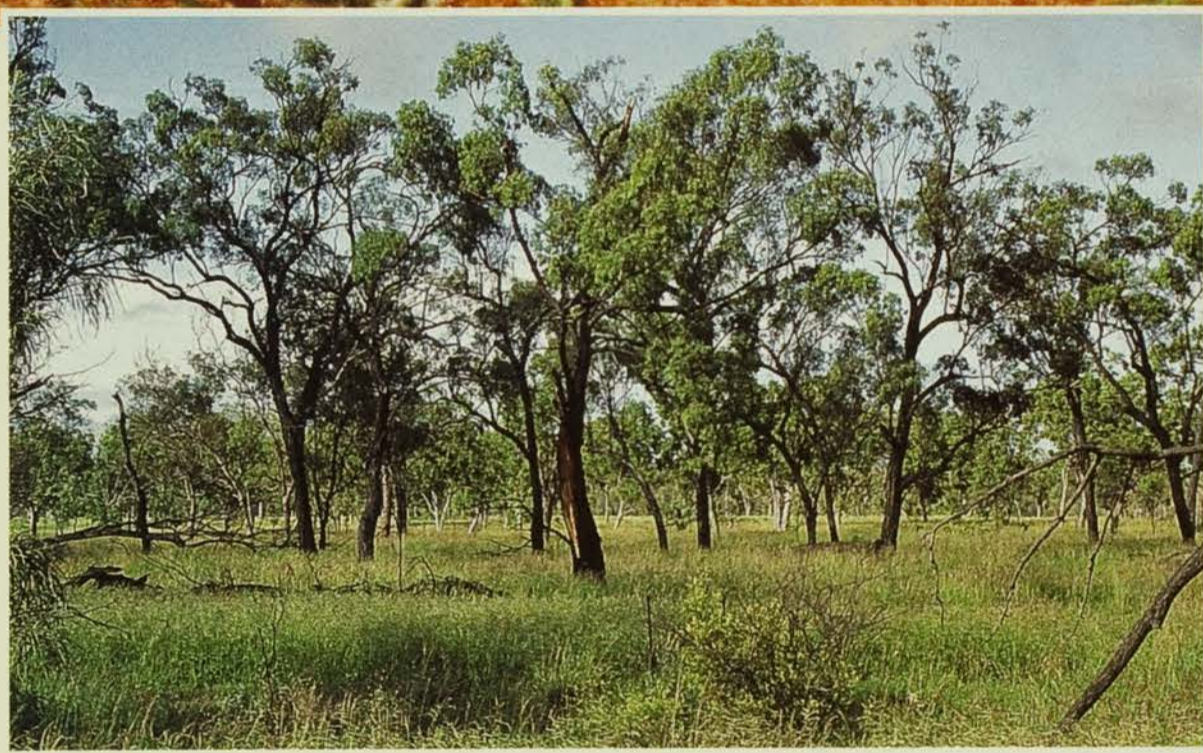


Managing northern speargrass

a grazier's guide

Ian Partridge



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Department of Primary Industries
Queensland

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Contributors

The information in this book comes from a wide range of sources—from local graziers through the Local Consensus Data and from many officers of the Department of Primary Industries and CSIRO Division of Tropical Crops and Pastures.

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Preface

Successful graziers are successful because of their expertise in managing their livestock. Income from these livestock provides for the needs of the family and for future development of the property.

Many of these livestock will eat native pastures for all or much of their lives. However, even if the stock are in good condition, it does not necessarily follow that the pasture is. A recent survey suggests that only about a third of the area of native pasture in Queensland is in top condition, the rest is under some sort of stress—some of it has been degraded too far to be restored economically.

The condition of this native pasture resource is of vital importance to the long-term profitability and efficiency of each property, and hence of the pastoral industry as a whole.

The main reason why land is in poor condition is overgrazing—carrying more stock than the native grasses can continue to support over the long term.

Overgrazing may have arisen unintentionally for technical reasons, for example following the introduction of breeds of cattle better able to survive periods of feed shortage, or the use of dry season supplements and introduced legumes, or because of economic pressures.

In a few cases, short-term profit has appeared more important than the long-term future but, in more cases, grazing managers have not realised or appreciated what was happening to their pastures.

Most graziers and the federal and state governments regard maintenance of our natural resources as one of their more important strategies. Commonwealth programs through the National Landcare Program and state programs through the Department of Primary Industries seek to help graziers to protect their asset for the present and future.

Property Management Planning plays a major part in increasing the efficient use of the land. Whole property management involves planning for all aspects of the entire property—land, vegetation, livestock and finances; it must be followed up with suitable information and guidelines on the management of each aspect.

This book concentrates on the plant side of the livestock industry; I hope it will help you by:

- bringing together the knowledge that you already have
- telling you about management practices being developed through research
- stimulating more interest in what is happening in your pastures.

In a nut shell

There can be no fixed recipes for managing native pastures; instead you need to

- look closely at the pasture on the ground
- understand how the different plants and grazing animals affect each other
- have some practical local guidelines.

Local guidelines are given for:

- setting your stocking rates
- moving stock
- burning
- tree management
- improving feed quality by adding legumes.

The guidelines for managing speargrass country can be summarised simply

Burn every three or four years

If your paddocks can carry a good fire every 3 or 4 years, you will have:

- stocked at a reasonable and sustainable rate
- kept a good ground cover
- allowed the desirable grasses
 - to drop plenty of seed
 - to re-establish from new seedlings
 - to compete against weeds
- reduced some undesirable grasses
- kept woody weed saplings under control
- killed many woody weed seedlings.

With your stock, you will have:

- allowed each animal to select more of a high quality diet
- produced a heavier carcass at a younger age
- high average calving rates
- minimised the need for dry season supplementary feeding
- minimised the need for drought feeding.

Trees should not be cleared from most grazing lands, but clearing may be beneficial on some of the better class country.

Woody regrowth and weeds, especially rubbervine, are a major cause of deterioration in the condition of the native pasture, and their control must be integrated into normal pasture management.

Introduction

The aim—production with care

Good grazing management aims to achieve a level of production that can be maintained over decades—without the condition of the pasture deteriorating because woody species increase, palatable perennial grass species disappear or because the soil washes away.

A recent survey in the northern speargrass region suggests that only about 30% of the pasture is in top condition. Much of the deteriorated pasture can be restored by suitable management practices—and with reasonable rainfall.

No fixed recipes

Managing native pastures well is not always as simple as it looks—it needs a little effort. Rainfall varies from droughts to floods between years, beef herds take years to build up, and costs have to be kept low for this type of country. Pastures can change significantly over a few years, but these changes may be difficult to recognise.

There can be no fixed recipes for managing native pastures—unlike the management of crops or intensive sown pastures. Rather you need:

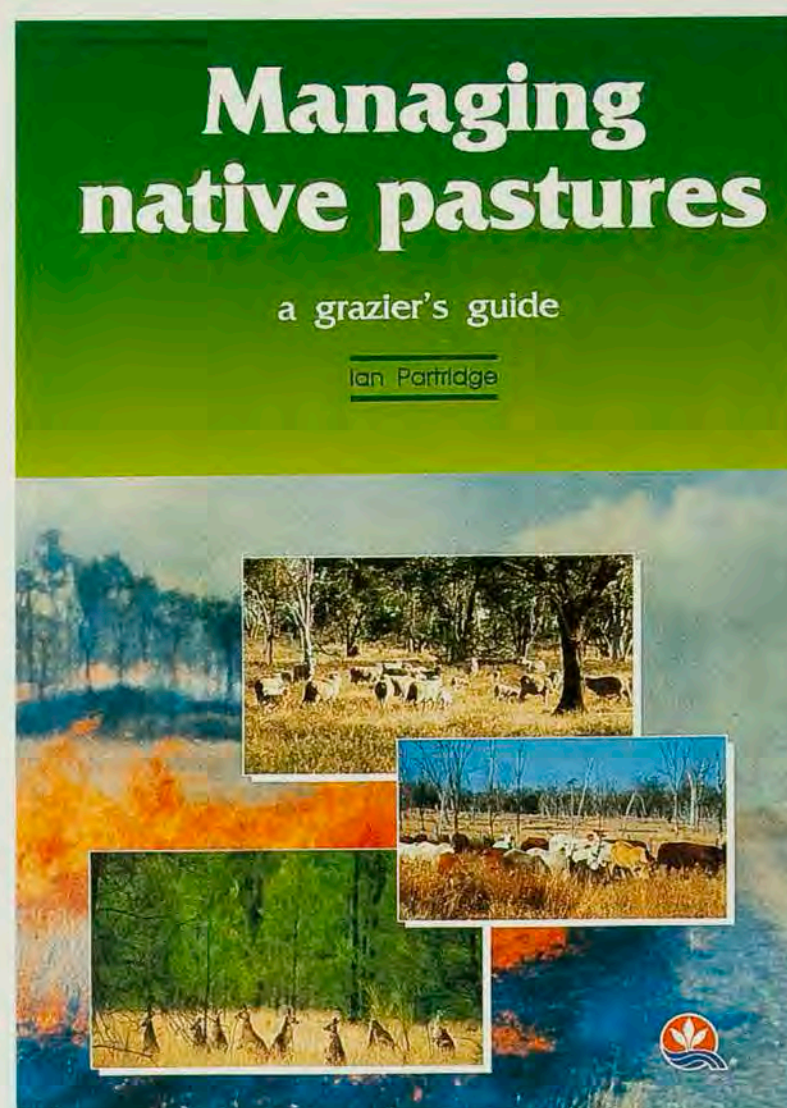
- to understand how the grasses, trees, soils, grazing animals and climate affect each other—their ecology
- to follow some practical local guidelines which are based on experience and research
- to check—monitor—gradual and other changes that may occur.

The basic principles of native pasture ecology have been described in ***Managing native pastures: a graziers guide***.

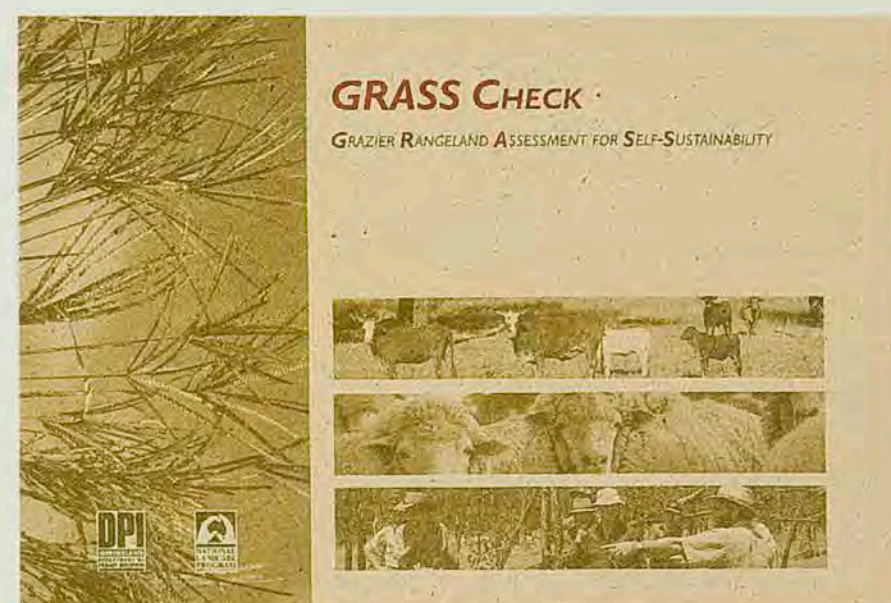
Methods of monitoring are described in a separate DPI publication **GRASS Check**.

This book provides some local guidelines for managing speargrass country; it also helps to identify important species found in your pastures.

