3

Property Planning and Managing Native Pasture

KEY POINTS

» Property planning allows the property's resources to be managed efficiently and sustainably.

» Native pastures and sown pastures are complementary, and can be managed strategically to maintain pasture condition and livestock health.

» Locating fences along the boundaries between different land types minimises overgrazing of some areas and undergrazing of others.

» Subdividing large paddocks and strategically locating watering points can provide greater flexibility for managing grazing and protecting sensitive areas, such as north-facing slopes.

WHY HAVE A PROPERTY PLAN?

Managing native pastures for production and nature conservation takes place in the context of the 'whole' farm, the management team, and current and predicted markets.

Property planning seeks to improve business profitability while developing sustainable farming practices to protect natural resources. Property plans should not be seen as fixed. Rather, they should develop over time as the natural resources become better understood, goals evolve, and markets and technologies change.

This chapter examines only two aspects of property planning: mapping the location and condition of natural resources, and considering native pasture management in the context of the wider grazing and farm management system.

"My property plan is a feasibility study of what's possible on the farm. I would like to return 10–20% of my farm back to native vegetation. The plan is part of an on-going process."

DEVELOPING A PROPERTY PLAN

Your property plan should state where you are now, where you want to be, and how you intend getting there. Mapping and reviewing the condition and location of the natural resources on your property enables you to understand where you are now.

Before you can make a plan, you need to set down what you hope to achieve. Your goals should incorporate a triple bottom line (social, economic and environmental) approach to planning. Your goals should be written down and agreed upon by all who have a say in the running of the farm. Involving family members and farm staff in the planning process is essential. It provides ideas from a range of people, and enhances everybody's commitment to the changes set out in the plan. Farm plans take time to develop, and evolve with changing attitudes, ideas, farming techniques and opportunities.

WHERE YOU ARE NOW

Collect all the information available about the natural resources on your property, such as soil maps, land capability maps, hydrology maps, vegetation maps, contour maps and aerial photographs. Many of these resources are available in either paper or computer form (digital data) from Service Tasmania.

Use these resources to compile a multilayered map of the property using clear acetate sheets or digital layers in a geographic information system (GIS) computer software. Use a separate layer for each theme, such as hydrology, and overlay them over an aerial photograph.

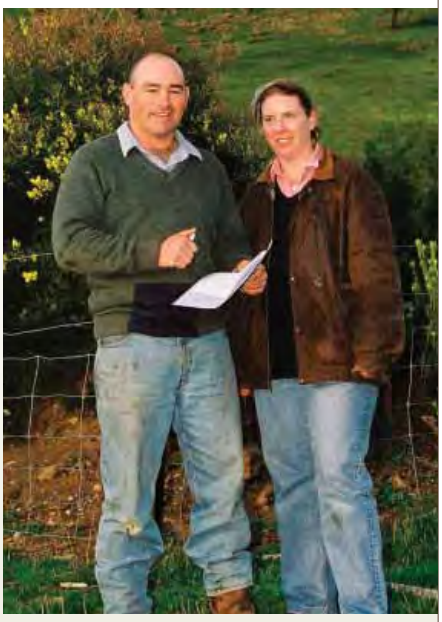
Use your knowledge of the property to add any details to the maps that may be relevant for developing your property plan, such as infrastructure, erosion, salinity or animal habitat. Don't forget to include any potentially relevant information that you have learnt as a result of reading books, brochures, consultants' reports and so on.

The maps will be used for a variety of purposes, including

- showing the potential productivity of the property
- showing where production activities could result in land degradation
- showing conservation priorities
- showing activities, such as stocking rates, fertiliser application and pasture renovation
- planning new paddock and infrastructure boundaries.

Sarah Ackland & Steve Barrington

'Apsley Park', Apsley



'We developed a property plan for Apsley Park largely to ensure that we had a shared vision for improving the property, and to help determine how we were going to go about achieving that vision. The plan enabled us to set down what had to be done, and to prioritise those actions. With a property plan in place you overcome the daunting feeling of wanting everything to be done at once. You feel as though you're working towards an end goal.

'Mapping the physical resources of the farm highlighted issues that needed to be addressed. Many of the fences on Apsley Park are over 40 years old, and in urgent need of replacing. This gives us the opportunity to realign fences according to slope, aspect, soil type and vegetation cover, all of which are shown on our map.

'The first priority is to fence off north-facing slopes so they can be managed separately. Some of these slopes are on sandy soils, which makes them particularly vulnerable to erosion. They are the first to dry off in summer, and it is essential to make sure that you don't overgraze them at this time. However, when you do get rain, they respond a lot quicker than the heavier soils, so you can put sheep on them first after the autumn break, before moving them on to the heavier country.

'Correctly managing the bush areas on Apsley Park is a major issue. The plan identifies the best areas of bush, and documents the way these areas have been managed. The important thing with these areas is to continue managing them in the same way they have been managed in the past. In some cases, where the plan involves increasing stocking rates on adjacent areas of improved pasture, we need to fence off the bush. However, if the bush is already badly degraded, it will not be a priority to fence it off.'

Knowing your land capability

Land capability maps indicate the capacity of different parts of the property to support different intensities of agricultural use (Figure 2). Land capability enhances the basic soils information by considering factors such as slope, erosion hazard, climate and the area's potential agricultural versatility.

Some of Tasmania's land capability maps are based on 1:100,000 surveys of private land, while others are based on modelling of the mapped areas. Either way, the scale of the maps is really too small for farm planning, so they should be augmented with surveying of the farm by yourself or a consultant.

Tasmania's Land Capability Classification System (Grose, 1999) comprises seven classes ranked in order of increasing limitation in relation to agricultural use, and decreasing agricultural versatility. The classes are defined as follows:

- Classes 1 to 3 are considered to be prime agricultural land
- Class 4 is considered to be marginal cropping land
- Classes 5 and 6 are considered to be suitable for grazing only
- Class 7 is considered to be unsuitable for agriculture.

Extensive areas in Tasmania's grazing regions are Class 4 land. The soil in these areas is deep enough to be ploughed and sown to introduced pastures. However, it does not always produce better pastures than Class 5 land, because the soil may be lighter and more drought prone.

Class 5 land is not suitable for broadacre cropping. However, it may have good grazing potential, perhaps having flat to moderately sloping terrain with few surface rocks. Class 6 land is bush run country, having steeper slopes, rock outcrops, shallow soils and/or a northerly aspect. Pastures on less productive, Class 6 land, tend to decline more rapidly in summer than pastures on more productive, Class 5 land. Pastures on Class 5 land also tend to be more resilient to adverse conditions than pastures on Class 6 land because of their deeper soils and greater moisture retention and fertility.

A land capability map provides a guide for planning new fences. If it makes economic sense, paddock boundaries can be relocated over time so that paddocks have consistent land capability ratings. This makes it easier to manage stocking rates without overgrazing some areas and undergrazing others.

