and gradually work your way in, giving (or assisting through revegetation) the surrounding natural vegetation or agricultural vegetation a chance to colonise

the spaces left by weed control.

Target mature pest plants – woody weeds (shrubs and trees) take several years to reach reproductive maturity. Targeting removal of a 'mother weed' can drastically reduce the spread of weed seed, while giving you time to remove immature seedlings in later years.

Prevent seed set – particularly with large infestations of annual grasses, a practical approach is to prevent the plant from setting seed. This can be done by slashing/mowing, a spray of herbicide or removing flower heads before the plants set seed. While this won't kill the weed, preventing seed set can slow the progression of the infestation until you have time for more active management. You can use phased slashing to target grassy weeds amongst native grasses, as they set seed at different times of the year.



Sweet Briar

Pest animals

Pest animals have been introduced to Australia for sport or food, escaped or been dumped illegally. They have a devastating impact on the natural environment and agricultural land. Rabbits, hares, foxes, deer, wild pigs, feral goats, wild dogs, feral cats and mynas typically have high reproductive rates, a generalised diet and are adaptable to different environments.

Rabbits, hares, goats and deer compete with native wildlife for food, prevent the regeneration of indigenous plants, compete with livestock for pasture, spread weeds and can cause soil damage and erosion. Small native mammals, ground-nesting birds and some small reptiles are particularly susceptible to predation by foxes, wild dogs and feral cats. Foxes prey on livestock (mainly lambs) and poultry. The cost to biodiversity and agriculture is immense.

European Rabbits

Rabbits are Australia's most serious pest animal and under the *Catchment and Land Protection* (CaLP) Act 1994, landholders must control them on their land. Rabbit control requires persistence and implementing a number of different control methods. Work with your neighbours for a unified approach that will have the biggest impact.

Monitoring is important. Take a walk around your property with a strong torch at dusk or in the early morning. Record how many rabbits you see, what they are feeding on and where they run when disturbed.

Try to identify rabbit harbours. It may be a burrow, a thicket of woody weeds, under a shed, in a wood pile, rubbish, rocks, or piled soil. Remove weeds such as Boxthorn (*Lycium ferocissimum*), Blackberry (*Rubus fruticosus*) or Gorse (*Ulex europaeus*) that provide harbour and replace with indigenous species. Install wire netting around the base of buildings and build rabbit-proof fences around vegetable gardens or woodpiles.

Chemical control

Baiting to reduce rabbit numbers prior to warren ripping is effective. Pindone is generally mixed with carrots or oats and laid out to bait rabbits and hares. Prepared Pindone products such as oats and carrots coated with poison do not require an Agricultural Chemical Users Permit. It is effective in controlling large infestations of rabbits, but there is some risk to native animals and pets. One method to reduce the risk is to dig a small trench, cover it with wire netting open at each end with enough room for a rabbit to enter. Lay your bait in the covered trench at dusk and collect it at dawn.

A baiting program must be carefully planned, neighbours informed and

signs erected. Late summer, early autumn when rabbits are most actively feeding is an ideal time to conduct a baiting program. Start by providing a free feed of Pindone-free carrots to attract and monitor the number of rabbits. Several poison feeds are then given, usually a few days apart. Carcasses must be collected daily and disposed of appropriately.

Fumigation involves trapping as many rabbits as possible in a warren, introducing poisonous fumigants and blocking all exits. The warren is then destroyed to prevent re-establishment. Fumigation of warrens requires an Agricultural Chemical Users Permit and is usually undertaken by contractors.

Warren ripping

Burrow ripping with machines such as backhoes and tractor-mounted rippers destroys the burrow system. Avoid areas of high quality vegetation or environmentally sensitive areas.

Ferretting

This technique is effective inside fenced-off areas or under buildings where access is difficult. Professional ferreters can be hired to ensure that any native animals using rabbit burrows are not harmed before the ferrets dispose of the rabbits.

Biological controls

Biocontrols such as the new rabbit haemorrhagic disease virus (RHDV1 – K5) and the rabbit Calicivirus provide an additional tool to reduce rabbit populations. Release of infected rabbits into the population will be managed under a national strategic plan to maximise effectiveness.