You probably already know many of the individual guidelines, but this book may help you bring them together to devise suitable grazing management strategies. It may encourage you to give the management of your native pastures the same consideration as the management of your livestock.



describes the principles of grazing management and ecology



describes how to monitor pastures



Speargrass seedheads

Speargrass – Black speargrass

Black speargrass (*Heteropogon contortus*) community provides the largest extensive grazing resource in Queensland. It covers a broad belt of medium to low rainfall (1000 to 600 mm) country from Cooktown to the New South Wales border, a total area of 25 million hectares.

Northern and southern speargrass

Many aspects of grazing management for speargrass are similar throughout the state, even though conditions and the associated species are very different between tropical Far North Queensland and the subtropics of the Brisbane Valley.

The most important difference in grazing management revolves around the responses to clearing the eucalypt woodlands for satisfactory grass growth. Based on this, we have divided the speargrass country into northern and southern regions, split on a latitude around 21°S—around Bowen. This book deals with the northern region.

Most of this grass community is under open woodland of eucalypts, growing mainly on infertile soils. It includes many other grasses, some of which may indicate local fertility of the soil or past grazing management.

Speargrass was not always the predominant species, and is now seldom dominant in this region. When the country was first settled by European graziers, kangaroo grass (*Themeda triandra*) was the main species, but it has since declined. Now, under the continual heavy grazing since the 1970s, black speargrass itself has been replaced—often by less useful annual species, but by the useful creeping Indian couch (*Bothriochloa pertusa*) in the southern part of this region.

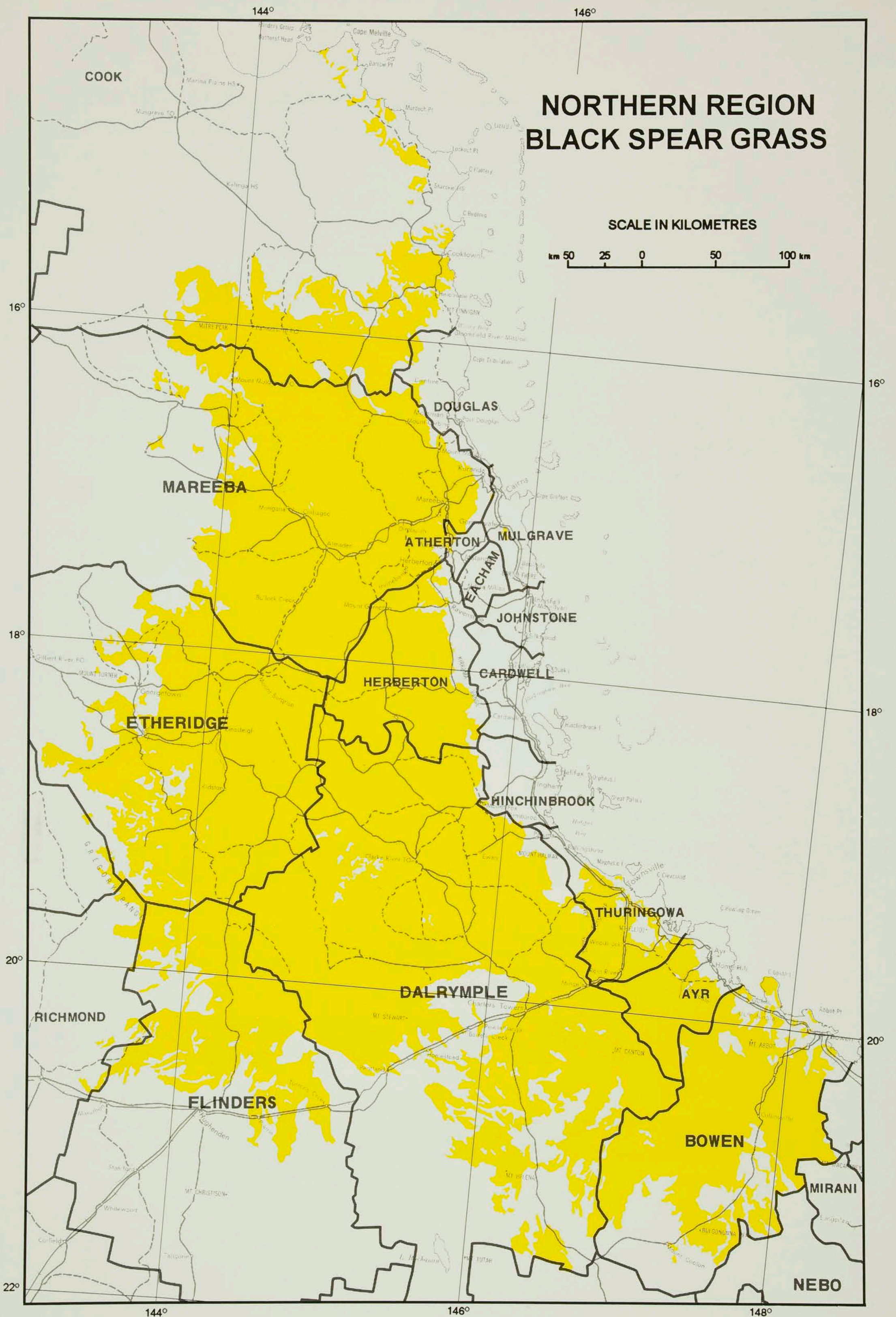
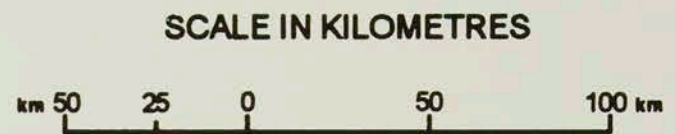


Perennial tussock grasses indicate light grazing and good pasture condition



Eucalypt woodland covers typical grazing country in north Queensland

NORTHERN REGION BLACK SPEAR GRASS





*Droughts are part of the normal cycle ...
... as are floods*



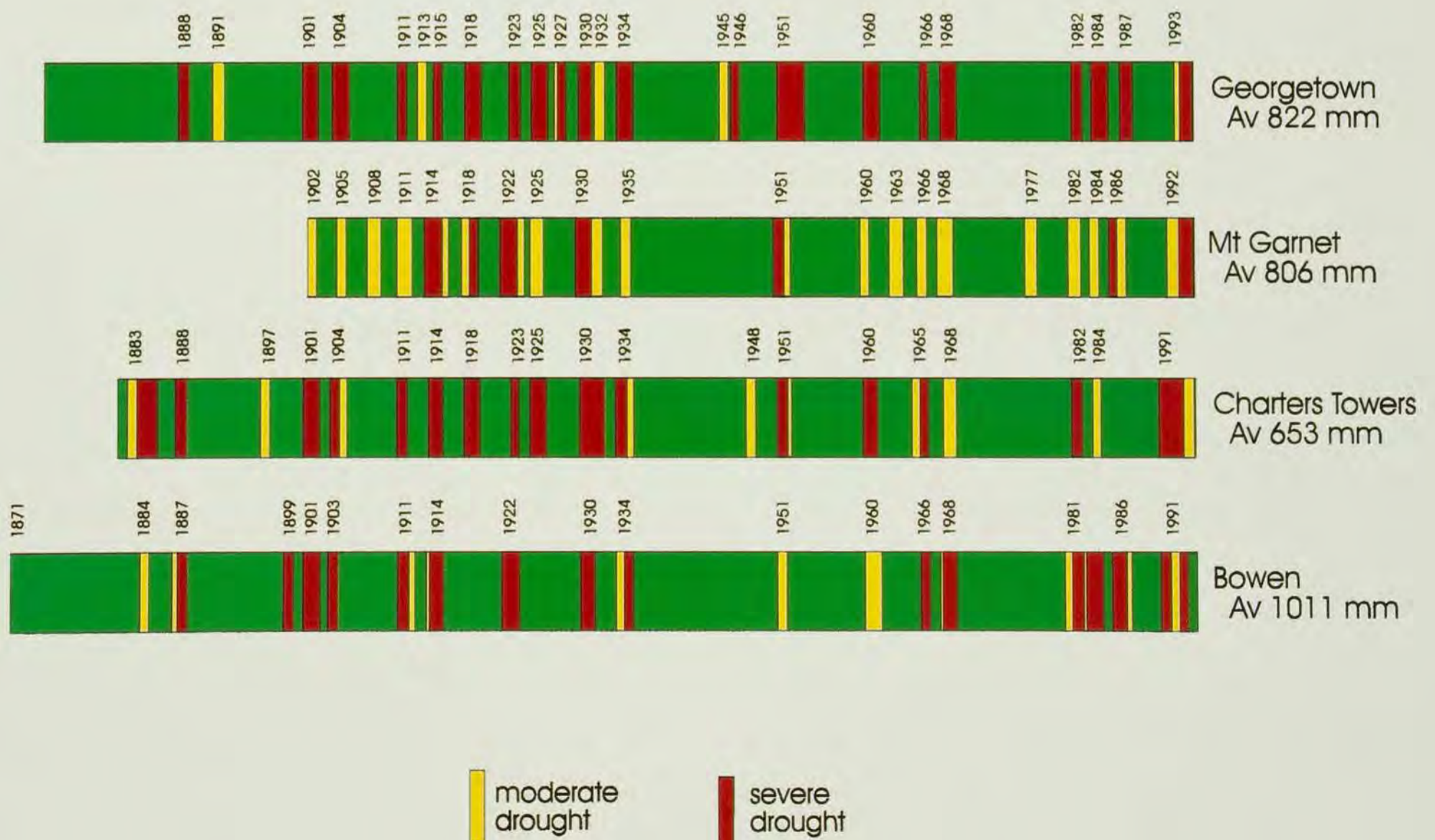
Rainfall and droughts

Annual rainfall varies from 1000 mm on the eastern edge of the region to about 600 mm inland. More than 90% falls in summer, so that grass grows for only 12 to 20 weeks each year.

Rainfall is highly variable between years—a sign that the region is under the influence of the Southern Oscillation—and droughts are a normal, if irregular, part of the weather. Most droughts develop with the failure of the rains during one wet season, and are defined here as severe rainfall deficiencies over a minimum period of 12 months. A moderate drought has rainfall less than that received in the driest 10% of years, a severe drought less than that received in the driest 5% of years—at that location. Droughts extending for more than one year are much rarer, but have more important consequences for stock and pastures.

The occurrence of moderate and severe droughts for Georgetown, Mt Garnet, Charters Towers and Bowen over the last century is shown below.

While droughts have not occurred at regular intervals, they will keep on occurring in the future, and must be planned for as a normal part of property management.



Changes under heavy grazing

When are grasses most susceptible to grazing?

Grasses are most easily damaged when sprouting just after the first storms at the end of the dry season or a drought—that first green pick.

At that stage, the grass is trying to produce new green leaves from its reserves. Until there is enough leaf for productive photosynthesis, the plant will be weakened by grazing.

Pasture can be damaged in early summer if you have been carrying too many stock during winter, or if you burn only part of a paddock and allow stock to concentrate on this patch.

Kangaroo grass speared

Kangaroo grass is more susceptible as all buds of the tillers emerge at the same time in early summer rains; these erect shoots are easily bitten off by grazing animals. Over-grazing of the new growth when early storms receive no follow-up rain can result in the loss of kangaroo grass.

Speargrass is more tolerant because it shoots later, its buds emerge progressively, and tillers can be more prostrate. But under continuous heavy grazing, speargrass also succumbs.

Speargrass going too

Under continued heavy grazing, the tussocks of speargrass become smaller and produce less seed, allowing other grasses or weeds to invade or increase.

If the new grasses are less palatable or inedible, they grow larger, taking more and more of the soil moisture and nutrients, and setting more seed.

Cattle seek out the remaining speargrass, further increasing the grazing pressure on it. The pasture gradually changes its composition with more unpalatable perennial grasses (such as wire grass), more annual grasses (such as summer grasses) or to a more grazing-tolerant creeping grass such as Indian couch.