Knowing your hydrology

Water moves through the landscape over the ground, through the soil, and through groundwater systems. Tasmania's digital hydrology layer and 1:25,000 TASMAP maps show rivers and streams, intermittent watercourses and drainage lines, wet areas, wetlands and floodplains (Figure 3).

The presence and action of water often influences paddock layout. For example, paddock layout may be designed to enable livestock access to water, irrigate crops, or isolate boggy and flood-prone areas. Fencing according to hydrology often makes good sense. For instance, damp areas commonly provide good habitat for liver fluke, so fencing off such areas to prevent stock access reduces the likelihood of fluke infection.

Modelled land capability

Figure 2. Modelled land capability (red: Class 4, blue: Class 5, purple: Class 6). Exisiting fences (red line)

Hydrology and topography

Figure 3. Hydrology and and topography (pink: 10m contour lines, blue: streams and drainage lines, blue hatching: wet areas)

Native vegetation communities

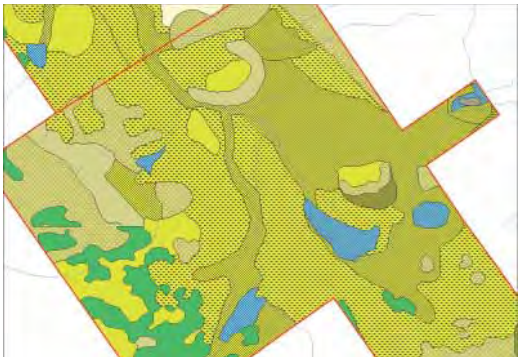


Figure 4. Vegetation communities (yellow: native grassland, blue: wetland, khaki: scrub, green: woodland)

Knowing your native vegetation

Mapping the native vegetation on your property is a fundamental part of developing a property plan. This may be done from aerial photographs and ground-truthing, or by using TASVEG.

TASVEG Version 1.0 is a State-wide map of Tasmania's vegetation at a scale of 1:25,000 that uses over 150 ecological mapping communities. Vegetation maps can be sourced from Service Tasmania as digital information (Figure 4). Information is also available on other natural values such as threatened species.

It is also important to make an assessment of the condition of the native vegetation. Recording the condition of the vegetation (e.g. presence of dieback, regenerating trees, woody weeds), the variety of groundcover, grass, shrub and tree layers, and the grazing and fire management history will help you determine which areas of native vegetation should be targeted for specific management actions. Such could include changing grazing management, controlling weeds, and promoting tree and shrub regeneration. The Tasmanian Bushcare Toolkit (Kirkpatrick & Gilfedder 1999) will help with management information.

MAPPING AND PLANNING FARM INFRASTRUCTURE

Fencing

Most properties comprise a variety of land types, such as south-facing slopes, eucalypt woodlands and river flats. The location of fences is usually a legacy of past decisions, and is not always related to land type. This can result in uneven grazing intensities in paddocks (e.g. livestock usually graze north-facing slopes more heavily than other parts of a paddock). If grazing intensity is uneven, strategic fencing allows more even utilisation of the pasture through grazing management. The preferred location for fences is between the boundaries of different land types as defined by topography, aspect and land capability (Figure 5).

Subdividing large paddocks can be a useful tool for managing native pastures. Using fencing to produce several smaller paddocks allows some paddocks to be grazed intensively at key times of the year, such as when the annual grasses are flowering or setting seed, and others to be rested at key times of the year, such as when the native grasses are flowering or setting seed.

Relocating fences in more appropriate locations, reducing paddock sizes and providing better access to water makes more feed available because of better grazing control. Well designed fences and watering points can be expected to last for 40 or more years.

New paddock subdivision

Figure 5. Paddock subdivision into four new paddocks follows hydrology and land capability (see Figures 2 and 3), separating areas that remain wet from those that are drier. It also seeks to obtain similar feed supply between paddocks and separate grasslands from woodlands for tree regeneration (Figure 4).

"Before we fenced off the northerly slopes from the flats they were spoiled with stock camps and nutrient transfer, so that horehound and prickly box spread in many areas. Fencing has enabled us to run our best wethers on these slopes."

Unfortunately, relocating fences and subdividing larger paddocks is not cheap. The financial returns from native pastures are low, but the capital expenditure can be minimised by using low-cost fencing, such as electric fencing. The cost of strategically locating fences and subdividing larger paddocks must be weighed against the long-term benefits, including increased pasture productivity, increased pasture utilisation and decreased soil erosion.

Fencing has an important role in limiting stock access to sensitive areas, such as

- pastures needing rehabilitation
- areas with highly palatable threatened species
- north-facing slopes where soil erosion is a problem
- riparian bush and wetlands
- gullies and areas of thick vegetation that provide important fauna habitat (difficult to muster sheep in these areas)
- recently burnt bush
- regenerating bush.

Watering points

The location of watering points can have a dramatic effect on the intensity of grazing in different parts of a paddock. If livestock have to travel more than 1.2 km to get to water, the land near the watering point will be overgrazed and the land further away will be undergrazed. Locating watering points in the centre of large paddocks can help avoid such problems. Alternatively, watering points can be located strategically in areas of the paddock that would benefit from more intense grazing, and away from areas that are more sensitive or have previously been overgrazed. The cost of relocating watering points needs to be weighed against the long-term benefits, such as better utilisation of pasture and higher productivity.

RECORDING FARM MANAGEMENT INFORMATION

Paddock layout maps are a wonderful tool for recording your management. They can be used as a yearly record of

- stocking intensity and patterns
- DSE ratings
- fertiliser type and rates
- pasture monitoring.

“ Today we’ve got access to good GIS information, so we can accurately map paddock boundaries and calculate paddock areas. We can then rate all our paddocks on carrying capacity, based on what stocking rates we have run in the past and the condition of the pasture. Then we can determine what stocking rate we are going to run in the future. ”

BALANCING NATIVE AND SOWN PASTURES

An important point raised by many Tasmanian graziers is that native pastures and sown pastures are complementary. A diversity of landscapes and pasture types on farms provides balance, flexibility and resilience to pests. Sown pastures are usually more productive than native pastures, and provide large amounts of high quality stock feed. However, sown pastures need greater inputs to maintain them in good condition.

Native pastures can play a strategic role in the property grazing system. Tasmanian graziers can run more merino wethers if they have run country. Native pastures can also act as a forage bank when feed is short during drought or winter, which is vital on many grazing properties. Most native pastures are stocked from late summer until lambing and shearing in spring, which provides valuable winter feed (Figure 6).

Native pastures can also be used to run sheep that have been grazed on sown pastures over winter for a short time before shearing in early spring to reduce scouring and consequent damage to the wool.