For further information visit:

www.pestsmart.org.au

<https://vran.com.au>

<https://agriculture.vic.gov.au/biosecurity/pest-animals/invasive-animal-management/impact-of-invasive-pest-animals>



Rabbit warren ripping with machinery (HL)



European Red Fox

Foxes shelter in Blackberry thickets and other woody weeds. Foxes are mainly scavengers that eat a wide variety of food. Do not leave pet food out overnight, collect fallen fruit from under fruit trees, seal compost bins and secure chickens and pets in safe enclosures. A combination of fumigation of fox dens, baits laid by a licensed contractor, shooting or trapping can be useful methods of control.

For further information visit:
www.fieldandgame.com.au/page/fox-drives

Removing woody weeds, reducing food access and applying a series of control measures will help control pest animals.

Deer

Red and Fallow deer are a pest animal causing considerable environmental damage, loss of farm productivity and an increase in road accidents.

Shooting deer is currently the most effective method of managing them. Working as a community with trained, contracted shooters is the safest and most effective method to control them.

Landowners can shoot deer on their property without a permit provided they have a firearms permit, use firearms and ammunition specified by the Game Management Authority, do not venture off their property and dispose of the carcass. It may also be worthwhile contacting a registered shooting association as they often have licensed members who will eradicate deer on your property free of charge.

For further information visit:
Game Management Authority:
www.gma.vic.gov.au/
Sporting Shooters Association of Australia (Victoria):
www.ssaavic.com.au/

European Red Fox (MW)



Fallow Deer (NV)



Domestic cats and dogs

Both these animals can maim and kill native and farm animals. Pets must be kept inside your boundary and managed within your property. Keep cats indoors and dogs within a secure yard, don't let them roam around the property when you are not about and register your pet with your local council. If your pets wander onto your neighbour's property they do have the right to contain or shoot these animals. Feral cats are usually trapped in baited cages.

For further information on feral cat control visit: www.agriculture.vic.gov.au and search 'feral cat control'.

Nuisance wildlife

Some species of native animals within the region are perceived as being overabundant and out of balance with the environment. This is primarily due to our expanding urban environment, loss of habitat and an overabundance of food and water resources.

Research is required to gain a more comprehensive understanding of nuisance native wildlife and their impact on biodiversity and agriculture. At times management procedures may be required, such as removing animals.

In some situations, some members of the community regard the following native species to be nuisance wildlife:

- Brushtail and Ringtail Possums
- Eastern Grey Kangaroo
- Common Wombat

- Sulphur-crested Cockatoo
- Long-billed Corella
- Swooping birds (e.g. Australian Magpie, Lapwing Plover and Noisy Miner)

These native wildlife species are not declared pests and in fact are protected under the *Victorian Wildlife Guarantee Act (1975)*.

Removal of Grey Kangaroos requires an approved permit from DEECA before culling. Ph: 136 186

Indian Mynas are becoming more numerous and the result is less small woodland birds. Indian Mynas can be trapped and disposed of appropriately. Indian Myna Action Groups (IMAG) local Landcare groups and Landcare Networks hold information sessions and instructional workshops on building traps.

Visit www.feralscan.org.au for further information on Indian Myna control.



Indian Myna (PW)



(CO)

PASTURES

If you decide to stock horses, sheep, cattle, goats or alpacas on a small landholding, quality pasture is generally required as a source of feed. You need to ensure your land class is appropriate i.e. not too steep, and that your pasture quality and quantity will support the type and number of stock you want to run. You are legally responsible for the wellbeing of your stock. Research is needed to fully understand the lifecycle, habits, dietary and water requirements and pasture area needed for your animals. How will you cope in drought conditions? If you are not living permanently on your property, how will you responsibly manage the care and safety of your animals? Is a better option to lease your land to a nearby farmer?

Pasture quality

A pasture area should ideally contain pasture grasses and legumes and only a few (if any) weed species. Too many weeds results in low productivity and animal health issues. A paddock should have good cover of 100% throughout the year (or a minimum of 70%), and preferably a mix of deep-rooted perennial plants and annual species. As perennial grasses can survive throughout the year they provide a continuous ground cover which protects your soil from erosion and weed incursion.

Pasture plants – soil type, rainfall, topography, acidity, salinity, waterlogging and previous activities will all influence the nature of plants found in your pastures. Your aim is to maintain 70% predominantly perennial grasses or native grasses, and 30% legumes (e.g. Clover) throughout the year.