Indian couch or pertusa

Indian couch (Indian bluegrass or pertusa) has now spread over more than one million hectares of grazing land in the northern speargrass region. It is most widespread on neutral red duplex soils of medium phosphorus status in the southern part of this region.



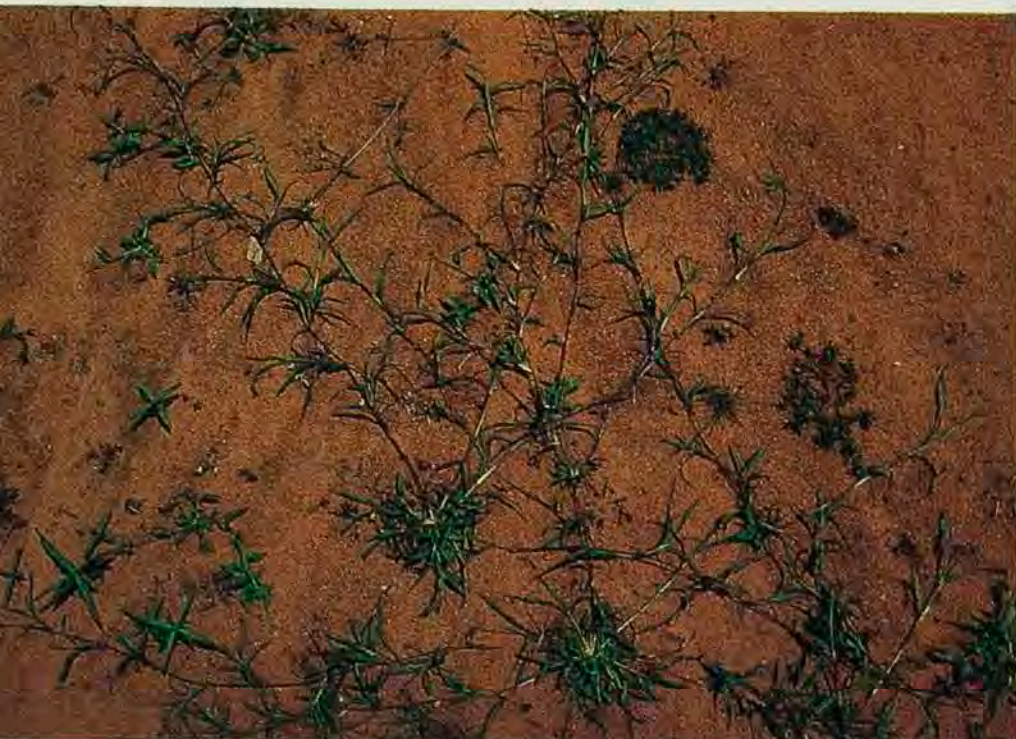
Kangaroo grass is still common on lightly grazed basalt country



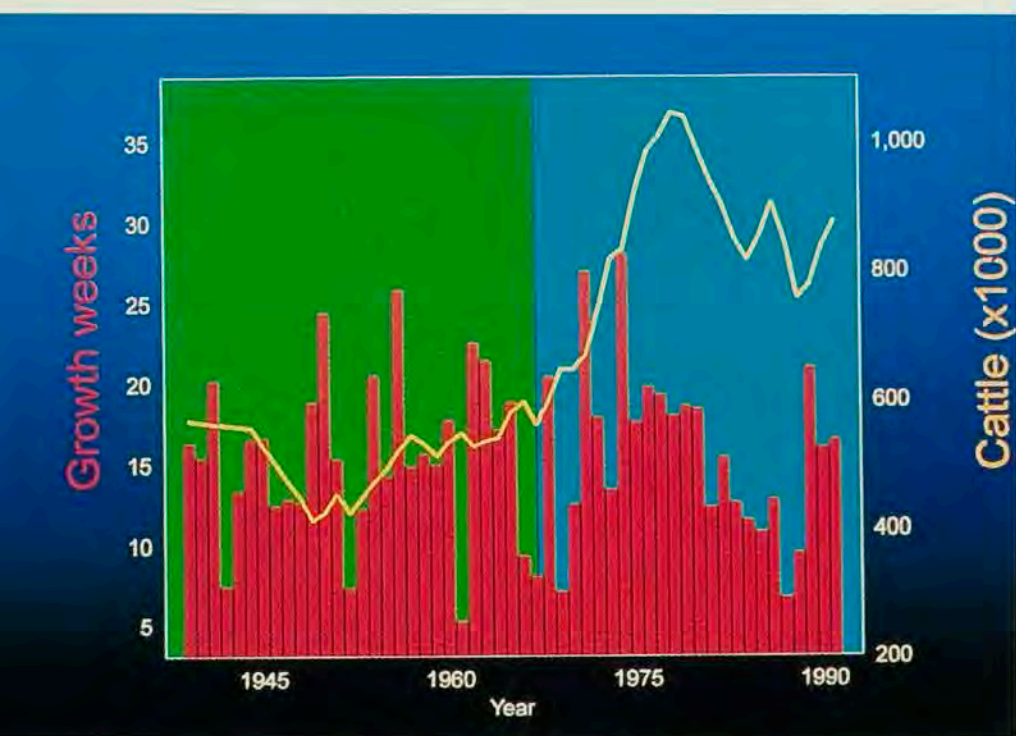
Black speargrass was often dominant in the 1970s



Tussock grasses on the roadside, pertusa in the grazed paddock



The vigorous runners of pertusa colonise open spaces



Cattle numbers in Dalrymple Shire have increased greatly since the 1970s



Pertusa plants will recede to scattered crowns in drought

Why has Indian couch spread?

Indian couch has naturalised because it:

- is adapted to a wide range of soils with low or high phosphorus
- is not particularly palatable
- sends out vigorous runners
- is very tolerant of heavy grazing
- sets a lot of seed.

Where did this couch come from?

Several lines of Indian couch were introduced from India and East Africa in the 1930s, one of these becoming the Yeppoon strain. Another introduction from India in 1950, planted on country aerodromes; died out at Cloncurry, persisted at Charleville, and spread dramatically at Bowen.

However, we do not really know the origin of the Bowen strain. A specimen was collected from the Bowen showgrounds five years before the aerodrome planting, and old residents claimed 'Indian couch' was around in the mid-1940s—perhaps another war-time import.

'Bowen' is the least stoloniferous (creeping) of all the strains of pertusa tested, and has the lowest yield, is the earliest flowering, and has least resistance to leaf rust—but the least productive strain may be the best to naturalise. 'Bowen' couch can flower within four weeks after the break of the season, often as early as January, and continues to set seed as long as there is moisture. This may give it a short growing season, but ensures some seed is produced in a short wet season and well ahead of any frost.

Seed will blow around by the wind, but seed spread through dung is not viable.

What sort of pasture is best?

You should try to manage your grazing to keep speargrass and other tussock grasses but, even with a 'reasonable' stocking rate, the pasture may be 20–30% Indian couch in districts where it is prevalent. The proportions of tussock grasses and pertusa will vary with growing conditions and grazing pressure to provide a good stable compromise. In pertusa areas, aim for at least 50% tussock grasses.

Lower stocking rates will give lower stress on your cattle, your pasture, your land and yourself.

Couch—better or worse than speargrass?

Is this a valid question? Indian couch has invaded because speargrass could not stand the grazing pressure.

On similar soils, speargrass produces the same amount of total herbage as Indian couch, but much of it, especially the mature seed stems, cannot be eaten by cattle. The grasses have similar digestibility and chemical composition when green, but cattle prefer to eat speargrass, allowing couch runners to invade.

There is little difference in animal production between the grasses at the same stocking rate over a whole year; steers may grow faster on speargrass during the wet, but better on couch in autumn. At low stocking rates, there is no difference in weight gain, but a low-stocked paddock would be mainly taller grasses such as speargrass. At medium or high stocking rates, cattle will do better on Indian couch—because both couch and cattle will survive.

Indian couch provides a better ground cover with less run-off when herbage is sparse. Erosion increases rapidly when cover drops below 40%; couch provides better cover with less herbage than speargrass. But even couch will recede to scattered individual crowns during droughts, after frosts, and on lighter soils.

Woody weeds and regrowth can increase in well-grazed couch paddocks because there is insufficient fuel to carry a good fire; but the better ground cover will suppress smaller broad-leaved weeds. However, this also makes it difficult to maintain legumes, especially as couch is not particularly palatable. Cattle prefer to eat the legume, browsing *Seca stylo* throughout the year and *Verano* in autumn.



before...

This degraded pasture was colonised by pertusa within a few years



...after



Black and white satellite images offer the best resolution for medium-sized properties

Property management planning

Property management planning (PMP) is about landholders developing resource and business plans for their properties.

This planning builds on your knowledge and expertise, and allows you to:

- map your resources of land, water and infrastructure
- plan future management and improvements
- consider the financial costs and benefits of management options
- manage and monitor areas of weeds, land degradation and conservation
- assess the ability of your resources to achieve your objectives.

Property management planning usually starts with workshops on personal, financial, land and production aspects of planning, and usually involves preparing a property map based on an aerial map or satellite image.

Land management types

Graziers recognise that their properties are made up of different classes of land, often based on the vegetation (eucalypt species) or the soil, for example narrow-leaf ironbark country or basalt.

A typical property may have only a few (maybe 5) main paddocks, with some smaller special use paddocks, on an area covering 26 000 hectares.

Most of these paddocks contain a mixture of land types; land types needing greatly different management should be fenced separately if it is practical. For example, it may be possible to fence large areas of 'sweeter' black soil or box flats on which stock concentrate and overgraze.

Colour satellite images help to identify land management types on larger properties



Frontage country. Frontage country may have high to moderate fertility. Under heavy grazing, creek flats have often been invaded by broad-leaved and woody weeds, especially rubbervine. Larger loamy flats have sometimes been sown with buffel, with urochloa and pertusa planted on moderate fertility soils to withstand heavy grazing pressures. Soils growing poplar gums on tight dispersible clays are erodible.

Unfortunately it is rarely practical to fence off long narrow strips of frontage country, unless water can be provided to the back country.

Woodlands. These eucalypt woodlands cover undulating plains to high hills.

Narrow-leaved ironbarks with bloodwoods grow on basalts, earths and neutral red duplex soils. They indicate good quality grazing, frequently dominated by speargrass, desert blue and Cloncurry pitted blue. Pertusa has invaded much of the southern region.

Silver-leaved ironbark grows on ridges with more infertile and shallower soils, 'spewy' when wet and hard when dry. The grazing is poorer with a range of poorer grasses, often including wire grasses.

Box country Grey box grows on better watered, but erodible, clays frequently at the bottom of slopes. It is good grazing country, growing native bluegrasses, but will produce much regrowth if cleared.

Basalt country. Basaltic soils can be red, brown or black. The red and brown soils are frequently stony and carry a vegetation of narrow-leaved ironbarks, whereas the black basalts are often almost treeless.

Cattle on basalts grow well in the wet season, but are renowned for rapidly losing condition with the onset of the dry season. This is partly due to the greater incidence of frosts on this higher country, and partly due to deficiencies of sulphur and sodium in the vegetation.

The lack of ground water has often resulted in traditionally lower stocking rates and grazing-susceptible grasses such as kangaroo and giant speargrass are more common. The heavier clays of the black basalts carry native bluegrasses, including Queensland bluegrass.

Ranges. The forested hill ranges are rugged, with thin, stony soils, and provide little useful grazing.

Stocking rates for sustainable grazing naturally depend on the rainfall in the area and type (fertility) of the country. Suggested stocking rates are given later.



Good frontage loams planted to buffel grass



Some frontage clays are highly erodible



Narrow-leaved ironbarks indicate good quality native pastures

Local guidelines

The options when managing speargrass country are fairly limited because of the low potential of the land. These options are:

- altering number of animals (stocking rate)
- moving stock (spelling)
- burning
- clearing or thinning trees
- adding a legume with or without fertiliser to existing pastures.

