Native Pasture Management

State Government Victoria

DEPARTMENT OF PRIMARY INDUSTRIES

future farming systems research

Native grasses and native pastures

Australian native grass is a general term to describe a diverse range of grasses that have evolved in Australia over millions of years. There are about 1000 native grass species in Australia. They are well adapted to the harsh and varying climate, low fertility soils and play an important part in maintaining ecosystem health.

Agricultural development over the past two centuries has changed the diversity and extent of native grasslands. Many remnants of native grassland are on small patches of public land or on uncultivated areas of lightly grazed private land. Native grasslands in Victoria often contain varying proportions of introduced perennial and annual species. In this report, native pasture is defined as a pasture where native grasses are the dominant perennial species.

The agronomic and environmental benefits of Australian native grasses have sometimes been underrated. Studies have found that in some situations native grasses have both environmental value and agronomic characteristics such as dry matter (DM) production, potential to respond to summer rain events, persistence and nutritive value similar to introduced species. Thus there are situations and environments where native pastures can be a well adapted, sustainable and productive choice for livestock production.

Benefits and limitations

In agricultural grazing systems, native grasses offer a range of benefits:

- Native grasses are mostly perennials and persist well in the Australian environment;
- Some have nutritive characteristics similar to introduced pasture species;
- They can cope with adverse climate conditions such as droughts, heavy rains and frosts;
- Many tolerate low fertility, acid soils, water stress and are more resistant to disease;
- Different native species such as warm season or cool season grasses have growth periods at different times of the year, providing the potential for year-round green feed;
- Generally they have dense tillers and roots that hold the soil and allow increased use of soil moisture to help prevent soil erosion and nutrient runoff;
- Some native grasses can also help control dryland salinity, due to their deep root systems, summer activity and perenniality, reducing recharge to ground water;
- They can provide a lower input grazing system, reducing the dependence on finite resources;
- They provide for integrated pest management and native biodiversity.

Native grasses also have some limitations:

- Wild species have diverse genetic traits, flower over a long period, have lower seed yields or do not yield commercial quantities of viable seed;
- They are difficult to establish through sowing with traditional sowing technologies;
- Some species are less palatable to stock due to coarse hairy leaves and have lower nutritive values and herbage yield;
- Under conditions where improved pasture species perform adequately, native grasses are unlikely to be more productive or be able to compete with improved pasture species.

This publication summarises the findings from a series of field and glasshouse experiments conducted by the Victorian Department of Primary Industries in central and western Victoria. It aims to assist Victorian farmers to manage their native pasture for increased productivity and profitability while maintaining and improving environmental sustainability and resilience. The information may also be applicable to native pastures in similar soil and climate conditions across southern Australia.

The challenge

Overgrazing caused by set-stocked grazing practices and the grazing behaviour of livestock, results in lower ground cover in key areas of the landscape. This is a major challenge for managing native pasture on steep hill country where low groundcover occurs frequently on hill crests and sides over summer and autumn. This has significant economic impact through reduced green feed and stocking rates, while environmental impacts occur through wind erosion, soil/nutrient runoff, recharge and loss of biodiversity.

When a native pasture is set stocked, perennial species are subject to selective and heavy grazing. Overgrazing of perennial species, particularly when plants are stressed by low soil moisture, can lead to the death of plants and a decline in the population.

A low population of perennial species in the sward of native pastures will encourage invasion by other species such as onion grass, broadleaf weeds and annual grasses. Less palatable annual grasses, such as silver grass, are opportunistic species that germinate when soil moisture becomes available and complete their life cycle in a short time frame (mostly from late autumn to mid spring). These annual pastures then die and decompose during summer and autumn leaving behind bare ground. When these species form a major part of the pasture over the growing season, pasture production and nutritive value deteriorate dramatically.

Strategies to manage and rejuvenate native pastures

To restore native grasses in degraded pastures, we must remember three ways that can lead to success: 1) seed production and seedling recruitment of new native grasses; 2) increased vigour of existing native grass plants; and 3) stronger competition of native grasses with other species (either through seeds or plants). Strategies that promote one or more of these three avenues to success are likely to rejuvenate native pastures.

Deferred grazing that matches the timing of grazing or resting of a pasture to an appropriate growth stage of the desired pasture grass will provide positive selection pressure for the species. For instance, withholding grazing from spring to late-summer allows desirable perennial plants to set seed and conserve energy, leading to higher recruitment rates of new plants and plant tillers in autumn and winter. Grazing heavily after annual grass stem elongation, but before seed head emergence, followed by resting over spring and summer, will increase the amount of seed produced by perennials, while reducing the seed from undesirable annuals.

Types of deferred grazing

There are several types of deferred grazing that have been designed to achieve different management targets. The higher the proportion of desirable native species, the more effective the deferred grazing will be in boosting native pasture density and farm productivity.