To identify your pasture plants and their growing conditions visit:

www.dpi.nsw.gov.au/agriculture/pastures-and-rangelands/species-varieties

Working out groundcover

As a rough guide to determining pasture groundcover, take 10 steps in one direction. Count how many times you step on plants. If you step on plants 8 times and on bare ground 2

times, you have 80% groundcover. Do this a number of times over different areas to gain a general average of your pasture groundcover.

Good groundcover



Poor groundcover



Native grasses such as Wallaby Grass (*Austrodanthonia* spp.), Joycea spp.), Kangaroo Grass (*Themeda triandra*) and Weeping Grass (*Microlaena stipoides*) are perennial and summer growing. They tolerate low-nutrient, acidic and alkaline soils and are drought resistant. Compared to high input introduced pasture grasses that require fertiliser, additional water and are expensive to re-establish if required after drought, native grasses in your pastures are a gem. If you find native grass in your pasture it is an excellent idea to try and make it a more dominant pasture plant. The first step is to ensure your fencing arrangement

means you can selectively graze native grasses occurring on your property. For example, from the beginning of summer until the end of autumn native grasses will seed and expand their area of coverage, so grazing should be removed during this time. When grazing is used well, native grasses can out-compete weeds, such as Cape Weed (*Arctotheca calendula*), and provide good pasture and groundcover.

For further information visit:
<https://agriculture.vic.gov.au/farm-management/land-and-pasture-management/native-pasture-management>

Weeping Grass



Kangaroo Grass



Pasture area

The carrying capacity of a pasture refers to the number of stock you can sustainably graze in that area at times of low feed production. It will vary depending on the type of animals, rainfall, soil structure and the quality of pasture feed. Conditions will also vary throughout the year with water and pasture feed availability. Under-grazing a property can result in weed infestation and an increased fire risk, while over-grazing can lead to serious environmental damage and land degradation.

Stocking rate

Stocking rate is different, but related to, carrying capacity. Stocking rate refers to the number of stock per unit area at a particular time.

For further information visit: www.mla.com.au/extension-training-and-tools/feedbase-hub/persistent-pastures/grazing-management/stocking-rate/