Altering stocking rates

Stocking rate (number of hectares per beast) is the most important factor in grazing management—whether under trees, on fully cleared land, on native or sown pastures

Stocking rate has the over-riding effect on animal production and pasture stability.

Light stocking is sustainable, allows burning, keeps the land and pasture in good condition, and lets each animal grow faster.

Heavy stocking weakens the valuable species, encourages undesirable grasses and weeds, exposes the soil surface to erosion, prevents hot fires allowing woody regrowth to take over, and produces slower growing cattle which are more at risk during droughts.

Nearly all the deterioration seen in pasture land has been caused by over-stocking.

I cannot keep altering my stock numbers!

Where it is not practical to alter stock numbers every year, a safe constant stocking rate has to be set.

This stocking rate is set to be suitable for 7–8 years out of 10; you cannot profitably set stock to allow for the droughts (about 2 years in 10). In the good years, you can plan to burn.

If the stocking rate is set for the average year, it will lead to over-grazing in the 5 years with below average-rainfall, and the pasture will not have time to recover during the good years. It can take years for pasture to recover from the effects of over-grazing that are bound to occur during a drought.

How do I determine the right stocking rate?

It is not easy for a grazier going to a new area to *calculate* suitable stocking rates, but they have been determined by long-term local experience. Groups of local graziers have been asked what they consider to



Stocking rate has the over-riding effect on pasture stability

The DPI recommends continuous grazing with the number of stock adjusted to the feed available—but with opportunistic spelling.



Hardy Brahman cattle can put extra pressure on pastures

be the most suitable sustainable stocking rate for each land type; their answers were often similar to the long-term stocking rates practised before the 1970s.

These 'Local Consensus Data' (LCD) or Local Best Practice stocking rates also agree with theoretical calculations based on soil type, rainfall and safe levels of utilisation of the pasture growth.

What is the safe stocking rate for my paddock?

The stocking rates recommended by producers are fairly broad; they may range, for example, from 6 to 10 hectares for a beast within a land type.

Suggested sustainable stocking rates for native pastures (1 Adult equivalent (AE) = 400–450 kg beast)

Land management type	Stocking rate (ha/AE)	Steer growth rates (kg/hd/yr)
Frontage improved	2–4	150–180
Woodland n-l ironbark (basalt)	6–10	100–130
Open forest n-l ironbark improved with stylo	10–12	80–130
Range country	3–5	150–160
	15–20	80–100

You should refine these stocking rates for your paddocks by monitoring your pasture each year to see whether it is improving or deteriorating. You should check how much feed is left over at the end of summer, or the botanical composition of the species, remembering that significant changes in the condition of speargrass pastures may take 2–3 years to become apparent. Monitoring is explained in a later chapter.

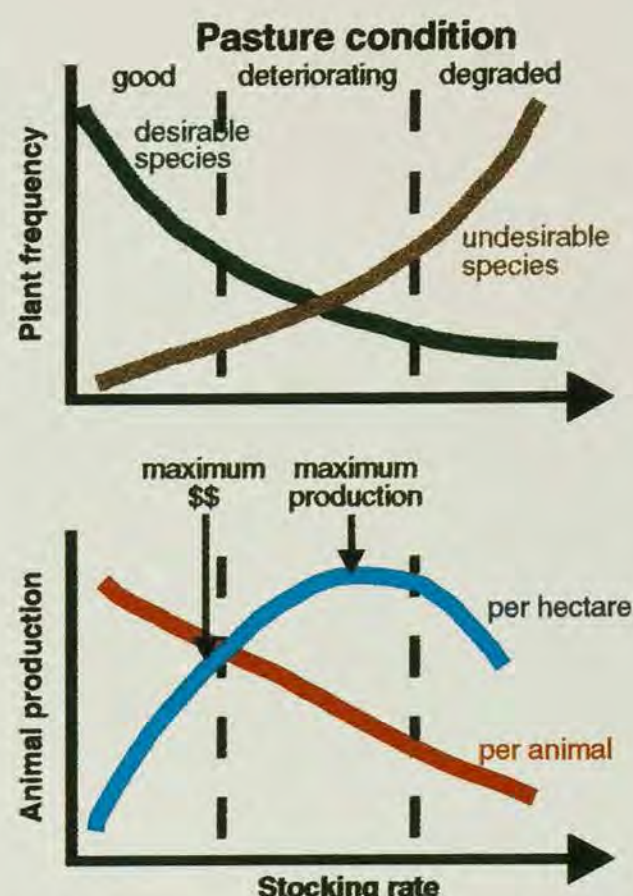
In very large paddocks, your stocking rate will depend on the distribution of watering points which allow stock to utilise the whole area.

How can long-term stocking rates be calculated?

A scientific approach is to calculate the amount of grass growing, which depends on the soil type and rainfall, and to allow only a proportion to be eaten.

The grass species in native pastures are mostly erect clump types that cannot stand being grazed heavily year in, year out.

Pasture scientists have worked out that, on average and in this region, 20–25% of the summer growth can be utilised (eaten) during summer without damaging the pasture.



The best economic returns are developed at stocking rates below those giving the maximum animal production per hectare



Different grazing pressures on basalt country



Your soil needs protection from the early storms



Grasses protect the soil surface from erosion

Eating only a quarter does not sound much?

The rule when setting long-term stocking rates is to eat no more than 25% of the **summer growth during the summer**.

The animals can eat and trample another 15–20% of the dry feed during the dry season without doing any damage to the grass plants because the grasses are dormant. Thus the total utilised over the whole year is 45–50%.

Eat half, leave half.

Leave enough dry matter to protect the soil, or to provide a good burn later in the dry season.

How do I calculate a stocking rate each year?

The simplest method is based on allowing stock to use 30% of the feed standing at the end of summer over the dry season (see next page).

A more complex method is to calculate the stocking rate based on the amount of feed in the paddock at the end of summer and the amount of ground cover needed at the start of the wet.

These calculations are done before the first weaning muster to allow excess stock to be drafted for sale.

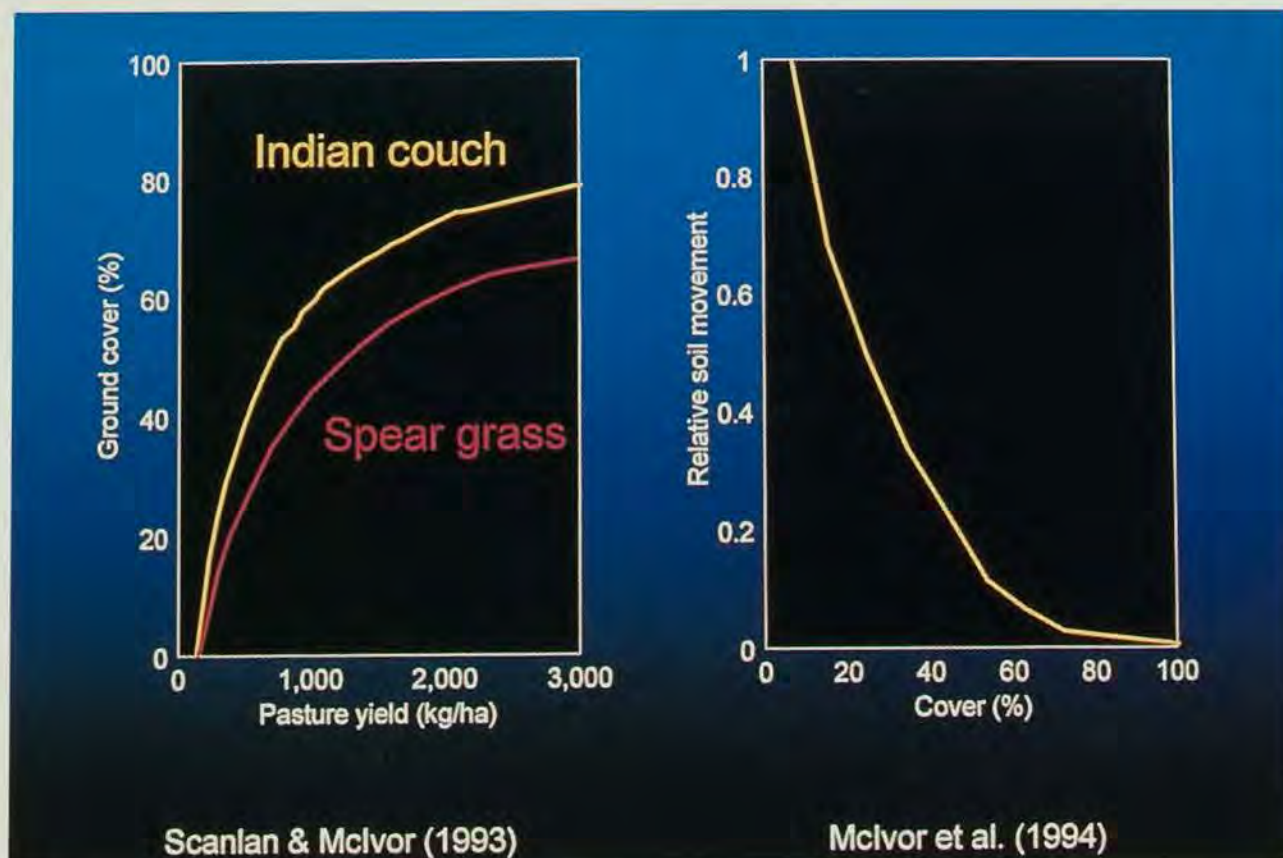
How much cover do I need at the start of the wet?

The soil and land are most liable to damage when you have lost your good pasture. However, during any year, it is most susceptible to erosion if it is bare at the time of heavy storm rains.

Soil erosion increases greatly when there is less than 40% ground cover. Although this 40% includes weeds, fallen leaves and sticks from trees and stones, it still represents 500–1000 kg of dry grass per hectare. The tussock grasses may need up to 1000 kg, whereas the creeping pertusa can achieve 40% cover with only 500 kg/ha.

If you want a good fire in early summer, you will need even more dry matter for fuel, at least 1500 kg.

Soil erosion increases greatly when less than 40% of the surface is covered



Adjusting stocking rates at the end of summer

Stocking rates can be adjusted each autumn according to the feed available at that time. This sets the stock numbers right through for the whole year.

1. Estimate the feed standing in the paddock at the end of the growing season (March-April), either by using the photo-standards at the end of this book or by more direct measurement.
2. Calculate the available feed by allowing your stock to use 30% of the standing feed.
3. Divide the stock need by the available feed to calculate the number of hectares needed for each breeder unit (BU)
(e.g. 2400 kg need/375 kg feed = 6.4 ha/BU)

(A breeder unit includes the cow, calf and herd bulls in a continuously mated herd. 1 BU needs about 10 kg of feed dry matter each day or 2400 kg over the 8 month dry season).

An example using 30% utilisation of the feed standing in March/April.

Standing feed (kg/ha)	available feed at 30% utilisation	Stocking rate (ha/BU)
500	150	16 (destock)
750	225	11
1000	300	8
1250	375	6.5
1500	450	5.5
1750	525	4.5
2000	600	4

If you have very little feed at the end of the wet season, you are obviously in trouble and have to consider destocking.



800 kg/ha of dry matter. You should be aiming at having this amount of feed and cover at the end of the dry season



The total number of animals is more important than how they are moved around

Moving stock

Stock can be moved off the paddock for agistment, sale or into a feed-lot, so altering the stocking rate, or they can be moved between paddocks under various grazing systems.

Most graziers leave animals in one paddock all year round, others could move stock around a series of paddocks regularly. Much interest in rotational grazing has been created recently by proponents of cell (short duration) grazing.

The total number of animals on the pasture is much more important than how they are moved around.

What is the best way to graze speargrass?

The DPI recommends continuous grazing, with the number of stock adjusted to the feed available, but with opportunistic spelling.

Is continuous grazing the same as set-stocking?