Optimised deferred grazing

With optimised deferred grazing, the withholding time from grazing depends on the growth stage of the pasture plants, generally from spring to late-summer depending on seasonal variations. This deferred grazing starts after annual grass stems elongate, but before seed heads emerge so that the growing points of undesirable annual plants can be effectively removed by grazing. The completion of the withholding time for this grazing strategy depends on pasture conditions of the desirable perennial grasses (seed set, growth and herbage on offer), which are generally ready for grazing from late summer to early autumn. This strategy aims to reduce the amount of seed produced by annual grasses and alter pasture composition – lifting the proportion of perennials while suppressing the annual grasses.

Short-term deferred grazing

Short-term deferred grazing involves no defoliation between October and January each year, aiming to increase soil seed reserves and plant population density. This strategy also allows use of feed in mid summer when there is generally a feed shortage and may reduce fire risk by grazing long grasses early in summer.

Long-term deferred grazing

Long-term deferred grazing involves no defoliation from October to the autumn break in the following year (the first significant rainfall event of the autumn/winter growing season). This strategy is used to build up the soil seed reserves, soil moisture and restore ground cover by perennial species. This strategy aims to rehabilitate degraded paddocks with a low percentage of perennial species (e.g. 5-10 per cent) quickly.

Timed grazing

Timed grazing is an alternative form of long-term deferred grazing. It is used to build up the soil seed reserve, restore ground cover and recruit new plants. Pasture is grazed using a large group of sheep greater than 100 sheep/ha, over a short grazing period ranging from 10 to 20 days, depending on paddock size, followed by a resting period from 120 to 130 days. This strategy targets the rehabilitation of significantly degraded paddocks with a very low percentage of desirable species (e.g. ~5 per cent).

In addition, strategic management of pastures can be combined with all types of deferred grazing to deliver the best outcomes. This is often referred to as strategic deferred grazing. For instance, onion grass control and fertiliser application can be practised following optimised deferred grazing in an onion grass infested paddock, which may greatly increase the yield and nutritive value of pastures.

Impact of deferred grazing strategies

Deferred grazing addresses several key measures of pasture performance that contribute to the successful rejuvenation of pastures.

Ground cover

Ground cover remains greater than 70 per cent up to mid January, regardless of grazing treatment applied in (Figure 1). However, when a large amount of dead annual grass under set stocking is removed by grazing from January to March, ground cover declines dramatically, before increasing in April/May after rainfall. Ground cover is consistently higher with all deferred grazing regimes due to limitation of grazing over summer/autumn and increased perennial native grass population.

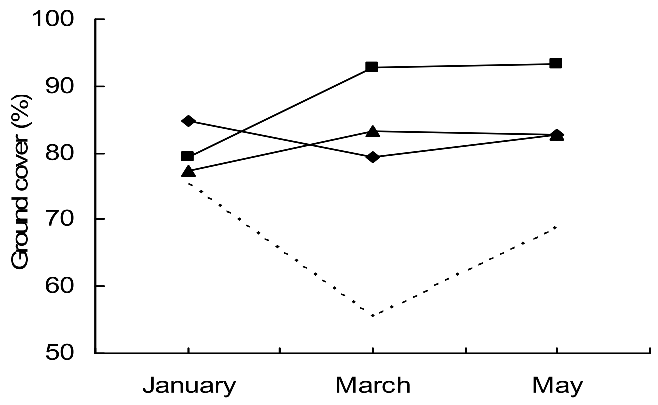

Figure 1. Ground cover over summer/autumn under short-term deferred grazing (■), long-term deferred grazing (♦), optimised deferred grazing (▲) and set stocking (--).

Plant density

The results from a long-term grazing experiment have shown that deferred grazing regimes significantly increased perennial (predominantly native grasses) and reduced annual grass tiller density (Table 1). However, there were no significant differences in the densities of onion grass, legumes and broadleaf weeds.

Photos left:

1) Set-stocked grazed paddock, autumn break;
1a) Low ground cover, depleted organic material;
2) Deferred grazed paddock, autumn break;
2a) High ground cover, retaining organic material.

Table 1. Mean plant density (tillers or plants/m^2) of perennial grass (PG), annual grass (AG), onion grass (ONG), legume (LEG) and broadleaf weed (WD), under different grazing regimes from a four year grazing experiment

Treatment	PG	AG	ONG	LEG	WD
Short deferred	8338	5396	3159	630	466
Long deferred	9003	4713	3552	460	239
Optimised deferred	9998	2558	3800	411	245
Set stocked	6245	8890	4786	681	248

Soil seed reserve

Soil seed reserve is the number of seeds in the topsoil (0 – 3 cm) measured in autumn. It is an indication of seed production from a grazing system in the previous seasons. Figure 2 shows the germinated seed population (an estimation of soil seed reserve) of perennial and annual grasses, two major plant categories in a hill pasture. Long-term deferred grazing, short-term deferred grazing and optimised deferred grazing produced 637 – 1850 perennial grass seeds/m^2 whereas set stocking achieved 570 seeds/m^2. Optimised deferred grazing is the most effective treatment to reduce annual grass seed production, with the germinated seed population being the lowest among the other grazing regimes.