“ The native pastures allow us to spread our stock over a wider area over the autumn - winter period, when pasture growth rates are low. If we then shut them up over the spring - summer period, and concentrate our grazing on the improved pastures, this allows us to control the huge flush of growth in the spring and early summer. ”

Moving stock from native to improved country in spring allows the runs to recover, and ensures that the sown pastures are fully utilised.

Timing the use of native pastures

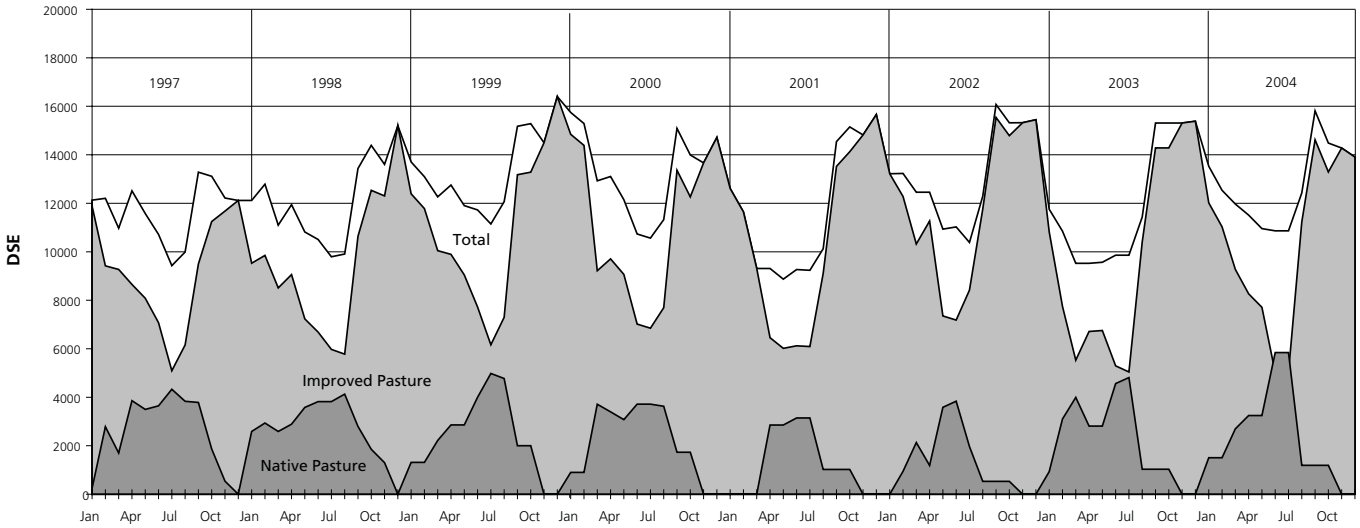


Figure 6. Distribution of sheep grazing between native and improved pastures on a property at Dunalley from 1997 to 2004.

John Fowler

Bendeveron, Bothwell

'In the 1980s, we started a development program on our Trap Hut property, and fencing was the cheapest and most cost-effective form of development we did. We cleared some areas, and ploughed some areas, but fencing was the best return—by a long shot.

'Before fencing, the stock would just selectively graze the best country, and there was a large proportion of the place they didn't even go near. So, purely by fencing, we were able to have a lot more area available for grazing.

'There was one paddock where we used to run 600 wethers. It has a plateau area in the centre and gorges around it. We fenced around the plateau. In the first year, we ran 1000 wethers just around the edge, and still ran our 600 wethers on the plateau area in the centre.

'The initial fencing we did in the 1980s was all permanent fencing. Then, in the 1990s, we came back through there with electric fencing and subdivided it, and went to rotational grazing to improve our grazing control.

'Fencing enabled us to stop the sheep overgrazing the north-facing slopes, and get them grazing the south-facing slopes. The north-facing slopes were in terrible condition. The plants were on pedestals and most of the topsoil had gone. Now, we've got our ground cover back. There was no kangaroo grass out there, but now it's coming back.

'In our experience, fencing is the most cost effective thing to do. Your dry matter production per year goes up, your utilisation goes up, and the area of the farm you're using goes up. Fencing also extends the time I have green feed. I can use the north-facing slopes in winter, and then move stock to the south-facing slopes in summer when there's still some green feed available.'

4 Managing Grazing on Native Pastures

KEY POINTS

» Understanding how grasses respond to grazing is critical for sound grazing management.

» Grass growth is slow when grasses have been grazed too short.

» The shorter a pasture is grazed, the longer it will take for the regrowth to reach its potential growth rate.

» Perennial species usually weaken and die off when grazed continuously.

» Overgrazing is one of the main causes of degradation of native pastures.

» Grasses are most productive when the most appropriate stocking rate is used, so match the stocking rate to the pasture's carrying capacity.

» The most appropriate stocking rate varies from year to year and from season to season.

» Using the most appropriate stocking rate is more important than choosing a particular grazing method.

» Pastures should be allowed adequate time to recover after grazing.

» Pastures should be strategically grazed so that competition and seed production from desirable species is maximised.

» Maintain at least 70% cover of pasture plants throughout the year.

GRASS GROWTH AND GRAZING

Understanding how grasses respond to grazing is an important basis for sound grazing management. Grasses have evolved to tolerate grazing. Their growing points are located at the bases of the plants close to the ground so grazing animals cannot bite them off or damage them easily. After grazing, the remaining leaves can continue to grow from growing points in the bases of the leaves, while basal buds in the crown of the plant are stimulated to produce new shoots (tillers) (Figure 7). In contrast, the growing points of broadleaf plants, such as legumes, are located higher up the plant, so they are more likely to be removed by grazing (Figure 7).

When grasses are grazed heavily (too short), regrowth is slow, because only a small area of leaf remains to capture light (Figure 8 – Phase 1). During this period of slow growth, energy reserves from other parts of the plant, such as the roots, are used to help the leaves regrow. As the area of leaf increases, growth becomes more rapid, because a larger leaf area is available to capture light (Figure 8 – Phase 2). During this period of rapid growth, the grasses build up their energy reserves and store them in their roots, which allows them to recover rapidly from future grazing.

Responses to grazing

Figure 7. Diagrammatic representation of the responses of grasses (top) and broadleaf plants (bottom) to grazing, showing the position of the growing points (red). Grass leaves keep growing from their bases after grazing, and new tillers arise from the basal buds, while broadleaf plants lose many of their buds during grazing.

Continuous heavy grazing can irreparably damage native pastures.

If grasses are grazed to maintain a relatively large leaf area, the pasture will provide good quality feed and be more productive, and the grasses will recover more rapidly. If grasses are repeatedly overgrazed, the energy reserves in the roots will diminish and the plants will take longer to recover. Native grasses take longer to recover from grazing than sown grasses.