No! In set-stocking, the same number of stock remain in a paddock every year, regardless of the amount of rain and grass; the stocking rate remains constant but the grazing pressure varies. Unless the stocking rate is very low, set-stocking will lead to over-grazing in years with below-average rainfall.

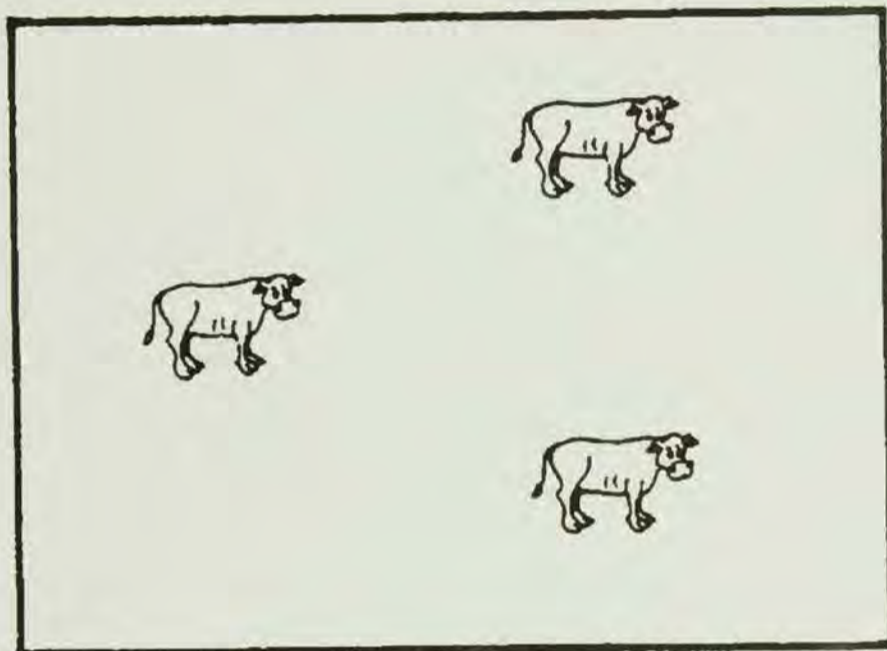
In continuous stocking, there are always animals in the paddock, but their number is adjusted to the feed available—the grazing pressure remains constant but the stocking rate varies.

Why not rotational grazing?

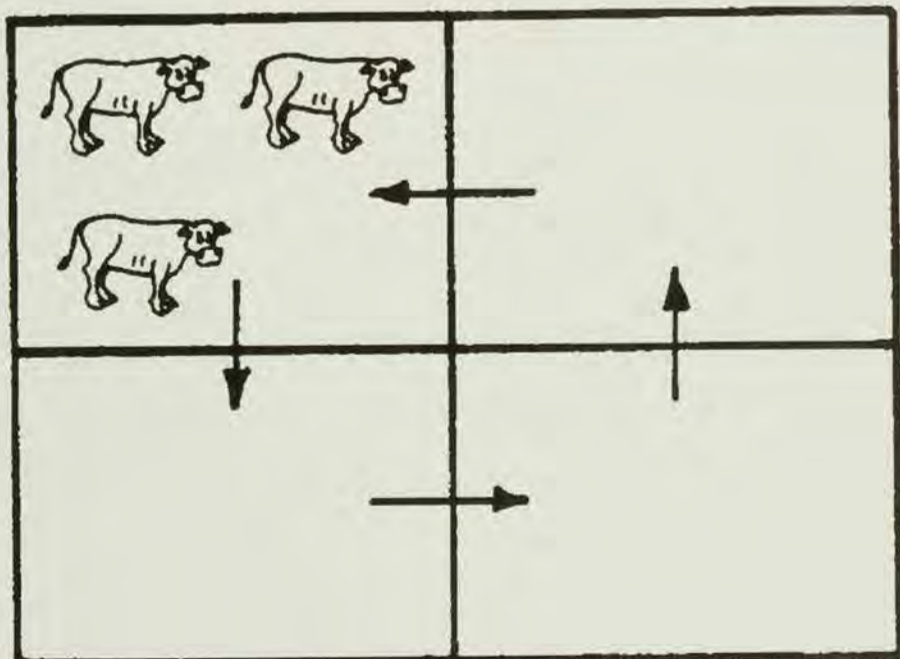
Because the extra costs of management and subdivision fencing bring little or no benefit in terms of animal production or pasture condition when systems are compared at the same stocking rate—especially with extensive grazing. You may get quieter stock as they are handled more frequently.

Rotational grazing may be the most efficient system for high utilisation of high-quality temperate pastures for milk production on the Atherton Tableland, but it shows no advantage to stock or the pasture under the more marginal productivity of your variable-quality native pastures.

Native grasses cannot stand heavy grazing (high utilisation). Numerous trials have compared rotational and continuous grazing of native pastures in Queensland and the rest of the world; usually they showed that animals gained more weight when able to select their diet over the whole area under continuous grazing than when forced to eat more of the mature leaves



Continuous grazing



Rotational grazing

before being moved to the next sub-division in rotational grazing.

Surely time control grazing overcomes this?

Once again, it's a case of costs against benefits. The claimed benefits of TCG are increased carrying capacity, better animal performance, reduced soil capping, better pasture and reduced regrowth of woody weeds.

Unfortunately TCG has never shown these benefits in objective trials on native pastures anywhere in the world. Actually the picture was generally the opposite whenever the stocking rates were increased as proponents have recommended. The pastures deteriorated, hoof action compacted the soil surface, and the stock gained less weight—the system often crashed in severely dry times.

The benefits from TCG have been said to come from:

- higher stocking rates, but this means lower production from each animal, and damage to the pasture
- timing the rotations to allow grasses to rest until new herbage has grown, but timing cannot be fixed because of our highly variable rainfall and lack of growth in the dry months.

The main case against Short Duration Grazing (as TCG used to be called) lies in the claim of increased stocking rates.

Many of our native pastures in Queensland are already being stocked pretty close to capacity now; most stocking rates should be lowered rather than raised.

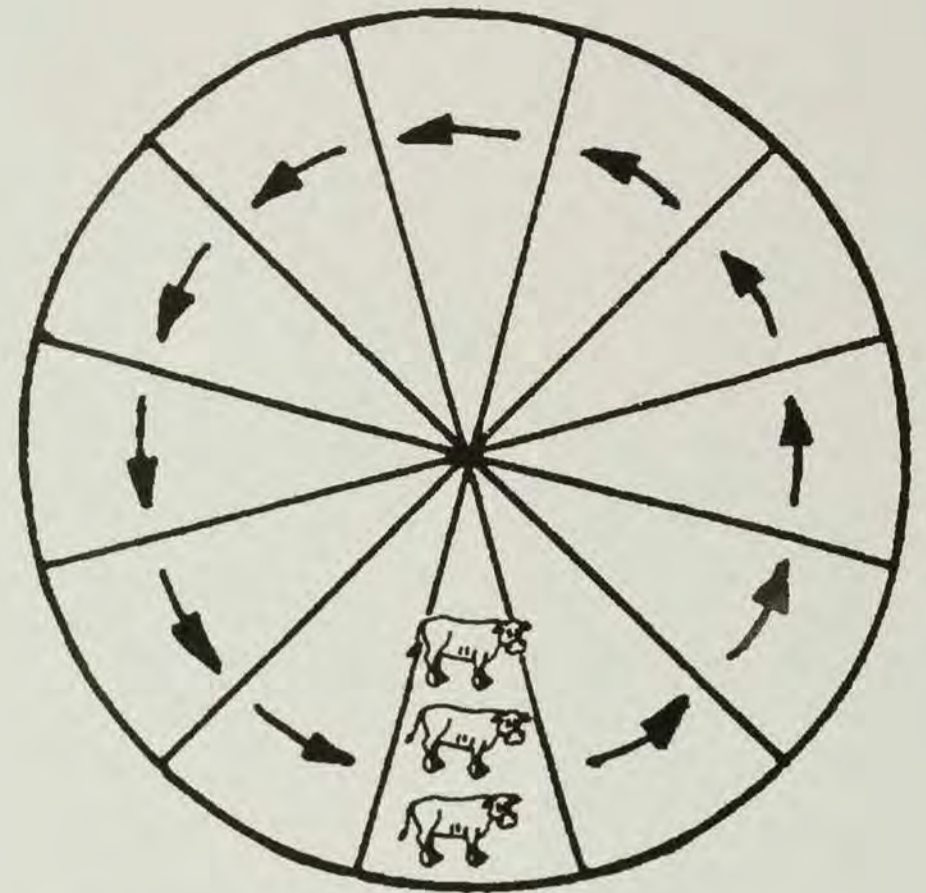
We suggest that extra fencing for better distribution of cattle and more even grazing, better water distribution, improving pasture with legumes, fencing separate land management types, and controlling woody regrowth offer more productive returns and better long-term care of your land than fencing for short duration grazing.

When do I adjust stocking rates?

Most graziers can afford to muster only infrequently, with the main muster for weaning in March-April. This then has to be the time to adjust stock numbers. (See previous section on setting stocking rates)

If you are able to move stock with relative ease, more management options become available. You can sell stock off earlier than normal or bring extra stock in depending on your attitude to risk.

If you are short of feed in February, sell stock early while the market is still reasonable. *Don't get caught with no feed and no market.*



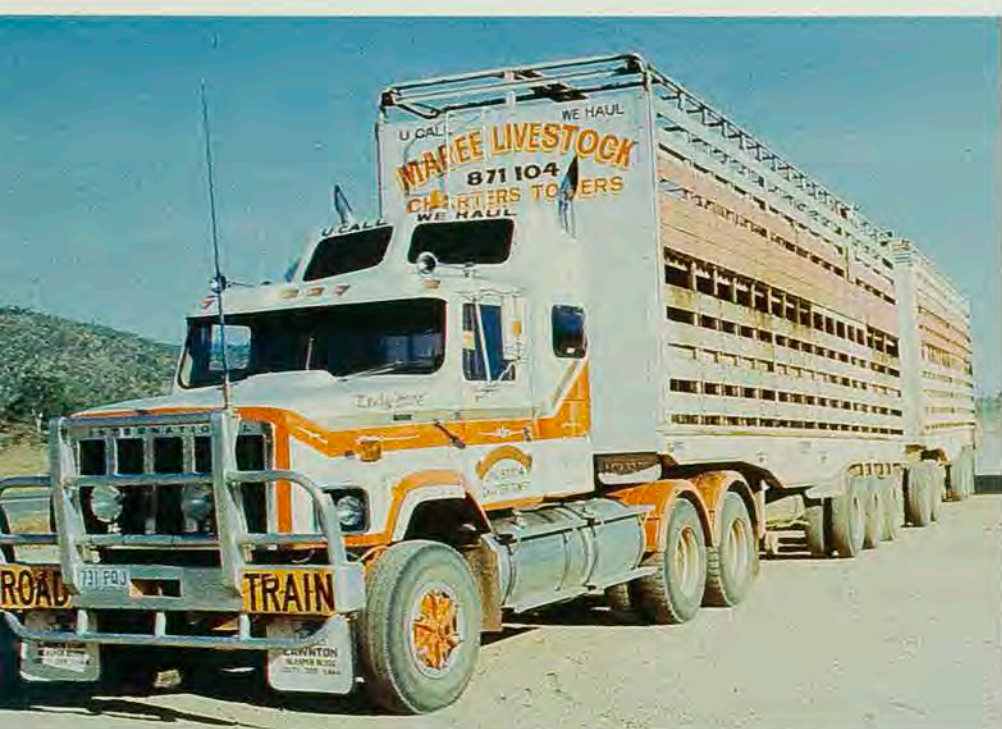
'Time control' or short duration grazing

Any system of grazing that encourages you to look more carefully at your pastures can give positive results.



Improving pastures with stylos offers better returns than rotational grazing

Sell!
Sell and regret maybe,
but sell!