Paddock of Wallaby Grass

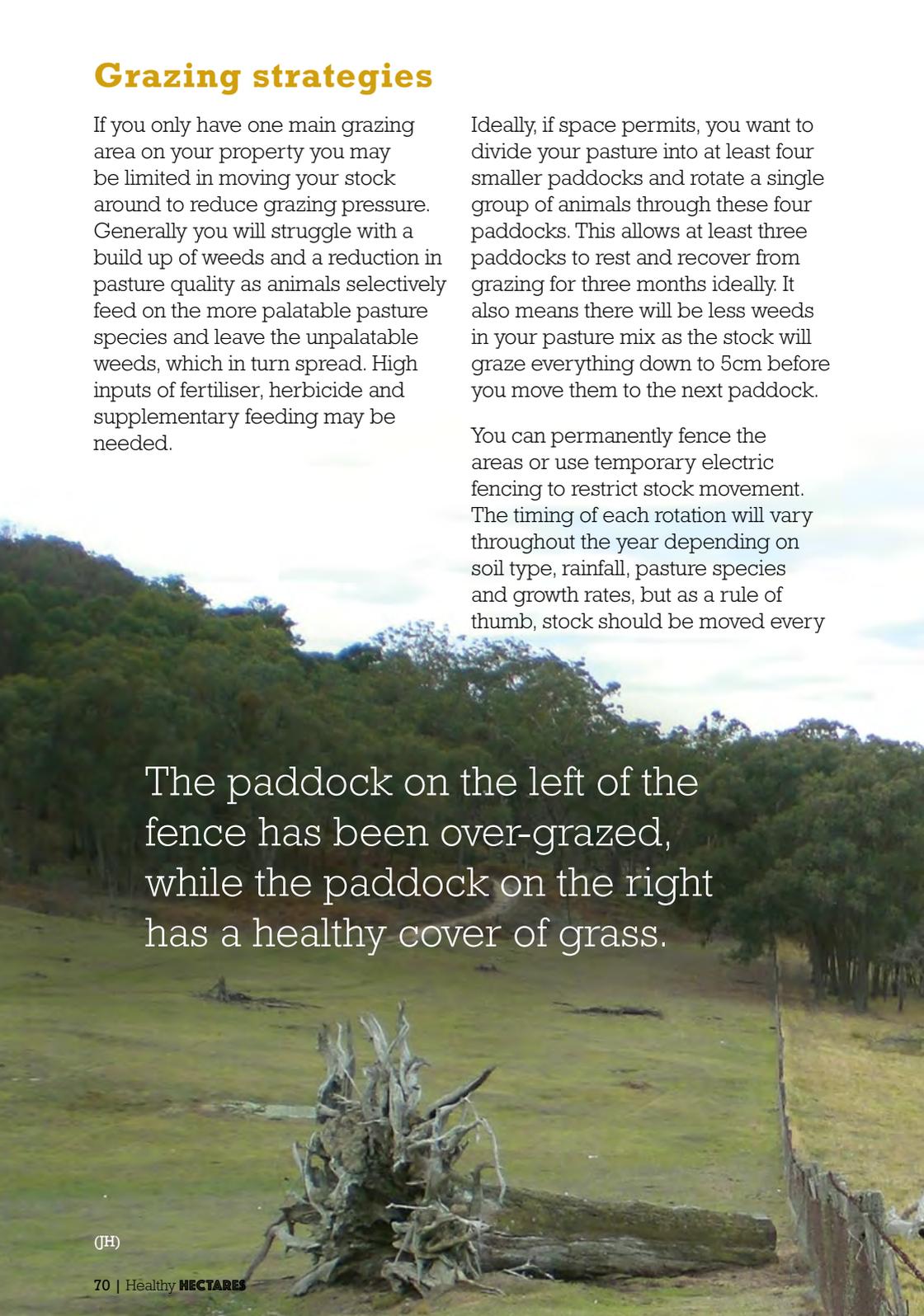


Grazing strategies

If you only have one main grazing area on your property you may be limited in moving your stock around to reduce grazing pressure. Generally you will struggle with a build up of weeds and a reduction in pasture quality as animals selectively feed on the more palatable pasture species and leave the unpalatable weeds, which in turn spread. High inputs of fertiliser, herbicide and supplementary feeding may be needed.

Ideally, if space permits, you want to divide your pasture into at least four smaller paddocks and rotate a single group of animals through these four paddocks. This allows at least three paddocks to rest and recover from grazing for three months ideally. It also means there will be less weeds in your pasture mix as the stock will graze everything down to 5cm before you move them to the next paddock.

You can permanently fence the areas or use temporary electric fencing to restrict stock movement. The timing of each rotation will vary throughout the year depending on soil type, rainfall, pasture species and growth rates, but as a rule of thumb, stock should be moved every



The paddock on the left of the fence has been over-grazed, while the paddock on the right has a healthy cover of grass.

4 weeks when pasture plant height is 5cm, and returned when height is 12cm. If the plant stubble is grazed below 5cm, the plant will struggle to survive and regrow. Grazing areas of weed species during seed set, and resting desirable species to encourage seed production will also assist in maintaining pasture quality.

Crash (or Planned) grazing is a form of rotational grazing that involves creating a greater number of smaller paddocks and rotating your stock more frequently e.g. every 24 hours, resulting in high intensity grazing in a smaller area with longer rest periods. This results in the animals eating less selectively (i.e. not just the plants they like), a large amount of manure (fertiliser)

being deposited and the soil seed bank being stimulated which accelerates pasture plant diversity.

For further information visit:

<https://agriculture.vic.gov.au/livestock-and-animals/horses>

<https://agriculture.vic.gov.au/livestock-and-animals/dairy/managing-wet-soils>

<https://www.mla.com.au/extension-training-and-tools/feedbase-hub/persistent-pastures/grazing-management/grazing-strategies/>

www.makingmorefromsheep.com.au/turn-pasture-into-product/tool_8.7.htm



Pasture plant control

As annual and perennial pasture plants usually set seed at different times of the year, you can effectively use grazing (or slashing/mowing depending on your situation) to manage undesirable plants. Deferred grazing basically matches the timing of intensive grazing or resting a pasture to encourage a desired pasture plant or reduce an undesirable plant. If your stock numbers are low or you are dealing with a small paddock you could slash or mow your paddock instead, at least for the first few years to establish groundcover until you introduce stock to the paddock.

Ideally, you want deep-rooted perennial plants to dominate

your pasture grasses. If annual grasses are taking over, you can implement deferred grazing. Annual pasture weeds often have an earlier flowering time frame than perennial grasses. These can effectively be grazed out in early to mid spring before they set seed, allowing time in late spring and early summer for desirable perennial grasses to seed and spread. If you have a perennial weed problem in your pasture, such as Bent Grass (*Argrotis* spp.) to limit growth, prevent seed development and encourage competition by more desirable species, you may need to graze (or slash) over the growing period to limit growth and prevent seed from developing.