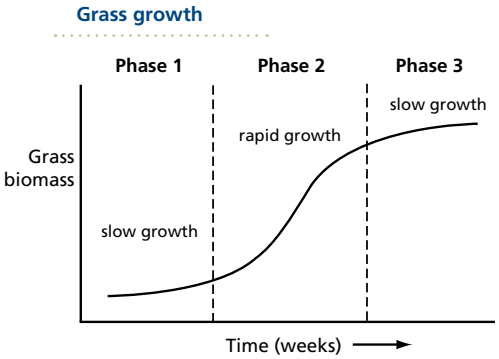


Figure 8. The three phases of growth that occur as grass biomass increases over time.

In the absence of grazing or under continuous light grazing, grasses become rank, the nutrient content of the leaves decreases and the rate of growth again slows (Figure 8 – Phase 3).

It is best not to graze pastures too heavily, because they will take longer to recover sufficiently to carry livestock again. Continued heavy grazing leads to a loss of energy reserves in grasses, and reduced grass vigour. Older roots are not replaced by new ones, so root systems become smaller, which limits the grass plant's ability to capture soil water and nutrients. Grasses can also be damaged if grazing occurs while the grass is resprouting from its reserves after a period of dormancy, such as after drought or fire.

Maximising pasture growth involves adjusting livestock numbers and grazing periods according to the season. A grazing trial on a kangaroo grass pasture at Nile in Tasmania (Friend *et al.* 1999) found that resting the pasture in spring resulted in a 48% increase in pasture growth compared with continuous grazing (no resting) (Table 4). Increasing livestock numbers in spring decreased pasture growth by 11% compared with continuous grazing at constant livestock numbers.

RESPONSES OF OTHER NATIVE SPECIES TO GRAZING

Most native species in Tasmanian native pastures tolerate some grazing. Grazing-sensitive species, such as soft peppercress (*Lepidium hyssopifolium*) and spur velleia (*Velleia paradoxa*), are highly palatable and are not adapted to recovering from grazing. Therefore, they are often listed as threatened species and need ongoing protection from livestock.

Although some native plants are threatened by grazing, many rely on grazing to reduce the dominance of native grasses and create bare spaces where they can establish and thrive. These bare spaces are particularly important for rare native annuals, lilies and orchids.

Table 4. The effect of resting in spring compared with continuous grazing at a constant stocking rate and continuous grazing with an increased stocking rate in spring on net pasture growth (NPG - the difference between true growth and decay measured as kilograms of dry matter (DM) per hectare per day) of a kangaroo grass pasture at Nile, Tasmania.

Treatment	Mean NPG (kg DM/ha/day)[1]
Spring resting	5.45
Continuous grazing	3.69
Continuous grazing with increased grazing pressure in spring	3.29

[1] *Mean net pasture growth rate over 5 years, September 1993–September 1998.*

MANAGING NATIVE PASTURE AS FEED

Healthy, diverse native pastures provide livestock grazing them with all their nutritional needs: energy, protein, fibre, vitamins and minerals. The capacity of a pasture to meet the nutritional needs of livestock depends on the quantity and quality of forage available. The quantity of forage depends on the pasture growth rates, which vary through the year (Figure 9). Forage quality, as measured by digestibility, crude protein and metabolisable energy, also varies through the year (Figure 9).

Forage quality is highest when the pasture plants are young and actively growing during winter and early spring (Figure 9). It declines as the plants mature, flower, set seed, and the leaves dry off in late spring (Figure 9). Ranges in forage quality measures for kangaroo grass and wallaby grass pastures in Tasmania are shown in Table 5.

High quality feed is digested rapidly by livestock, providing high levels of energy and releasing nutrients. It passes through the animal quickly, which allows the animal to keep eating and producing (growing or lactating). Low quality forage takes a long time to digest, and a large proportion is excreted and not used. It passes through the animal slowly, which restricts the animal's intake and results in lower animal productivity. Dry standing feed may initially provide the maintenance requirements of dry livestock, but it gradually declines in quality due to leaching of the nutrients by rain.