Don't get caught with no feed and no market

If you have to feed a lot of hay and supplement every dry season, you are carrying too many stock.

Stock numbers can be adjusted according to the rainfall expected in the coming year or season.

The probability of wetter- or drier-than-average rainfall can be checked using the Southern Oscillation Index in the AUSTRALIAN RAINMAN computer program. Although there is often a good relationship between the SOI as early as June and rainfall six months ahead (the next summer) in this region, this relationship is not apparent at mustering time in April.

How can I increase flexibility in my operation?

Flexibility can be increased by early weaning, feeding supplements at the appropriate time of the year, and by segregating classes of stock as much as possible.

Early weaning. Early weaning is now the generally recommended practice in this region. Calves can be weaned as early as three months and fed protein supplement. Calves should be weaned at least twice a year, by April and then in September.

The advantages of early weaning are

- weaned cows will gain weight and get back into calf
- cows without calves are pretty hardy and will survive under most conditions.

Supplements. Supplements should be fed for production, but they can also allow cattle to survive or maintain condition. Dry season supplements have become part of normal cattle management in most districts. But, as they allow cattle to utilise more of the dry herbage, these extra cattle can put more pressure on the grass when it is trying to recover from the drought. Normal dry season supplements include:

- urea—to increase use of dry standing feed for survival
- molasses—to provide energy for maintenance
- cotton seed, meat meal—to provide protein for production.

More complete information of drought feeding is given in the DPI publication ***Drought Notes***.

Phosphorus is a production supplement that is most beneficial to cattle during the wet season.

Segregating stock. Segregated cattle can be quickly drafted into lots when a marketing opportunity arises, and their feed can be better targeted.

Graziers selling stores have more flexibility than those wishing to finish stock for slaughter, even if sometimes they have to accept a low price.

Why should I spell my pastures?

Wet season spelling or partial destocking gives the palatable grasses chance to recover. Spelling for 4–5 months allows palatable grasses to set seed; spelling for 11–12 months allows fuel to accumulate for a fire to control woody weeds. How long you need to destock depends on the previous grazing pressure, the amount of grass present, and on growing conditions.

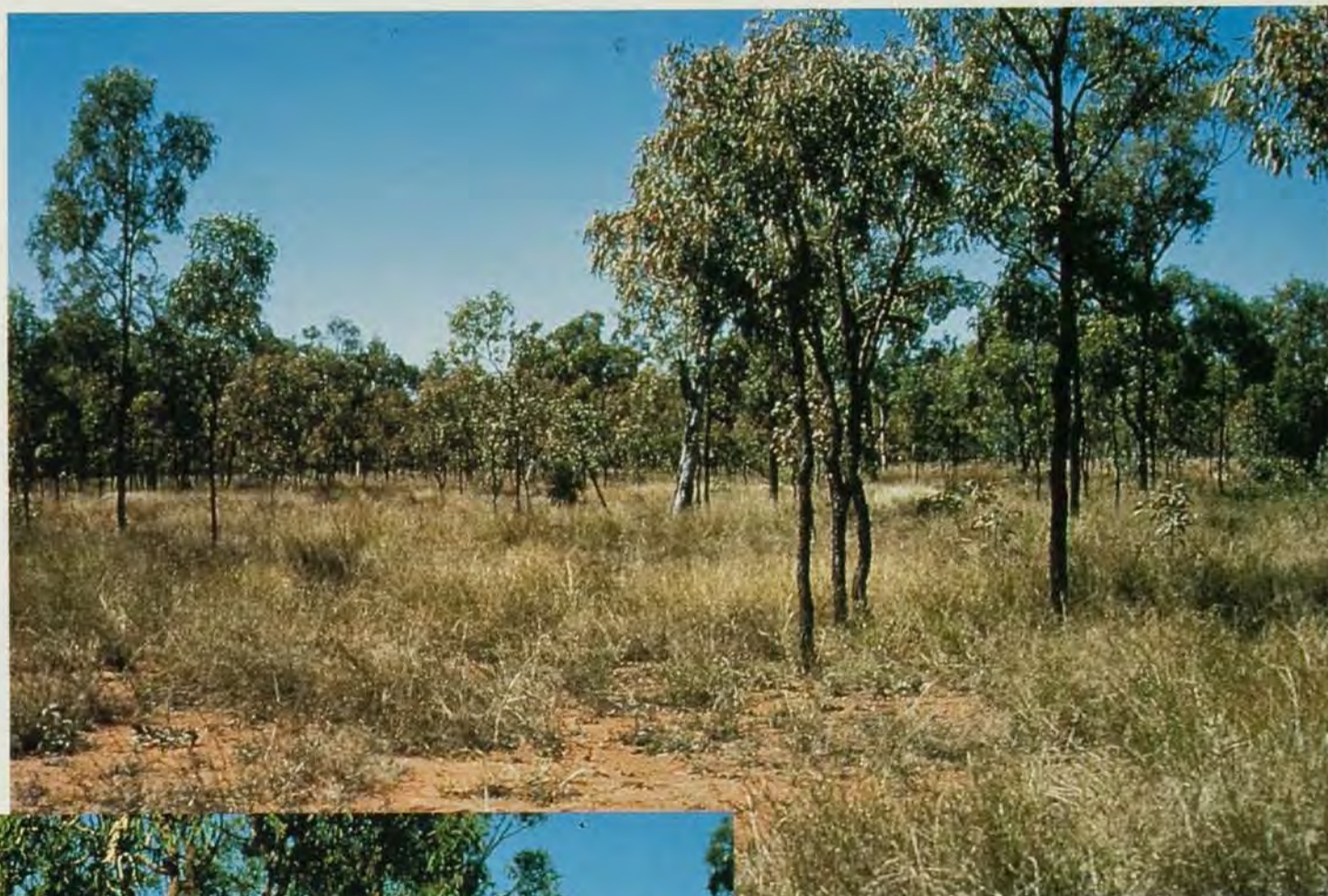
When should I spell?

It is obviously practical only to spell in a wet year when there is plenty of grass. You can get forewarning of the wet years by checking the SOI during winter; wetter-than-normal growing seasons, and early breaks to the monsoon, are nearly always associated with a strongly positive SOI during winter and spring.

Spell a paddock from the beginning of the wet season, by reducing the stocking rate by half, or by totally destocking during the wet years.

Are kangaroos a problem on spelled paddocks?

There are always kangaroos and wallabies around, but rarely in the large populations found on the downs in western Queensland. Their numbers are seldom so devastating as to cause a problem when pasture is spelled.



before spelling



Spelling allows pasture to recover

after spelling



Fire is an integral part of managing speargrass

Burning

The reasons that graziers give for burning their native pastures range from increasing green pick, controlling regrowth, and safeguarding against bush fires to a love of fire. In this section we will concentrate on the benefits to the pasture.

Do not burn indiscriminately; work out why and where you need to burn.

Why should I burn speargrass?

Fire is an integral part of speargrass management whether the land is timbered or cleared.

Fire will:

- stimulate the growth and seedling regeneration of speargrass
- reduce undesirable species
- control woody weeds and regrowth.

Fire favours speargrass

After a good season and light stocking, speargrass can drop hundreds of seeds per square metre, although, by spring, only a proportion will remain germinable. The long, bent and spiralled awn on the seed twists when moistened, lifting the end of the seed and effectively drilling it, base down, between the soil particles. Fire may kill the seeds of other grasses and weeds, but does no harm to the buried speargrass seed.

How often should I burn?

Although you should plan on a good fire every 3 to 4 years, in practice you will have to wait until after a good wet season. Much depends on how quickly your woody weeds grow as they should not be allowed to become too tall—over 1.5 metres high.

If you never seem to have enough grass, you are probably stocking too heavily.

If you are able to burn with a hot fire every 3 to 4 years, your stocking rate has been about right.

When should I burn?

For regrowth control you need as hot a fire as possible, and this may mean burning before the storm rains. Lighting up in the late afternoon with the evening dew and calm air makes the fire more controllable, but this cool fire may be less effective.

Burn only part of your property in any one year. For a cooler fire but with less risk of running out of feed, burn in early summer (end of November–early December) when there is sufficient moisture in the soil, generally after 25 mm of rain has fallen—after the first storms.



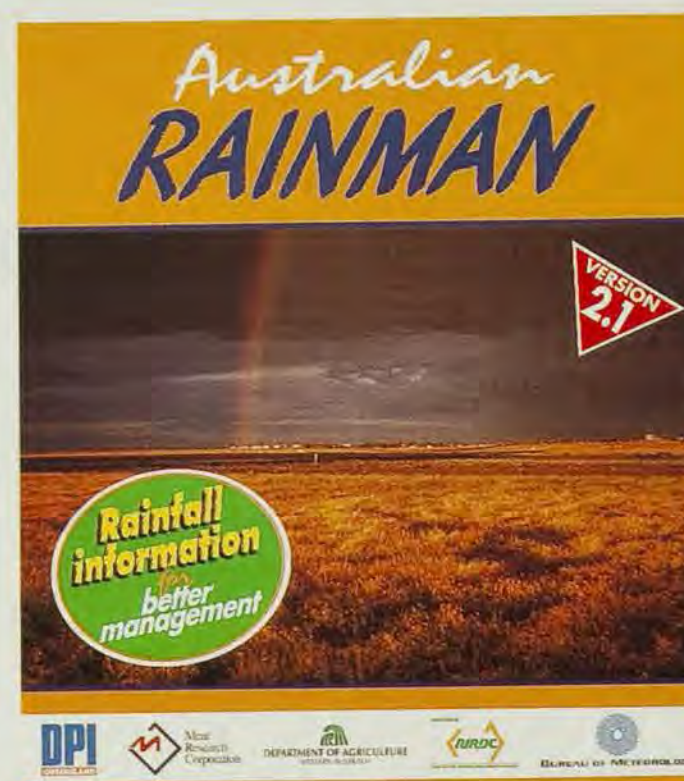
Fire will control woody weeds while they are small

What if it has not rained?

If the rains have not arrived by January, do not burn because this could leave you short of feed.

The Southern Oscillation Index over the spring months can be a useful guide to the likelihood of rain in summer. If the average SOI from August, or even earlier, is below -5, it is likely to be drier than normal—so do not burn; if it is above +5, the chances of rain are greatly improved.

The AUSTRALIAN RAINMAN decision support program can give the probabilities of rainfall for your locality based on the present values of the SOI.



Rainfall information for your locality

What's the SOI this month?

Monthly SOI values are given on the weather page of the Queensland Country Life and on the ABC Weather Forecast on Wednesday evenings.

You can check the latest values for the SOI by phoning the DPI Hotline on **(07) 877 9602** or the Fax Hotline on **(019) 725 301**.

A recorded message gives the updated value on the first and fifteenth day of each month, and a comment on the implications for the coming season.

Chances of getting average summer rain based on the SOI in spring

Location	Av. rainfall in summer (mm)	Probability of getting average rainfall when spring SOI is	
		below -5	above +5
Charters Towers	390	35	65
Georgetown	550	32	60
Bowen	640	40	60

How much fuel is needed to control regrowth?

A hot fire needs over 1500 kg of dry matter if it is to damage woody saplings up to 2 metres in height or to kill seedlings under 1 metre high.

Remember fire does not *kill* all woody regrowth, but it checks or controls it.

What about a late fire?

Burning later when the speargrass has produced new leaf from its crown reserves will weaken the grass plants in the same way as grazing, and may kill any new grass seedlings. The resulting 'cool' fire is unlikely to control regrowth.