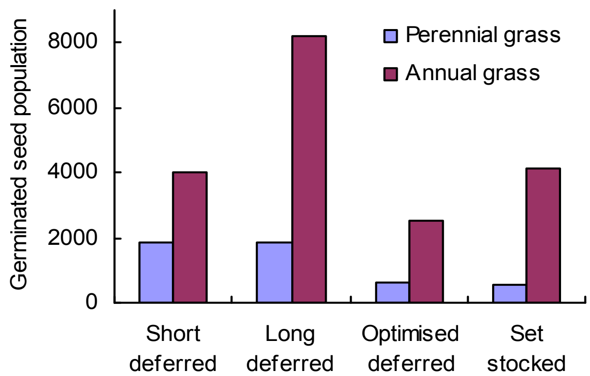

Figure 2. Germinated seed population (seeds/m^2) under short-term, long-term and optimised deferred grazing and set stocking.

Seedling recruitment and survival

While deferred grazing dramatically increases soil seed reserve (Figure 2), it is also important to know how these seeds, particularly from perennial native grasses, germinate and survive under various grazing systems.

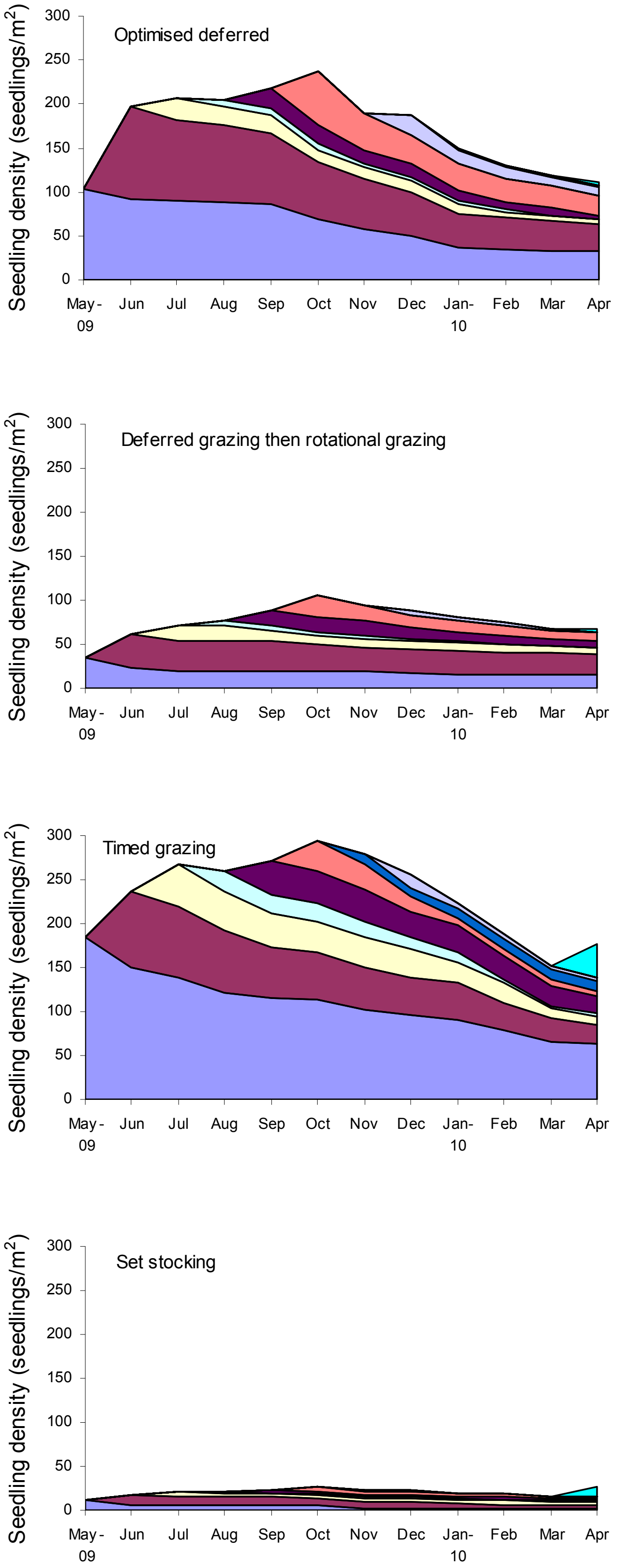

Figure 3. Perennial native grass seedling recruitment (seedlings/m^2) and survival under various grazing regimes from May 2009 to April 2010 (starting points in each colour/category represent the population of native grass seedlings that germinated each month and curve represents the change of seedling density over time up to April 2010).