Growth and forage quality of native pastures

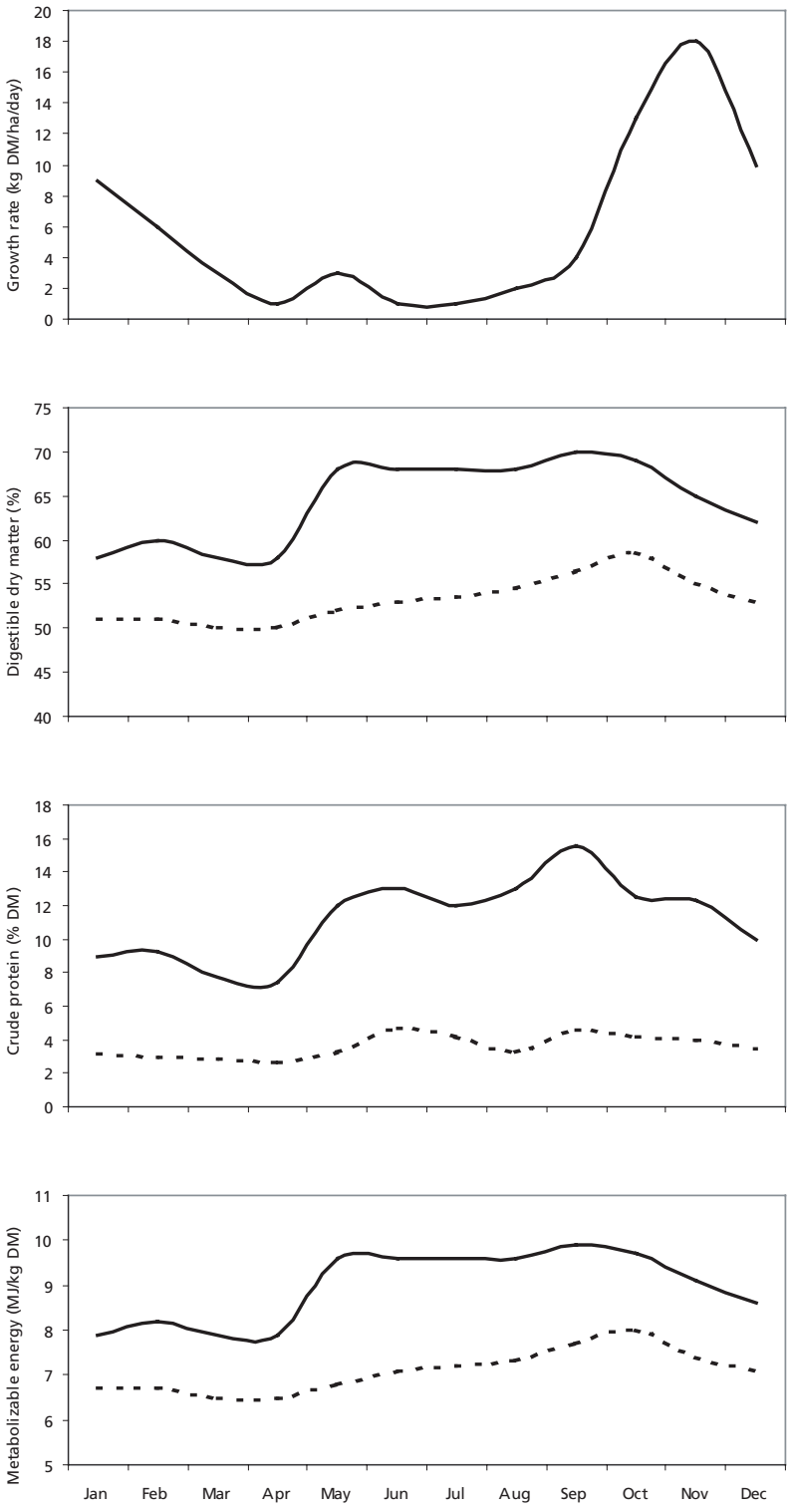


Figure 9. Seasonal changes in pasture growth rate and seasonal changes in forage quality as measured by digestible dry matter, crude protein and metabolisable energy for green herbage (solid lines) and dead herbage (broken lines) in a kangaroo grass pasture, based on data from Nile, Tasmania, for the period September 1993–September 1998 (DM = dry matter).

Green actively growing native pastures (top) provide high quality forage for livestock. When foliage dies off in summer (bottom), forage quality rapidly declines.

Feed supplementation blocks ('lick blocks') containing nitrogen (urea), phosphorus and sulphur can help livestock utilise dry or rank feed, and can eliminate the need to burn rank fodder. These supplements help maintain the condition of sheep grazed on dry, rank pastures, and may improve the quality of wool produced. However, despite the benefits, many graziers are not sure if their use is justified economically. In addition, these supplements may encourage overgrazing and damage to tussocks, and may lead to the loss of shrub species through increased grazing pressure.

The nutritional requirements of sheep and cattle vary throughout the year and are influenced by the reproductive state, age and condition of the animal. Successful grazing management requires a knowledge of the nutritional needs of livestock throughout the year and the capacity of the forage to meet those needs.

"Use urea blocks when the pasture is dry. You can tell from the dung—if the vegetation isn't broken down you need blocks."

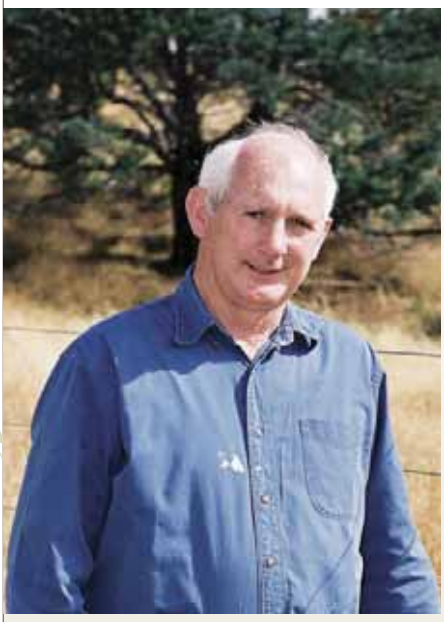
The consistency of forage quality in native pastures compared with sown pastures makes them ideal for fine wool production. Graziers with an abundance of run country can use this land for wool production from mature wethers, because they need only a maintenance feed intake and are experienced at searching for forage. Wool production from wethers is usually the most economically viable and environmentally sustainable use of run country.

Young growing livestock, ewes in late pregnancy and lactating ewes have more demanding nutritional needs, so they are better suited to lush green pastures with a high energy and protein content (normally sown pastures). In general, it is more difficult to manage native pastures being grazed by breeding animals, because it is not possible to force them onto poorer quality feed.

Sheep and cattle are selective grazers, but they prefer different plants, so they have different effects on the species composition of native pastures. Sheep graze closer to the ground, and tend to concentrate on patches of preferred species, so they have a greater impact on pasture composition than cattle. Cattle are effective in removing tall, rank and dry feed.

Table 5. Ranges in forage quality measures for kangaroo grass and wallaby grass pastures (green leaf) in Tasmania (DM = dry matter).

Digestibility (% DM)		Crude protein (% DM)		Metabolisable energy (MJ/kg DM)	
Autumn	Spring	Autumn	Spring	Autumn	Spring
55–62	66–74	8–12	13–18	7–8	9–11



Frank O'Connor

'Benham', Avoca

'The majority of our native pastures are on northerly slopes, from 200 to 500 m. They are used purely for wether grazing; we don't run ewes on native pasture. The aim of grazing on this country is to grow high value wool. If you're not growing premium quality wool, you're not making the best use of this country.

'To grow high value wool you need to look after the pasture as well as the sheep. We try to delay putting the wethers back on the runs for as long as we can after shearing in October. Ideally, we would like to see the runs seed before we put the sheep back on them.

'Getting the stocking rate right on native pastures is really important. If you overstock you do an enormous amount of damage. They also seem to perform better if they're not too understocked. We use rotational grazing, and it's just a matter of assessing the pasture to determine when to move the sheep. We run big mobs and rotate the sheep over four or five runs. With big mobs you have shorter grazing periods and longer recovery periods, which reduces the number of sheep tracks and the amount of bare ground in the pastures.

'We try to have as little bare ground as possible in order to keep the wool free of dust. Maintaining cover is good for the pasture, but it's also sensible for the sheep.

'It's important to make sure that stock have a reasonably even nutrition through the year to avoid tender wool. If feed gets tight in winter, we take the sheep off the runs for a short period. We have some areas that are semi-native, and can put them on this better quality feed in the winter without causing a break in the wool. You certainly wouldn't want to put them on a lush clover pasture. This management gives us the opportunity to spell the runs in winter.

GRAZING METHODS

The different approaches to stock grazing are described by different terms, including 'rotational grazing', 'rotational resting', 'block grazing', 'cell grazing', 'time-controlled grazing', 'strip grazing', 'mob stocking', 'crash grazing', 'continuous grazing' and 'set stocking'. The different terms suggest that each method is different, but, in reality, graziers usually apply aspects of several methods when managing grazing on their native pastures. Grazing management depends on the grazier's goals and pasture types, and in many native pastures the choices are limited. For example, it is difficult and time consuming to move sheep through thickly wooded vegetation, so rotational grazing may not be practical in bush runs.

The most important thing to consider when adopting a particular grazing method is whether it meets your grazing goals and objectives. Other things to consider include

- is it based on the biology of the pasture and livestock?
- is it flexible enough to allow for changing conditions between seasons and between years?
- does it encourage desirable pasture species?
- does it meet the nutritional needs of the animals?
- does it make optimal use of the available moisture?
- does it maintain native biodiversity and prevent land degradation such as erosion?