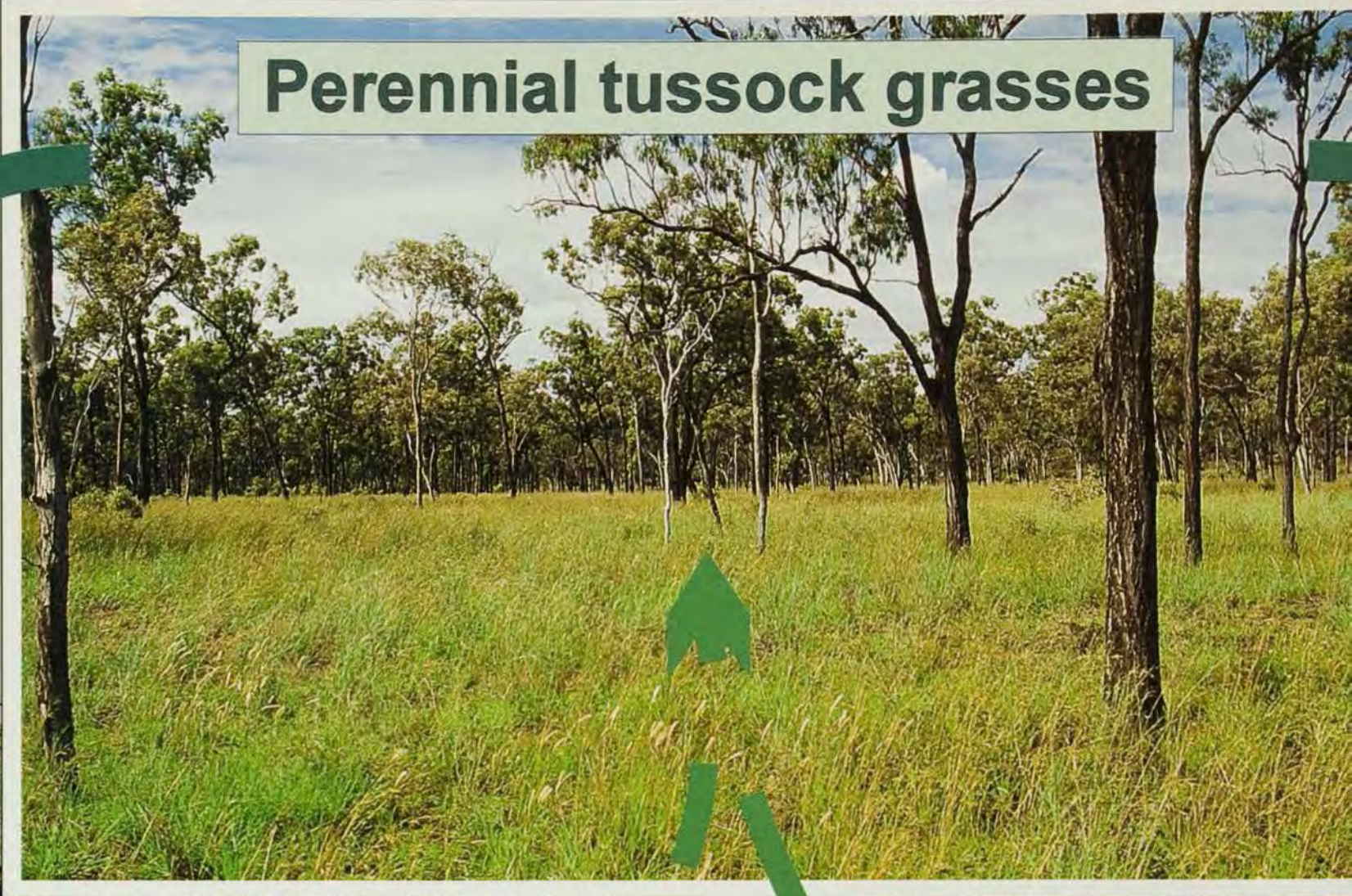
Doesn't fire encourage wattle seedlings?

Fire will crack the hard seed coats of some wattles and allow them to germinate. But as these seedlings will not flower in their first three years, another burn in this period will prevent more seed dropping.



A good fuel load is needed to control woody weeds

Perennial tussock grasses

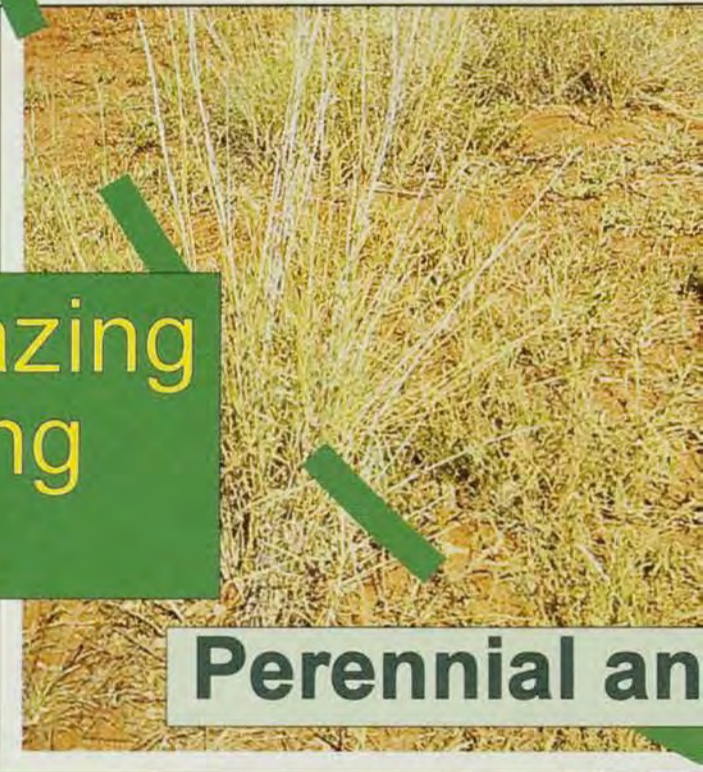


heavy grazing
and couch seed



Indian couch

light grazing
spelling
fire



Perennial an

The state of your pasture

depends on past seasons and on your management :

- stocking rate
- spelling
- fire

mechanical clearing
and grass seed

herb

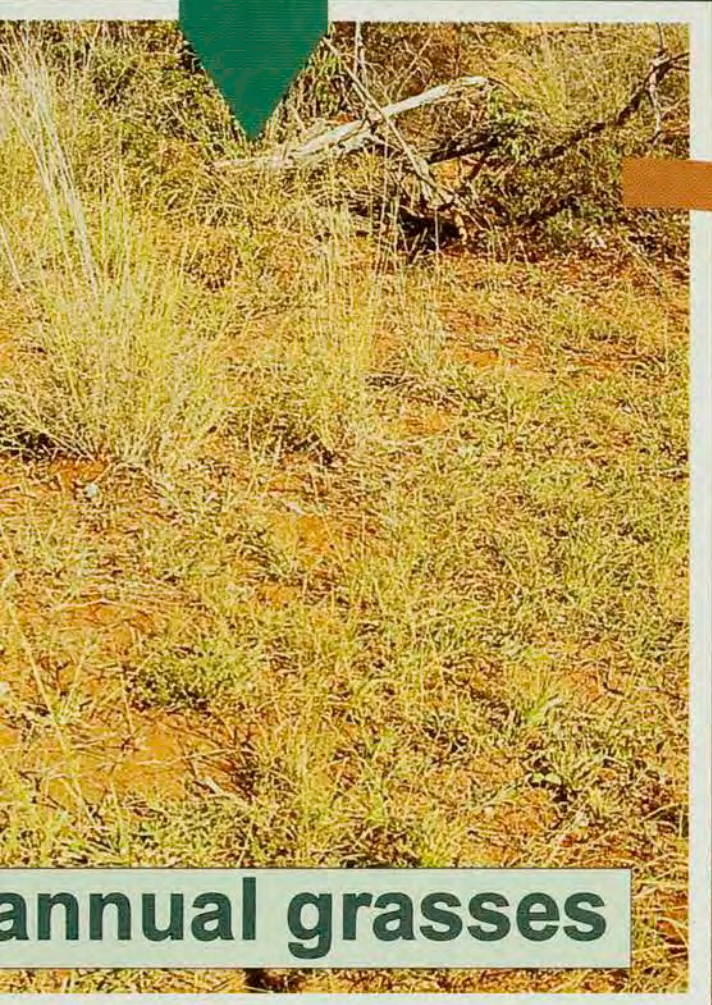


good

going

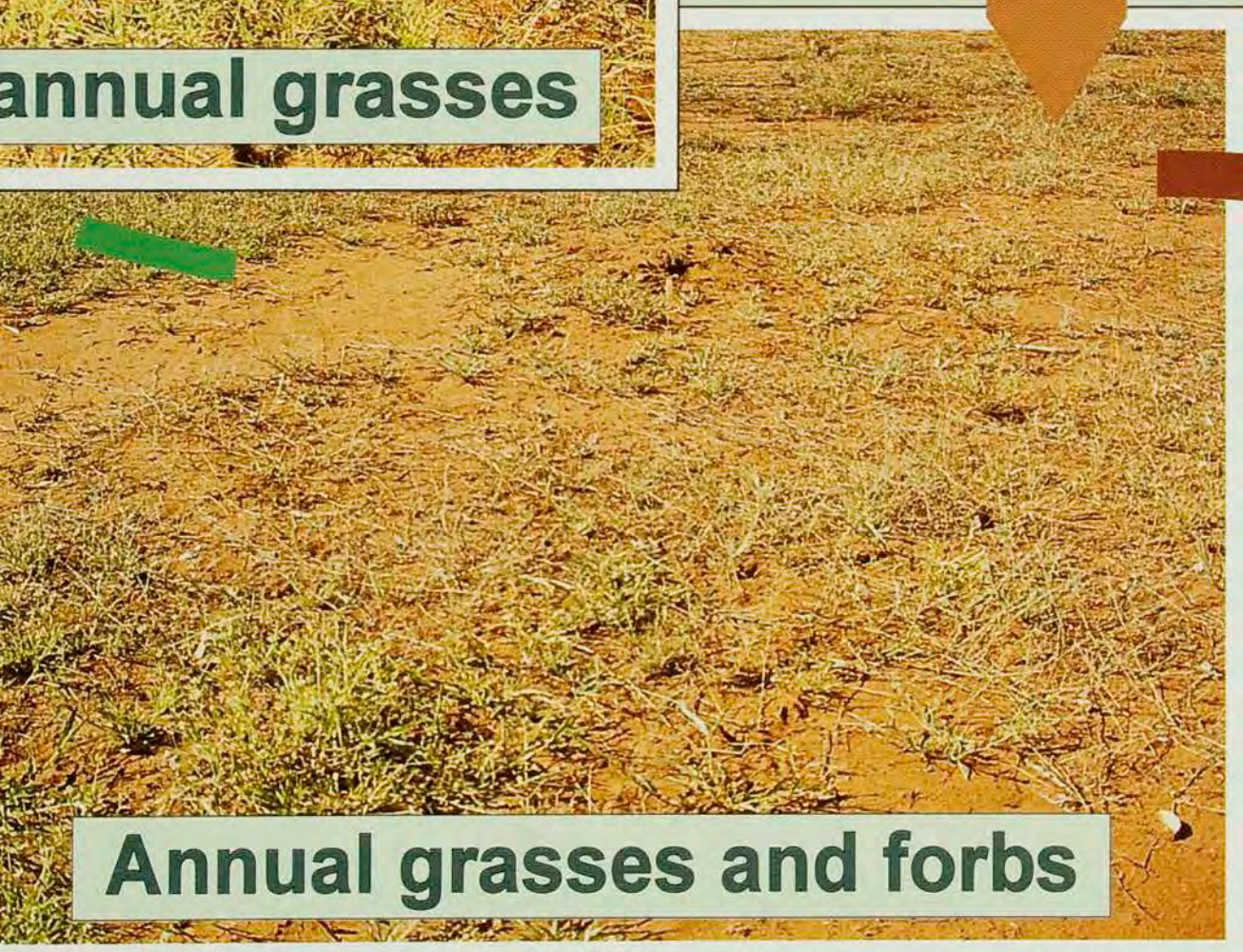
gone

heavy grazing
(no fire)



annual grasses

longer heavy grazing



Annual grasses and forbs

woody weed seed



Woody weeds

de



Grasses are susceptible to grazing just after a fire



Fire removes old trash making green leaf more accessible



Only small amounts of nutrients are lost in a fire

Frequent burning is the best way to get rid of wattles.