If your stock numbers are low or you are dealing with a small paddock you could slash or mow your paddock instead, at least for the first few years to establish groundcover until you introduce stock to the paddock.



Water for stock

If you have livestock on your property they will obviously need a constant supply of clean, fresh water. The amount required will vary depending on the animals you stock. Ideally, dams and watercourses will be fenced off from livestock and water will be supplied to water troughs in each paddock.

There are many types of water troughs on the market. Stock water troughs should be checked and cleaned regularly to prevent a build up of algae or salinity. Poor water quality can affect the condition of your stock and growth rates. As a rule of thumb, if the water quality is good your stock will gulp it down, if the quality is poor they will tend to snuffle it and walk away.

To determine the amount of water in your dam visit: <https://agriculture.vic.gov.au/farm-management/water/farm-water-solutions/how-much-water-is-in-my-dam>

If you are on a small property and in residence you may find it easiest to manually fill your water troughs.

If you have a larger number of animals that you are rotating through a number of paddocks you will most likely need to consider a reticulated watering system.

This system relies on water being pumped from a dam to a header tank which then allows the water to gravity flow through underground poly pipe into stock water troughs in each paddock. A series of pressure valves and ball floats ensure the troughs are always full and not overflowing. It is a good idea to turn off stock troughs and empty and clean them out while stock are not in the paddock to conserve water through evaporation.

Where possible a trough should be placed on higher well-drained ground. Although it is tempting to locate water troughs next to fence lines, try to avoid this as it tends to encourage bare patches that are susceptible to erosion. A gravel apron spread around the trough will help protect the area. If your water supply is running low you may need to purchase tanker water or reduce stock numbers.



Fertiliser

For maximum pasture growth soils need to be healthy for strong plant growth. Soil testing should be conducted to determine the soil pH (acidity) and any nutrient imbalances.

Conditions will vary across an area so a series of soil tests need to be carried out. From this information the type and amount of fertiliser for each area can be determined, and if lime is required to correct soil acidity, an accurate application rate can be determined.

Spring and summer is the best time to test soils, once they are dry, as this is when the nutrient levels are most stable and test results most reliable.

It is important to test soils on a regular basis (every 3-4 years) to monitor changes to your soil fertility.

Soil testing services:
Nutrient Advantage
www.nutrientadvantage.com.au

SWEP Analytical Laboratories:
www.swep.com.au

<https://agriculture.vic.gov.au/farm-management/soil/soil-acidity>

<https://agriculture.vic.gov.au/farm-management/soil/sampling-soils-for-soil-testing>



Manure management

It is important to manage manure in your paddocks to maintain healthy pastures, prevent fly and worm breeding, prevent excess nutrient runoff into nearby watercourses and to minimise unpleasant odours.

If you have a small number of animals, hand collecting manure by regularly shovelling it into a bucket may be an option. The manure can then be composted and used in your garden. If it is not possible to collect manure from paddocks, harrowing or mowing a paddock are options to spread the manure thinly and evenly and aid its drying. This is usually carried out when stock have been rotated off a paddock, the ground is dry enough to minimise damage and warm weather is predicted. You could also consider introducing dung beetles!

For further information visit:

www.ccmaknowledgebase.vic.gov.au/shkb/brown_book/06_Dung.htm

Pest control

Some invertebrate pests can damage pasture plants by eating the leaves, roots, flowers or seeds. Chemical control of insect pests is both costly and hazardous to stock and the environment. Many insect problems can be controlled through grazing management. For example, Wingless Grasshoppers mainly attack annual clovers. If your paddock has a good mix of perennial grasses as well as clover, grasshopper damage will not be as severe. Maintaining good groundcover and controlling weeds will also assist in controlling pasture pests.

Attracting insect-eating birds is also a great way to naturally control pasture pests. A magpie will eat around 40 scarab grubs a day, while ibis can eat up to 250 crickets and grasshoppers a day. Native vegetation and a wetland dam on your property will greatly increase the number and diversity of birds on your property. Research biological pest control on organic farms.

Dung beetles (BS)



Dung beetles disperse manure by rolling it away and burying it, or anchoring it to pieces of vegetation.