The key aspects of grazing management are

- matching the stocking rate to the carrying capacity (taking into account any grazing from wild herbivore populations)
- grazing duration (how long livestock are on the pasture)
- rest period (how long the pasture is rested before being grazed again)
- timing of grazing with respect to season and pasture condition.

Basically, there are two broad approaches to grazing management: continuous grazing or set stocking, and rotational grazing (Figure 10). These methods and their possible effects on the condition of native pastures are described overleaf.

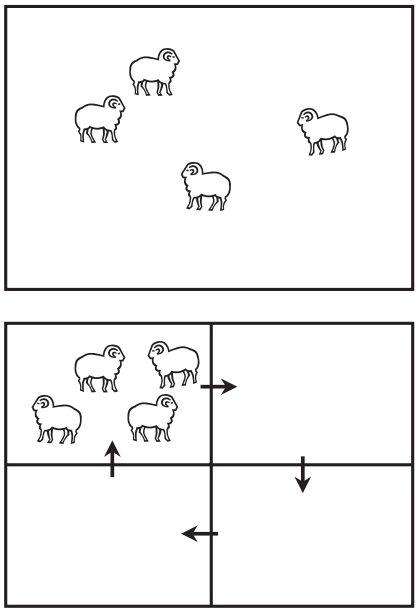


Figure 10. A diagrammatic representation of two contrasting methods of grazing management: continuous grazing (above) and rotational grazing (below). In each case, the stocking rate over the whole area is the same.

It can be difficult to move sheep through thickly wooded vegetation, so rotational grazing may not be practical in bush runs.

Continuous grazing (or set stocking)

Continuous grazing involves grazing a paddock or bush run continuously for long periods of time with a fixed or variable number of animals. Normally, the number of stock varies over time, and stock are usually removed from the paddock for part of the year (i.e. the pasture is rested). Continuous grazing is common on larger runs where moving livestock regularly is impractical.

The main disadvantage of continuous grazing is that it allows livestock to preferentially graze the pasture. This means the most palatable, nutritious and actively growing species are grazed more intensively than the less palatable or dormant species (e.g. many weeds). This can adversely affect the growth of desirable plants, and favour the growth of less desirable plants.

The negative effects of continuous grazing may be reduced if the pasture is rested at key times of the year to benefit desirable species (e.g. resting in spring or summer to benefit kangaroo grass and native wildflowers). Not using high stocking rates will also help limit the creation of bare ground.

A 5-year study compared the effects of different grazing practices on the species composition of a kangaroo grass pasture at Nile in the Northern Midlands of Tasmania (Garden *et al.* 2000). Resting during spring led to a marked increase in kangaroo grass compared with year-round continuous grazing (Figure 11).

Increased grazing intensity during spring led to wallaby grasses becoming dominant due to their ability to avoid heavy defoliation by developing a prostrate growth habit, so they were favoured compared with the more erect kangaroo grass. Flat weeds also increased under increased spring grazing due to the plants ('rosettes') becoming more prostrate, and so avoiding heavy defoliation, and probably also through reduced competition from taller growing species. Sweet vernal grass, a weedy introduced grass, decreased under both spring resting and increased spring grazing compared with year-round continuous grazing. Under spring resting, this may have been due to the increased competitiveness of kangaroo grass relative to sweet vernal grass. Under increased spring grazing, livestock would have been forced to graze this relatively unpalatable grass, reducing its vigour and seed production.

Continuous grazing can have positive and negative effects on the condition and biodiversity of native pastures, depending on the intensity and duration of grazing. Native species such as kangaroo grass and legumes (pea relatives) can be eliminated from continuously grazed pastures due to selective grazing. Some of the more diverse native pastures are continuously grazed at low stocking rates (e.g. 1–2 DSE/ha) and rested in late spring–early summer so native plants can flower and set seed. While desirable species such as clover glycine may be selectively grazed, resting allows them to reproduce.

"It's not relevant to think of different grazing systems on native country—everyone does a mix of all of them. It's better to look at the principles."