Figure 3 shows the seed germination and seedling survival of native grasses from May 2009 to April 2010 under four grazing regimes – optimised deferred grazing, optimised deferred grazing in year one followed by rotational grazing, timed grazing and set stocking. It is clear that optimised deferred grazing and timed grazing were superior to set stocking both in germinated seedling numbers and seedling survival. At the end of the measurement (April 2010), these two treatments had, on average, 396 seeds germinated and 144 seedlings survived, 9.9 and 5.3 times that of the set stocking. Deferred grazing in year one following by rotational grazing also had higher germinated seed numbers and seedling survival than set stocking, but lower than optimised and timed grazing.

Plant roots and soil properties

Deferred grazing has a profound effect on below ground plant growth. Under deferred grazing root biomass was increased more deeply in the 0-60 cm soil profile compared with set stocking. With deferred grazing, about 85 per cent of the roots were in the 0-20 cm soil and 15 per cent in the 20-60 cm soil. Under set stocking over 95 per cent of the total root biomass was in the 0-20 cm soil profile, and less than five per cent was within 20-60 cm profile.

The effect of grazing wet soils has been recognised as a potential problem for soil health. Stock treading has been shown to increase soil compaction and decrease soil porosity and water infiltration. Management options that reverse compaction without cultivation are desirable. Deferred grazing can lower soil bulk density by over 10 per cent by reducing soil compaction from stock treading, leading to increased soil pore size and water movement rate. The growth and subsequent decay of plant roots can enhance the activity of soil

organisms, such as earthworms. Deferred grazing systems also increased the soil moisture content of the 0-10 cm topsoil and reduced soil moisture at deeper soil profile, which may contribute to recharge control.

Herbage and animal production

Herbage production under deferred grazing regimes were increased by 19 – 50 per cent compared with set stocking, two years after deferred grazing regimes were implemented (Table 2). This is a result of increased density and groundcover of perennial native grasses under deferred grazing. An economic analysis on deferred grazing and other grazing regimes revealed that this management strategy can conservatively increase stocking rates by between 25 to 50 per cent within three years on hill country currently carrying less than eight dry sheep equivalent per hectare (DSE/ha).

Table 2. Herbage yield (kg DM/ha) under various grazing regimes

Treatment	Yield
Short deferred	4770
Long deferred	3785
Optimised deferred	4083
Set stocked	3183

Fertiliser application

Native grasses are adapted to Australia's low fertility soils and some require less fertiliser for production and persistence than exotic species. However, in any grazing system, nutrients that are removed from pasture plants by livestock need to be replaced in the soil to maintain a balance between nutrient export and input. In general, application of some fertiliser such as phosphorus can increase herbage yield, boost legume growth and pasture quality.

Before applying fertiliser to native pastures, a number of soil, pasture, livestock production and environmental aspects need to be considered:

- Soil tests should be performed regularly to determine current status of key soil nutrients;
- Current and future stocking rates, grazing practices, rainfall and pasture composition need to be considered in determining fertiliser needs;
- Fertilisers that are necessary for improved exotic species can lead to invasion by annual and broadleaf species and a decline in native grass and forb populations;
- Appropriate deferred grazing management, by itself, can increase herbage yield and may outweigh the economic benefit of applying fertiliser however nutrients used need to be replaced over time;
- Fertiliser application may have a negative impact on population density and herbage yield of some warm-season (summer growing) native grasses such as kangaroo grass;
- Care needs to be taken when applying fertiliser to paddocks adjacent to waterways and areas of remnant native vegetation. A good practice is to leave a buffer zone around such areas.

Practical implementation

To implement deferred grazing strategies effectively and achieve the desired management targets, land managers need to have a clear understanding about pasture composition, growth stage, seasonal constraints and expected outcomes from each of the grazing strategies.

These include:

- The proportion of desirable species in the pasture, monitored in early to mid spring;
- The objective of the practice change – whether it is primarily to increase the ground cover or to change the species composition, e.g. increasing perennials and reducing annual species;
- Requirement for intensive grazing – land-class subdivision and number of livestock;
- Backup paddocks where stock can be grazed from spring to autumn;
- Rainfall and length of growing season;
- Environmental aspiration;
- Perceived fire risk.