Drought strategies and adapting to climate change

Coping with drought conditions is not easy. It puts tremendous pressure on everyone: people, animals, plants and the environment. Climate change modelling suggests drought or dry condition will be more prevalent in the future. In times of drought, pasture feed can be drastically reduced. It is important to respond early so you do not stress your animals or land.

Once your pasture grasses are down to 5cm in height and groundcover is threatening to go below 70% you need to implement supplementary feeding. This involves purchasing hay or grain to hand feed your stock. This can be a source of weed infestation so feed in one location and monitor carefully for germinating plants and act quickly to control.

You may need to allocate a sacrifice paddock. This involves confining stock to a single paddock where animals receive supplementary feeding while groundcover and land condition is preserved across the rest of your property. Your sacrifice paddock should be an area of low erosion risk i.e. at least 50m from a watercourse and have a slope of no more than 8%.

The area will need to be well fenced, with adequate water, shade, room and feed. Manure management will also need to be implemented.

Another option to reduce stock numbers on your property may be to agist or sell your animals to a level that you can manage, or to remove stock all together in a drought situation.

While caring for stock and property it is important to also take care of your own mental health throughout potentially stressful times. Seek advice or assistance for financial hardship. A range of support networks exist for both mental and financial support.

For further information visit:

<https://agriculture.vic.gov.au/farm-management/managing-for-and-during-drought/managing-resources-in-a-drought>

<https://agriculture.vic.gov.au/farm-management/land-and-pasture-management/stock-containment-areas-for-emergencies>



Stock welfare

If you decide to run stock on your small landholding, apart from ensuring your stock are safely contained and sheltered, have appropriate feed and fresh water, you need to ensure you regularly check the welfare of your stock. Inspection of livestock should take

into consideration factors such as: feed availability, water supply, age, pregnancy status, weather, disease risk, predation risk and recent management procedures. The following inspection intervals are recommended by the Victorian Government DEDJTR Vets:

Stock	Best	Minimum
Calving cow	Twice daily	Once daily
Lambing sheep	Twice daily	Once daily
Sheep/wether	Once daily	Once weekly
Steer	Once daily	Once weekly
Horse	Twice daily	Once daily
Alpaca	Twice daily	Once daily
Goat	Once daily	Once weekly
Chicken	Twice daily	Once daily

It is your legal responsibility to provide appropriate care for animals on your property. Before you buy stock ensure you are familiar with the Code of Accepted Farming Practice and the Australian Animal Welfare Standards and Guidelines for each type of animal you are thinking of stocking, and that you can comply with the requirements. Contact your local vet and talk to them about requirements, risks and good practice. For example, a common issue vets encounter with small landholders relates to the age at which animals become sexually active – it's a lot sooner

than some people think. This can lead to pregnancy problems, birthing difficulties and in-breeding. The more you know, the happier your animals will be.

For further information visit the websites below and refer to the contact section at the back of this guide:

<https://agriculture.vic.gov.au/livestock-and-animals/animal-welfare-victoria/pocta-act-1986/victorian-codes-of-practice-for-animal-welfare>

www.animalwelfarestandards.net.au

Fencing

Fences have various functions on your property and are vital for the implementation of your property plan. Fences define your property boundary and are important in keeping stock confined to your land and not straying on to roads or neighbouring properties. They are an important tool in separating land classes and controlling stock grazing as well as protection for remnant vegetation, dams and watercourses.

Fences should follow the contour of the land while drainage lines and ridges should be fenced out. Fenced tracks and laneways provide excellent opportunities for revegetation.

The type of fence you construct will depend on its function. Generally you have the option of a wire strand fence, ringlock netting, rabbit netting or an electric fence (permanent or mobile).

For further information on fence function and construction contact your local fencing supplier or visit: www.fence.farm

Native wildlife are an important consideration when constructing fences. Each year thousands of animals suffer a cruel death when they become entangled on barbed wire fences or caught up in mesh fences. Many nocturnal animals such as gliders, bats and owls fail to detect the barbed wire fence or cannot clear the height in windy conditions. Kangaroos can become entangled in wire strands if it is too high for them to clear and not enough space to go under.

Fencing considerations:

- avoid barbed wire
- use plain wire instead of ringlock or hinge joint
- increase visibility on the top strand by attaching white nylon sighter wire that flickers in a breeze
- leave a 30cm gap between the top wire and the next one down
- leave a 15cm gap between the bottom wire and ground level
- avoid using an electric wire along the bottom of your fence as this distresses echidnas
- monitor regularly.