Effect of grazing method on sward composition

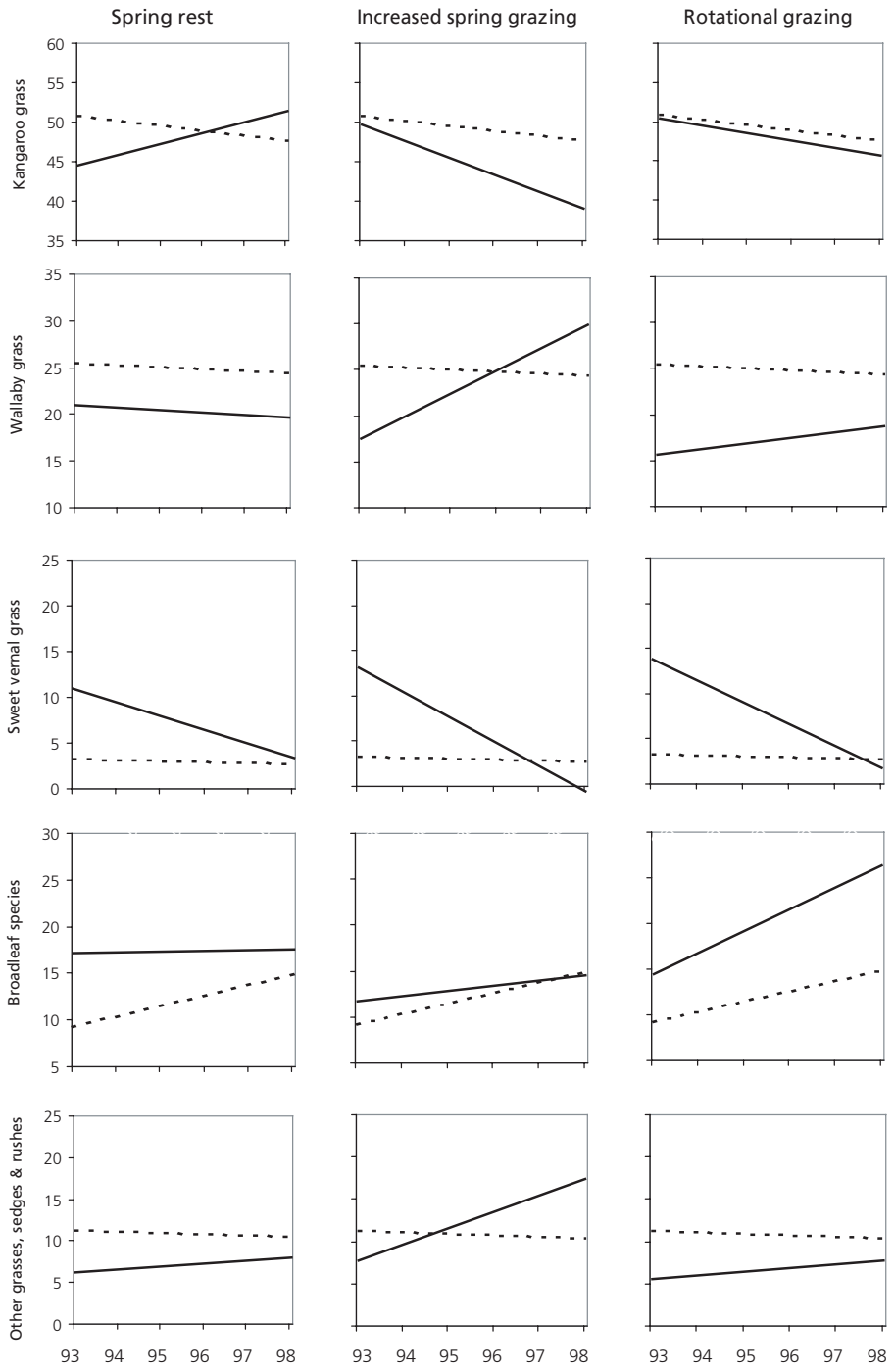


Figure 11. Linear trends in the percentage composition of key species and species groups under three grazing treatments, spring rest, increased spring grazing and rotational grazing (solid line), compared with continuous grazing (broken line), from a 5-year trial (1993 - 1998) in a kangaroo grass pasture at Nile, Tasmania.

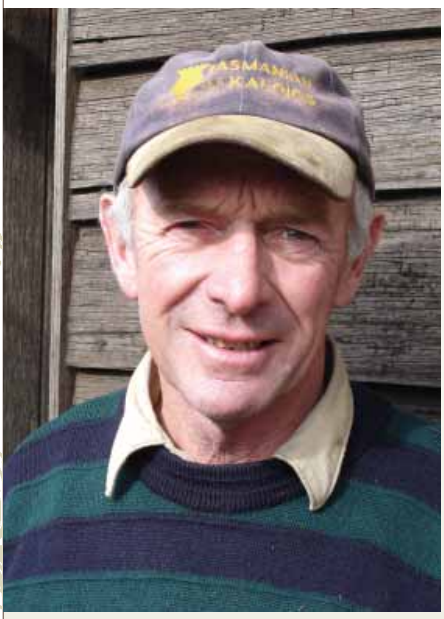
Continuous grazing at very low stocking rates may also result in the loss of some native herbs because of the rank grasses shading out the smaller species. Very low or very high stocking rates are also likely to result in woody plants establishing.

Rotational grazing (including time-controlled grazing)

Rotational grazing involves regular periods of grazing and resting. Livestock are moved from paddock to paddock (Figure 10) after set or varying lengths of time, depending on the season and condition of the pasture. Rotationally grazed paddocks usually carry more livestock during the grazing periods than continuously grazed paddocks (Figure 10), which encourages more even grazing of the paddocks and uses more of the pasture resource.

Time-controlled grazing methods, such as cell grazing, are essentially rotational grazing with a short grazing period, high stocking rate and a large number of paddocks. Thorough time-controlled grazing involves constantly adjusting the grazing interval and stocking rate to the growth rate of the pasture, which varies with season and rainfall. Hence, the stocking rate is flexible and adjusted to match the pasture's carrying capacity.

Grazier viewpoint Grazing methods



Richard Bennett

'Ashby', Ross

'We run 8000 sheep and 250 cows and calves. We use rotational grazing, running the stock in large mobs that we move around. Our aim is to spell the paddocks for as long as possible.

'In the past, the stock were run in smaller mobs, which were rotated more often, so the paddocks were not spelled for such a long time. Time in the paddock is feed-based, it depends on what's there, and we move the stock according to the amount of feed that's there.

'We try to get the stock to eat everything to a certain level, not just selectively eat the clover. There are no set rules as to when we move them, just experience and the appearance of the pasture. You can't set and forget — you need to make sure there's enough feed. Also, we don't want the paddocks to get too dusty, because the wool quality decreases.

Cell grazing is the best known time-controlled grazing method, but other methods include block grazing and strip grazing. Experience from Tasmanian graziers suggests that the minimum recovery period for native pastures under cell grazing is about 90 days, although shorter rest periods may be desirable at times of high pasture growth or when strategically desired. Cell grazing methods on native pastures often need to be modified because of specific problems such as access to water.

Rotational grazing methods, such as cell grazing, generally involve short periods of high density grazing.

> *"On the first day, the sheep eat the ice-cream; the second day, the brussell sprouts."*

The main benefit of rotational grazing is less selective grazing of desirable species compared with continuous grazing. The reduced selective grazing is a function of livestock density not grazing period, unless livestock are left on the pasture for too long. Under rotational grazing, livestock tend to graze pastures more evenly, which helps control the growth of the less palatable and weedy species, thus giving the desirable species the opportunity to compete more effectively.

Regular resting gives pastures the opportunity to recover from grazing. Allowing adequate recovery time for the desirable species is essential to derive the benefits of rotational grazing. Short grazing and long rest periods may also reduce the effects of stock camps, reduce sheep tracks, and allow better root development.

Heavy stocking for short periods after native grasses have set seed may help break up the soil surface and promote seed germination, and trample and recycle the rank grass. Finally, rotational grazing allows feed to be rationed, and forage to be built up for times of feed shortage, such as late winter.

The advocates of intensive rotational grazing, including some researchers and consultants, claim that it allows more livestock to be carried because it utilises the pasture more evenly. They also suggest that rotational grazing can improve nutrient cycling and the botanical composition of pasture. However, all grazing should be planned according to the seasonal conditions and livestock requirements if the benefits are to be realised and sustained long-term. The possible benefits include greater biodiversity, increased persistence, increased ground cover, more efficient water use, more soil organic matter and higher soil fertility, and better animal productivity.

Few studies have examined the effects of rotational grazing on native pasture condition and productivity. One study in the Northern Tablelands of New South Wales (Earl and Jones 1996) compared continuous and cell grazing, and found that cell grazing increased the vigour and abundance of desirable grasses, such as lovegrass (*Eragrostis leptostachya*), and decreased the vigour and abundance of undesirable grasses, such as wiregrass (*Aristida ramosa*). A Tasmanian trial (Garden *et al.* 2000) that compared continuous and rotational grazing also found a marked decrease in the weedy perennial, sweet vernal grass, with rotational grazing (Figure 11), but there was little effect on the main native grasses. In both studies, the rotational grazing involved a short duration of grazing (less than 4 days) at a high stocking rate (greater than 200 DSE/ha) four times a year. The number of livestock carried (DSE days/ha/year) was similar in both studies.

Rotational grazing with high stock densities reduces selective grazing and increases pasture utilisation.