Optimised deferred grazing

Optimised deferred grazing is one of the most effective strategies to alter pasture composition and lift perennial grass population and production while suppressing annual grasses. This method should be used when there is a reasonable amount of desirable perennial species (greater than 20 per cent) in the pasture and the capacity for intensive grazing in spring (e.g. land-class subdivision and stock requirement) is met, allowing for flexibility according to climate and seasonal conditions. The timing of grazing for this method is critical – heavy grazing is required when most annual grass stems have elongated in late winter and early spring (depending on seasonal and regional variations) and before seed heads emerge.

Short-term deferred grazing

Short-term deferred grazing is used to increase soil seed reserves and therefore plant population density, but will not alter pasture composition as effectively as optimised deferred grazing. This method can be used when intensive grazing is not possible, when there is a shortage of feed in summer and when there is a need to reduce perceived fire risk. The benefit of short term deferred grazing is to allow plant population density and groundcover to be increased, while in the interim provides time to bring about a long term whole farm plan (e.g. land-class subdivision and stock requirement).

Photos below:

3) Land-class subdivision fencing;
4) Solar powered pump for additional water points;
5) High input Lucerne paddock in more arable country to supplement summer feed shortage.

Long-term deferred grazing and Timed grazing

Long-term deferred grazing and timed grazing are used to effectively build up the soil seed reserve, restore ground cover and recruit new plants when a pasture is degraded and there is a very low percentage of desirable species (less than 20 per cent). These methods are expected to raise the desirable native perennials to a level (e.g. greater than 20 per cent) when optimised deferred grazing can be applied.

Strategic deferred grazing

Strategic deferred grazing is designed to control weeds such as onion grass, alter pasture composition and lift perennial grass and legume yield. This method should be used where weeds are a major problem and resources are available to achieve the production targets in a relatively short time.

Pasture maintenance

Outside the deferred grazing periods, it is recommended that rotational grazing based on leaf stage be used to maintain the outputs from deferred grazing. This is because rotational grazing is not only the recommended grazing technique to achieve production and quality targets, but also a grazing regime to maintain seedling recruitment for native grasses.

Leaf stage for grazing

The theory behind 'leaf stage' is that the best time to graze a grass plant is when the first regrowing leaf starts to die down as this will effectively reduce pasture decomposition, maintain sufficient carbon reserve in the root system and increase pasture and animal production through optimum tissue turnover and improved nutritive value and pasture utilisation. Different native grasses have a different optimum leaf stage for grazing. Find the most abundant native grass species in the paddock and use the following leaf stage to determine commencement of grazing:

- 3.4 leaves for wallaby grass
- 4.2 leaves for weeping grass
- 3.0 leaves for spear grass
- 3.8 leaves for red-leg grass
- 4.4 leaves for kangaroo grass.

Monitor livestock during grazing

As these deferred grazing strategies may sometimes require high stocking rates of animals grazing dry and lower quality feed care needs to be taken with the class of livestock grazing these pastures to ensure their nutritional requirements are being met. In particular it is important to monitor the growth of weaner sheep and the condition score of ewes when grazing these pastures. Supplementation of sheep grazing these pastures may be necessary to meet nutritional requirements.

Summary

A summary of what can be achieved and requirements for individual grazing management strategies are given in Table 3.

Table 3. Effectiveness and requirement of the optimised deferred grazing (OD), short-term deferred grazing (SD), long-term deferred grazing (LD), timed grazing (TG), strategic deferred grazing (STD) in comparison with set stocking (SS) in achieving specific targets ✓ = Yes, ± = Partial, ✗ = No

Management aim	OD	SD	LD	TG	STD	SS
Needs intensive grazing management	✓	✗	✗	✗	±	✗
Increase ground cover and plant population	✓	✓	✓	✓	✓	✗
Increase perennials and suppress annual grasses	✓	±	±	±	±	✗
Increase seedling survival	✓	±	✓	✓	±	✗
Effective in perennial plant recruitment	✓	✓	✓	✓	✓	✗
Effective in building soil seed reserve	✓	✓	✓	✓	✓	✗
Effective increase of soil organic material	✓	±	✓	✓	✓	✗
Effective control of onion grass and broadleaf weed	✗	✗	✗	✗	✓	✗
Provide feed in summer	±	✓	✗	✗	±	✓
Reduce perceived fire risk	±	✓	✗	✗	±	✓

Managing onion grass and broadleaf weeds

Onion grass is a perennial herb with distinctive growth behaviour. It appears to look like a grass, grows like an annual, and can spread rapidly on farm land. The plant not only produces abundant seed, but also underground corms which survive the hot and dry summers in Mediterranean environments of temperate Australia.

Most onion grass seeds require a temperature of less than 16.5ºC to germinate and animals can disperse large numbers of seeds through grazing (greater than 500 viable seeds/sheep/day). Seed of onion grass germinates in autumn to winter, grows over winter and flowers from August to November.