White nylon sighter wire



Barking Owl caught in barbed wire



(JM)

Rabbit-proof fencing

Rabbits love to feast in remnant and revegetated sites and are very clever at getting around plant guards. For the most successful outcome it is ideal if you can encircle your native vegetation in a rabbit proof fence. A common technique is to hammer in 1.6m star pickets into the ground leaving 1.05m out of the ground every 3m around the area to be protected. A wire strand is then attached at

the top and bottom and rabbit netting attached to a height of 1m. It is important that an apron of 20cm netting is either pegged down on the outside of your enclosure, or dug into a trench and backfilled, to prevent rabbits digging under the fence. Remove any rabbits from inside the enclosure and check regularly for damage or incursions.



Check
your fences
regularly to
make sure
rabbits have
not dug under
the skirt.

USEFUL RESOURCES

Organisations

Moorabool Shire Council
www.moorabool.vic.gov.au

Lerderderg Library

215 Main Street,
Bacchus Marsh 3340
Mon - Fri: 8:30 am - 5:00 pm,
Sat: 9:00 am - 2:00 pm

Ballan Office

15 Stead Street,
Ballan, Victoria 3342
Mon - Fri: 8.30 am - 5.00 pm

Darley Civic and Community Hub

182 Halletts Way,
Darley, Victoria 3340
Mon - Fri: 8.30 am - 5.00 pm

Melbourne Water

<https://www.melbournewater.com.au/>

Corangamite Catchment Management Authority

<https://ccma.vic.gov.au/>

Department of Energy, Environment and Climate Action

<https://www.delwp.vic.gov.au/>

Bacchus Marsh Office
219A Main St,
Bacchus Marsh
Ph: 138 186

Parks Victoria

<https://www.parks.vic.gov.au/>

Landcare Groups

(Education for new landholders, farming activities & farm walks, biodiversity education and incentives)

Moorabool Landcare Network

<https://www.mln.org.au>

Moorabool Landcare Network has details of each of the landcare and Friends of Groups within the Moorabool Shire.

- Bamganie Meredith
- Bullengarook
- Blackwood Barry's Reef
- Brisbane Ranges
- Coimadai
- Greendale Wombat
- Lal Lal Catchment
- Moorabool Catchment
- Pentland Hills
- Rowsley
- Upper Williams Creek
- Wattle Flat-Pootilla

Friends of Groups

Brisbane Ranges

<https://fobr.org.au/>

Werribee Gorge and Long Forest Mallee

<https://fowglfm.org.au/>

Hopetoun Park and Parwan Gorge

<https://www.mln.org.au/friends-groups/friends-of-hopetoun-park-parwan-gorge>

Friends of the Werribee River through Bacchus Marsh

Found on Facebook

Indigenous Nurseries
(Open by appointment only.)

Moorabool Landcare Network

Indigenous Nursery
1327 Glenmore Rd, Glenmore
<https://www.mln.org.au/mln-nursery>

Newport Lakes Native Nursery

Lakes Drive, Newport
Ph: (03) 9391 0044

Western Plains Flora

628 Wildwood Rd, Wildwood 3429
Ph: (03) 9740 3178
admin@wpflora.com.au

Useful Websites

Livestock Management and Welfare

<https://agriculture.vic.gov.au/livestock-and-animals/animal-welfare-victoria/livestock-management-and-welfare>

Land for Wildlife

<https://www.wildlife.vic.gov.au/protecting-wildlife/land-for-wildlife>

Victorian Volcanic Plains

<https://victorianvolcanicplainscmn.wordpress.com/>

Australian Plant Society, Victoria

<https://apsvic.org.au/>

Seeding Victoria

<https://www.seedingvictoria.com.au/>

Weeds Australia

<https://weeds.org.au/>

Country Fire Authority

<https://www.cfa.vic.gov.au/>

The Field Naturalists Club of Victoria

<https://www.fncv.org.au/>

The Atlas of Living Australia

<https://www.ala.org.au/>

Fence Farm

<https://fence.farm/>

Trust for Nature

<https://trustfornature.org.au/>

BirdLife Australia

<https://birdlife.org.au/>

iNaturalist

<https://inaturalist.ala.org.au>

List of Citizen Science websites can be found on SWIFFT.

https://www.swiff.net.au/cb_pages/citizen_science.php

HEALTHY
Hectares