“ You need at least 90 days rest in hard times. We had to give the paddocks 120 days rest last winter as it was so dry. In good times you can speed it up. For stock health you have to move them regularly … the length of spell is for the paddock but a short graze period is for the sheep. ”

Perhaps the greatest benefit of rotational grazing is that it encourages graziers to look at the condition of their pastures as well as the condition of their livestock when planning their grazing management. If livestock movements and stocking rates are not carefully planned, rotational grazing can have adverse effects on the condition of native pastures. Rotational grazing methods may also degrade pasture condition if the timing of grazing and resting is not flexible (e.g. does not allow native grasses to flower and set seed). The New South Wales study (Earl and Jones 1996) showed that native Poa tussocks were adversely affected by cell grazing. In addition, the increased subdivision associated with the more intense rotational grazing methods forces stock to graze areas that have previously been ungrazed or only lightly grazed, such as south-facing slopes. Increased grazing intensity in these areas may have negative effects on biodiversity. Excluding some cells from the intensive rotational grazing regime may reduce these potential effects on biodiversity.

Knowing how different species respond to grazing is useful for managing grazing and manipulating pastures. Information on the responses of different species to grazing, such as that shown in Figure 11, allows graziers to make more informed decisions about when and how to graze, depending on their goals for the pasture. For example, if the grazier wants to decrease the abundance of sweet vernal grass, they could do so by increasing the grazing intensity in spring. However, if they also want to maintain the kangaroo grass cover, the best option would be to use rotational grazing, because it has less impact on kangaroo grass than increased spring grazing.

The success of any grazing method depends on the grazier’s ability to monitor their pastures and livestock, and to adapt their management in response to early warning signs (see Chapter 12).

WHEN TO GRAZE AND REST NATIVE PASTURES

Informed grazing management is based on a knowledge of how the different pasture species respond to grazing at different times of the year. The idea behind managing pasture composition is that you rest the pasture when the desirable species are most sensitive to grazing, and graze it when the undesirable species are most sensitive to grazing. For example, you might rest the pasture when the native grasses are flowering and setting seed, and graze it when the seed heads of the annual grasses are emerging.

Rest kangaroo grass pastures in mid spring to early summer to allow the kangaroo grass and native wildflowers to flower and set seed.

Year-round management of wallaby grass pastures

- Before the autumn break – Graze to remove any dead plant material. Maintain the ground cover if annual grasses and broad-leaf weeds are a problem.
- After the autumn break – Rotationally graze to protect establishing native grass seed-lings, and allow established native grasses to develop new leaves. Do not graze heavily.
- Winter – Stock at a low to moderate stocking rate. To increase the density of plants, defer grazing to encourage and protect the native grass seedlings.
- Early spring – Maintain a low to moderate grazing intensity. To control annual grasses, broadleaf weeds and excess clover growth, use short-term, high intensity grazing.
- Late spring – To increase the seed set of native grasses, reduce the stocking rate or defer grazing when the native grass seed heads emerge.
- Summer – Continue a low to moderate grazing intensity or defer grazing until the native grasses have set seed.

Year-round management of kangaroo grass pastures

- Autumn – Use high intensity grazing to remove rank growth and encourage the growth of winter-growing native grasses.
- Winter to early spring – Graze with a low to moderate stocking rate to utilise winter-growing pasture species because kangaroo grass is dormant at this time.
- Mid spring to early summer – To maintain kangaroo grass, rest to allow kangaroo grass and native wildflowers to flower and set seed. To reduce the dominance of kangaroo grass, graze using a moderate grazing intensity.
- Mid to late summer – Use a moderate grazing intensity to utilise dry feed and the summer growth of kangaroo grass.

“ Native pastures are crucial to continued superfine wool production on our property because the nutritional value of the feed they provide for our saxon merinos doesn’t vary greatly through the year. ”

Intensively graze wallaby grass pastures for short periods in early spring to control annual grasses, broadleaf weeds and excess clover growth.

Use cattle to graze rank, dry forage.

“ Sheep won’t eat the tussocks and other rank feed, but cattle will. If you want to utilise this feed you’ve got to use cattle to eat it down first. Once you get some green leaf coming, then sheep will eat it. ”

MANAGING GRAZING BY WILDLIFE

Wildlife grazing can reduce pasture productivity and the effectiveness of resting if wildlife move into the paddock when livestock have been removed.

A Tasmanian study (Statham 2000) found that wallaby grazing reduced the availability of forage for sheep by an average of 37%. In most cases, the wild grazers with the greatest impact on Tasmanian native pastures are rabbits, wallabies and possums. However, other animals, such as fallow deer and forester kangaroos, may also pose problems. Effective wildlife management is essential if pastures are to be rested adequately. Before deciding on management actions, it is important to identify which animals are causing the most damage and to assess the extent of lost productivity. This allows the most cost-effective control measures to be determined.

Many Tasmanian farmers graze large areas of run country that provide habitat for native animals, including threatened species. However, wild herbivore populations, particularly deer and wallaby, in these areas may be greatly increased if wildlife have access to sown pastures. Many graziers try to control wildlife populations through game management plans and control permits from the relevant state department. Shooting and poisoning wildlife are some of the cheapest control measures. They can be useful for controlling populations when numbers increase, but experience has shown that they only reduce wildlife numbers temporarily.

Fencing is a longer-term wildlife control measure that can be highly effective despite the initial costs. The type of fencing needed depends on which wildlife species pose the greatest problem. For general wildlife control, rabbit netting is still the best and most effective type of fencing, although it is also the most expensive. Wallaby fencing has also been shown to be effective, with the initial investment making returns in 5–10 years. Electric fencing may also be useful, although species such as wallabies will test electric fences continually, and push through as soon as the charge drops. Whatever form of fencing is used, most animals will try to get under or through the lower part of the fence, so they should be made impenetrable and checked regularly.

A combination of wire netting and electric fencing is an expensive but viable option to contain wild herbivores, such as deer and kangaroos.

“ Effective wildlife management is essential if pastures are to be rested adequately. ”

Grazing enclosures have shown that wild herbivores remove up to 45% of the available biomass in native pastures.

Julian von Bibra

'Beaufront', Ross

'There are more wildlife now due to improved pastures. We have a game management plan, and we've tried different forms of game control.

'Fences don't work, they're too much of a maintenance problem, and we haven't had 1080 on the property for over 30 years.

'One deer has a greater impact than one sheep for the same amount of country grazed. Why are deer treated any different to rabbits? In the 1950s, you had a job to find a deer on this place. I want to reafforest large areas of the farm, and the deer destroy the saplings. Over three years of hunting, we've attained reasonable levels.

'Foresters are the touchy-feely Australian emblem. In the long term, I think society won't allow us to shoot them. They do damage fences, but they're easy to control. Wallabies are a big issue for us, and we have thousands of them. They're harder to control than foresters and they damage the fences.

'Possums do enormous damage to trees, and wombats are a potential erosion problem. Wombats weren't here 20–30 years ago, but now we have them in plague proportions.

'We need to manage all animals. We'd go out of business without game management.'