The corm may require a slightly different temperature to grow, but generally sprouts in autumn as well. Initially, the corm supplies nutrients for the plant to sprout and the nutrients in the corm diminish approximately eight weeks after the plant emerges (Figure 4). The residual of the corm remains unchanged in weight for about 11 weeks and then diminishes from week 19 onwards. The new corm starts to develop six weeks after emergence, grows slowly until 14 weeks when the growth rate increases exponentially. There is a short period (week six to eight after emergence) of increased vulnerability when the old corm is exhausted and the new corm starts to develop. This is a window of opportunity for the most effective control with selective herbicides.

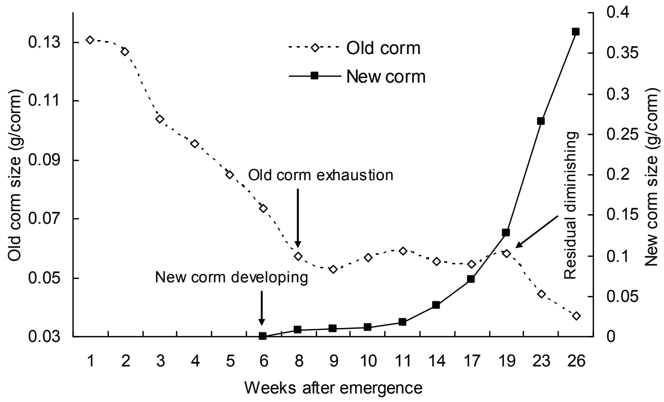

Figure 4. Mean dry weight of old and new corms after emergence of onion grass plants.

Response to soil fertility and defoliation

Onion grass does not respond to fertiliser as many pasture plants do. A glasshouse experiment conducted in south west Victoria revealed that the herbage yield of onion grass did not differ significantly when various rates of phosphorus were applied. However, herbage mass of other species, including native grasses, was significantly increased (greater than 40 per cent) by the medium to high levels of phosphorus treatments.

Onion grass is highly sensitive to close defoliation. Cutting to one centimetre above ground at three to five week intervals reduced onion grass corm mass by 70 per cent, seed pod density by 100 per cent and plant density by 60 per cent compared with the control

without defoliation. Cutting to 5 cm above ground also reduced onion grass corm mass by 58 per cent, seed pod density by 94 per cent and plant density by 35 per cent. Cutting at flowering only considerably reduced seed pod numbers (90 per cent), and corm mass to a lesser degree (27 per cent), but did not affect onion grass plant density.

In practice, lifting soil fertility or grazing heavily will help to control onion grass by either enhancing competition from companion pasture species or weakening the growth of onion grass. Fertiliser and close defoliation will not kill onion grass and if used excessively will reduce the persistence of perennial native grasses. Therefore other options to control onion grass need to be considered if a significant reduction of the weed in pasture is expected to occur in a growing season.

Control with herbicides

Onion grass can be controlled effectively in established pastures using an appropriately registered metsulfuron-methyl herbicide. It is important that spraying, wick wiping or carpeted drum wiping is conducted at, or as close as possible, to the point that the old corm is exhausted and the new corm is developing (Figure 4), approximately six to eight weeks after onion grass has emerged. This will enable enough chemical to be absorbed by the young plant to kill it. Weed control at flowering can get rid of flowers and seeds, but not corms. If broadleaf weeds such as capeweed are of concern, mixing metsulfuron-methyl with a compatible broadleaf herbicide will achieve the control of both types of weeds.

Before using any agricultural chemical, users must ensure they read and understand the entire product label. There are a variety of selective and non-selective herbicides registered for the control of onion grass in a number of different situations. The Australian Pesticide and Veterinary Medicine Authority (APVMA) maintains a searchable database of chemicals registered for the control of pests and diseases in Australia – go to www.apvma.gov.au and search using the PUBCRIS search function.

Risk to native vegetation

Note that if applied inappropriately, herbicides may affect beneficial native plants such as native herbs. Native ecosystems and their supporting flora and fauna have their own fundamental value. This has been widely recognised by State and Federal Governments and legislation that limits the clearing of native vegetation to prevent further loss of remnant native vegetation, including native grasslands and grassy woodlands. You should seek further advice from relevant authorities before commencing work in areas containing native vegetation. Ensure that prior to using herbicides you read and understand all sections of the product label, including the 'protection of crops, native and other non-target species' section that specifically addresses these issues.

Risk to clover

Note that products containing metsulfuron-methyl are likely to kill clover species for the remainder of the season after spraying and may affect the clover population in subsequent years, depending on the soil seed reserve of clovers. Use of a wick wiper or carpeted drum wiper for application of this chemical to onion grass can help protect clovers and non-target species in some situations. Sub-clover has been found to recover well in soils with good clover seed reserves in the second year after spraying.

Photos left:

6) Onion grass weed (*Romulea rosea);*
7) Onion grass control using a carpeted drum wiper;
8) Good stand of native weeping grass (*Microlaena stipoides).*

Managing water runoff

Catchment management problems arise when the soil water cycle becomes unbalanced due to artificial changes in the shape and function of a landscape through clearing, overgrazing, cropping or construction.

Historically, the year-round growth of native vegetation in southern Australia had greater ground cover by perennial species that used the moisture deep in the soil profile over summer and autumn, leading to less water and nutrient runoff and less leakage to the ground water. The replacement of native perennial vegetation and trees by winter and spring growing annuals that used less soil moisture in summer and autumn reversed this water balance, resulting in greater runoff and recharge.

Management of water runoff is therefore critical for steep hill country. Processes such as saturation-excess runoff (runoff created when rain continues to fall on saturated soil) and infiltration-excess runoff (runoff created when heavy rainfall on a surface exceeds the rate at which water infiltrates the ground) are responsible for runoff generation in steep hill areas. Saturation-excess runoff produces larger overall quantities of runoff, and occurs in late winter and early spring. Catchments with the most strongly convergent topography produces more saturation-excess runoff than other catchments.

Infiltration-excess runoff can occur at any time of the year, and requires high rainfall intensities. Groundcover and plant density greatly affect water runoff. It has been found that higher peak flows were produced from set stocked areas than deferred grazing areas. These high peak flows had high erosive potential, with sufficient kinetic energy to move rocks weighing up to 0.8 kg.

Sustainable management practices for steep hill country avoids applying more fertiliser than is required to increase plant cover to the areas that provide most of the runoff. The application of phosphorus (P) fertiliser can increase the P concentration of surface runoff. This does not always lead to lower water quality, particularly where runoff drains into a farm dam, because many farm dams are highly turbid due to dispersible subsoils. Inorganic P would bind to clay particles in the water. Furthermore, clay particles in the water limit the penetration of light, reducing the chances of toxic blue-green algal growth. However, where runoff is not turbid or is not intercepted by a farm dam, there is potential that fertilising of hill areas will reduce the quality of water in dams, wetlands, creeks and rivers affecting aquatic animals such as frogs.

Photos below:

9) Loss of organic material such as dung;
10) Poor water quality in dams and water ways;
11) High erosion potential.

Managing for biodiversity

Native vegetation is well adapted to the harsh Australian environment and in essence, provides essential ecosystem services such as integrated pest management, healthy soils and landscapes.

Striving toward ecologically healthy and diverse farming systems provides more resilience to climate change and can improve both profitability and biodiversity values.

Appropriate management of native pastures brings about key contributions to biodiversity and landscape health, not only because native species themselves are critical components of the ecosystem, but also species diversity and habitat structure in native pastures are far more diverse than in improved pasture systems.

One of the major benefits in adopting appropriate deferred grazing management is the increase in the density and persistence of perennial native grasses which benefit biodiversity. Deferred grazing may also influence invertebrate ecology and may have potential flow-on effects on litter and soil structure. This benefits the soil food web and nutrient cycling process by enhancing the abundance of beneficial fungi and bacteria.

These benefits are the result of increased availability of suitable habitat structure and niches for native fauna and flora species in which they find shelter from competition, protection from predators and increased availability of food and nutrients.

Increasing the ground cover and abundance of native perennial grasses and forbs using deferred grazing also reduces grazing pressure allowing natural regeneration of shrubs and trees for shelter. This is one of the most effective strategies for promoting biodiversity in the long term.

Low-input native pastures are also perceived as ‘clean and green’, providing stock with a diverse diet.

Significant production value can also arise from non-grass components of the native grasslands. For instance, inter-tussock forbs constitute a small percentage of the actual vegetative cover, but are often highly palatable and nutritious and can form a large part of the diet of domestic livestock. However, many perennial forbs are susceptible to grazing and decrease dramatically under intense grazing regimes.

Photos below:

12) Fat-tailed Dunnart (feeds on insects);
13) Thick-tailed Gecko;
14) Golden Sun Moth (female).

Deferred grazing (DG) quick reference guide

Type	Aim	Method	Post DG
Optimised	Increase perennial and suppress annual grasses (initial native grass composition greater than 20 per cent)	Graze pasture heavily when annual grass stems elongate and before seed heads emerge. Complete DG in late summer to early autumn	Rotational grazing using native grass leaf stage as a guide
Short-term	Use feed in summer while increasing soil seed reserve	Withhold grazing from mid spring (October) to mid summer (January)	Rotational grazing using native grass leaf stage as a guide
Long-term	Restore perennial plant density	Withhold grazing from mid spring (October) to autumn break	Rotational grazing using native grass leaf stage as a guide
Timed Grazing	Restore plant density of very degraded native pasture (initial native grass composition less than 20 per cent)	Preferably withhold grazing in mid spring (October). Graze pasture after 120 to 130 days of resting, then repeat for at least a year	Rotational grazing using native grass leaf stage as a guide
Strategic Grazing	Combine deferred grazing with weed and fertiliser management	Choose one of the DG strategies. Use the same rule of the DG	Rotational grazing with weed and fertiliser management based on recommendations

Further reading

Papers

Barlow, T (1998), Grassy Guidelines: How to manage native grasslands and grassy woodlands on your property. Free from the following web link: www.environment.gov.au/land/publications/grassguide.html

Barlow, T and Thorburn, R (ed.) (2000), Balancing conservation and production in Grassy landscapes. Proceedings of the Bushcare Grassy Landscapes Conference. Free from following web link: www.environment.gov.au/land/publications/grasscon.html

Dorrough, J, Stol, J and McIntyre, S (2008), Biodiversity in the Paddock: a Land Managers Guide. Future Farming Industries CRC. Can be downloaded via the following website: www.csiro.au/resources/biodiversityinthepaddock

Eddy, D (2002), Managing Native Grassland. Free from the WWF website: www.wwf.org.au/publications/managing_grasslands

Gibbs, J (2005), Grass Identification Manual for everyone.

Land & Water Australia (2007), Land, Water & Wool: managing for sustainable profit. Free from following web link: www.projectmetrics.com.au/project-metrics-publications-links.htm

Langford, CM, Simpson, PC, Garden, DL, Eddy, DA, Keys, MJ, Rehwinkel, R, Johnston, WH (2004), Managing Native pastures for Agriculture and Conservation. NSW Department of Primary Industries. 69p.

Lunt, I, Barlow, T, Ross, J (1998), Plains Wandering, exploring the grassy plains of south-eastern Australia.

Marriott, N & J (1998), Grassland Plants of South-eastern Australia.

McCaskill, M, Nie, Z, Zollinger, R, Nash, D (2010), Runoff and water quality from steep hills in south-eastern Australia. 19th World Congress of Soil Science, 2010, Brisbane.

Nie, ZN and Mitchell, M (2006) Managing and using native grasses (Chapter 11). In Nie, ZN and Saul, G (ed.), Greener pastures for south west Victoria. Victorian Department of Primary Industries, Hamilton. pp 99-106.

Nie, ZN, Zollinger, RP and Jacobs, JL (2009), Performance of 7 Australian native grasses from the temperate zone under a range of cutting and fertilizer regimes. Crop and Pasture Science 60, 943-953.

Websites

Department of Primary Industries, search native vegetation, Onion Grass or Phosphorous for sheep and beef pastures: www.dpi.vic.gov.au/

Department of Sustainability and Environment, search Land for Wildlife, native grasslands: www.dse.vic.gov.au

EverGraze on line, search native pasture management, Case Study: www.evergraze.com.au

Five Easy Steps to ensure you are making money from superphosphate: http://images.wool.com/pub/AWI-MLA-FiveEasySteps.pdf

Native Grass Resource Group: Aims to promote and facilitate identification and conservation of native grasses and to develop propagation and management techniques. www.nativegrassgroup.asn.au

The Australian Pesticide & Veterinary Medicine Authority (APVMA) maintains a searchable database of chemicals: www.apvma.gov.au

The Environment Protection and Biodiversity Act 1999, to find out more about the act and permit applications visit: www.environment.gov.au/epbc/publications/farming-epbc.html

For further information contact

Dr. Zhongnan Nie
Department of Primary Industries
Private Bag 105
Hamilton, Victoria, 3300
Phone: (03) 55 730 900

Acknowledgements

The research work was funded by the Victorian Department of Primary Industries, Glenelg Hopkins CMA, Future Farming Industries CRC, Meat and Livestock Australia, Australian Wool Innovation and EverGraze.

We thank all collaborating farmers, in particular families: Shea, Maconachie, Hartwich and Steven, for their commitment and support over many years.

Technical assistance: R. Zollinger, J. Byron, C. Heine, A. Byron and J. Chin.

Photos by: R. Zollinger and Z. Nie.

Printed on Australian Made, Spicers Tudor RP 100% Post-consumer recycled paper, 140gsm. Sales of Tudor RP support Landcare Australia.

If you would like to receive this information/publication in an accessible format (such as large print or audio) please call the Customer Service Centre on: 136 186, TTY: 1800 122 969, or email customer.service@dpi.vic.gov.au

Published by the Department of Primary Industries, Future Farming Systems Research, Hamilton, July 2011

Authorised by the Victorian Government, 1 Spring Street, Melbourne 3000

ISBN 978-1-74264-844-6 (print)
ISBN 978-1-74264-845-3 (online)

For more information about DPI go to www.dpi.vic.gov.au or call the Customer Call Centre on 136 186.