What if I have sown legumes in the paddock?

Once the legumes have been allowed to set seed, they will re-establish from seed after a fire. Fire can be used to encourage grasses in a legume-dominant pasture.

Allow legumes to seed well before you burn.

What about burning part of the paddock?

It is much better to burn the whole, or a large part, of the paddock so that stock do not concentrate on the burnt areas and weaken the new regrowing grasses.

However, fire can even up patchy grazing by encouraging stock into the burnt areas.

When can I restock after burning?

Speargrass plants are susceptible to grazing immediately after a fire (or drought) when trying to grow from new tiller buds.

If possible, keep stock off newly burnt pasture until the grass is about 10 cm high.

What are the benefits of burning to stock?

Fire removes the low quality roughage (dead leaf and stalk) allowing stock to get a more nutritious pick. Steers can gain an extra 25 kg in the first 3 months after a fire, but those on unburnt pasture may catch up later.

What nutrients go up in smoke?

Plant nutrients that combine with oxygen and become gases are lost to the atmosphere. These are mainly nitrogen and sulphur. Potash remains unchanged, but some phosphorus can be vaporised with a hot fire.

Some nutrients lost in smoke may return to another part of the paddock as ash, and you may get someone else's sulphur when sulphur dioxide gas dissolves in raindrops.

The levels of nitrogen, and sulphur, in dead leaf and stem are very low (0.5–0.7% N and less than 0.05% S), so burning 1500 kg of dry matter per hectare will lose less than 10 kg of nitrogen. This is small compared to the 3–6 tonnes of total nitrogen in each hectare of soil.

What about greenhouse gases?

Most of the dead grass will be burned to form carbon

dioxide—a greenhouse gas. However, as the dead grass would decay to carbon dioxide anyway; burning merely changes the speed of oxidation. Under a stable grazing system, an equivalent amount of carbon dioxide will be incorporated into new vegetation in the next year, and there is no net change in carbon dioxide emission.

Killing trees by stem injection and leaving them standing keeps carbon dioxide locked up for decades.

A vigorous pasture will lock up much more carbon than a degraded pasture, part in the tops, but much more in the roots. Good native pasture will hold several tonnes of carbon in every hectare of soil.

Ruminants produce methane, another greenhouse gas, from their digestive systems, especially while digesting poor quality roughage. Improving pastures with legumes improves digestion and reduces the production of methane.

Healthy pastures reduce atmospheric CO₂.

Improved pastures reduce methane emissions.



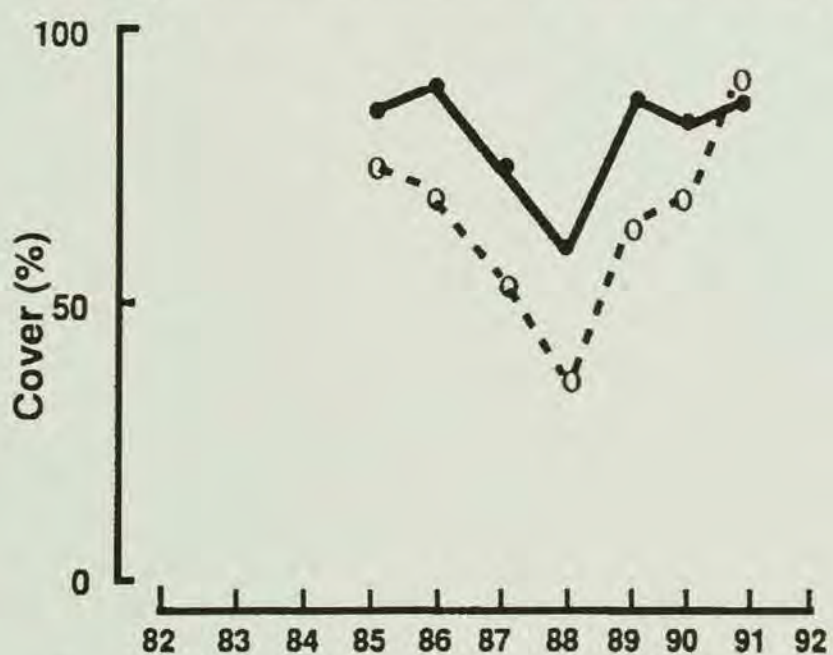
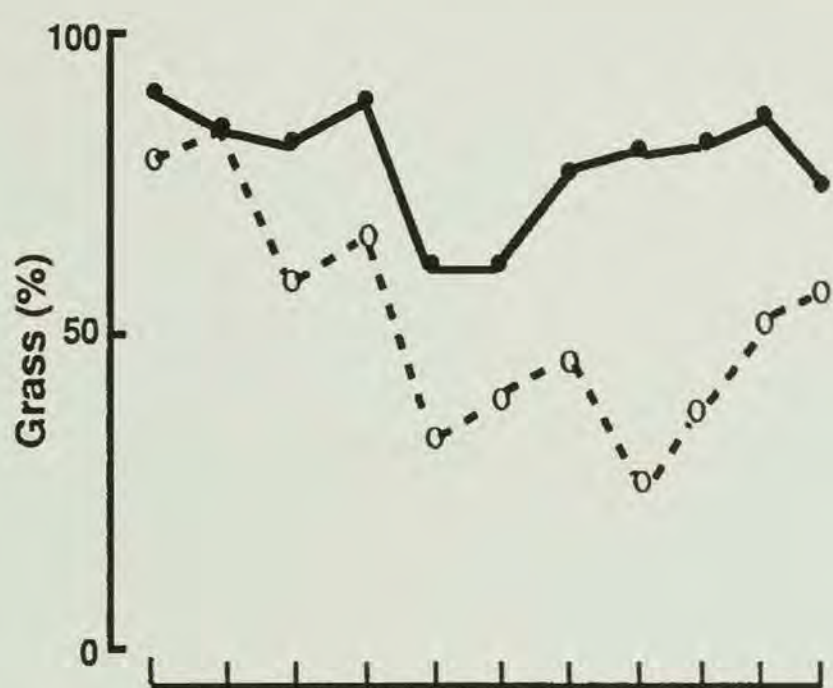
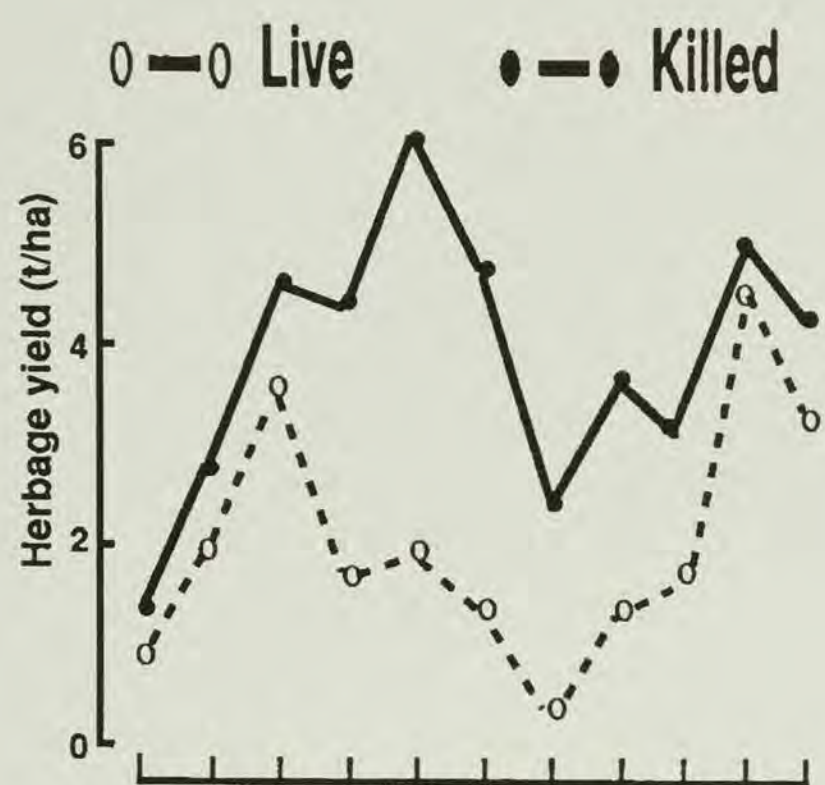
Leaving timber standing after stem injection keeps carbon locked up for decades

Clearing or thinning trees

Speargrass pastures grow naturally under an open canopy of eucalypts. In this northern region, the trees are often only about a third as dense (with a basal area of 3–4 square metres of stem per hectare) as those in the southern speargrass region.

Pasture is reasonably productive under the trees although they compete for water. However, during the intense wet seasons in the north there is usually enough moisture for both grass and trees; during the intense dry seasons, there is none for either. Tree competition is greatest on 'dry' and 'infertile' sites.

It is generally not worth clearing trees in this region. Most of the benefit would be offset by the cost of controlling regrowth.



Pasture growth under live or killed trees from 1982 to 1992 at Charters Towers. Killing trees gave better grass production in dry summers, but brought a new set of problems.

What are the advantages of clearing eucalypts?

More grass. The benefits depend on the fertility of the soil. Grass production on the red duplex soils may increase by 25%, while it can double on the better basalts. The advantage is most pronounced in dry summers.

You can carry more animals, or increase the weight gains per animal, if the land and grass quality are good enough. You may want to develop better class land with a fully sown pasture for fattening or weaning.

In open country, the better grass cover at high stocking rates may reduce erosion and loss of soil.

Easier stock handling. Mustering is easier in cleared country. Cattle may be enticed onto and held on a cleared area with improved and fertilised pasture.

Easier mechanical clearing of woody weeds. Dense infestations of rubbervine and berrybush can be cleared more easily with a bulldozer in open country.

What are the problems with clearing?

Cost. The cost of clearing will outweigh the benefits on much of your average country. Overall, there will usually be little benefit from clearing trees on poorer country, and there is likely to be more grass only in dry summers when there will be less competition for water because the trees have been killed.

You would almost certainly get a better return on your money on this country by improving water supplies or by sowing legumes into uncleared land.

You need to consider the initial cost of clearing, the expected benefits in terms of grass and stock, and

how long your management allows the benefits to last before they are wiped out by regrowth.

Salting. Clearing can induce salting in soils with this potential.

Regrowth. You will get more and larger seedlings and root suckers of trees and understorey shrubs—and these will keep growing larger every year.

What regrowth?

Within five years after clearing and under minimal management, hundreds of small seedlings per hectare can grow into a much worse problem than the original open woodland.

Almost half of the total population of eucalypts in a natural woodland are saplings under 1.5 metres high—suppressed by the mature trees. These saplings are usually missed when the trees are pulled with a chain or injected with herbicide. Once the mature trees are killed, the saplings start to grow and seedlings establish.

If the soil has been disturbed by pulling, seed of other species may germinate. Seeds of wattles or chinee apple may have been lying in the soil, while seeds of rubbervine can blow in from frontage country.

Do trees provide any benefit to grazing stock?

Animal production may be slightly higher under a light canopy in higher rainfall districts where there is less competition for water. Shaded green grass may be more digestible, and stock may suffer less heat stress in summer. The grass may be protected from light frosts in winter; minimum temperatures can be 2°C higher under living trees and 1°C higher under standing dead trees.

Some edible trees, such as bauhinia, may provide useful topfeed.

Some plant nutrients are cycled from greater soil depth by the tree roots, but their overall effect on pasture growth is minimal.

If I want to clear some land, where should I start?

Develop your best land first, typically the basalt areas. On better type of country:

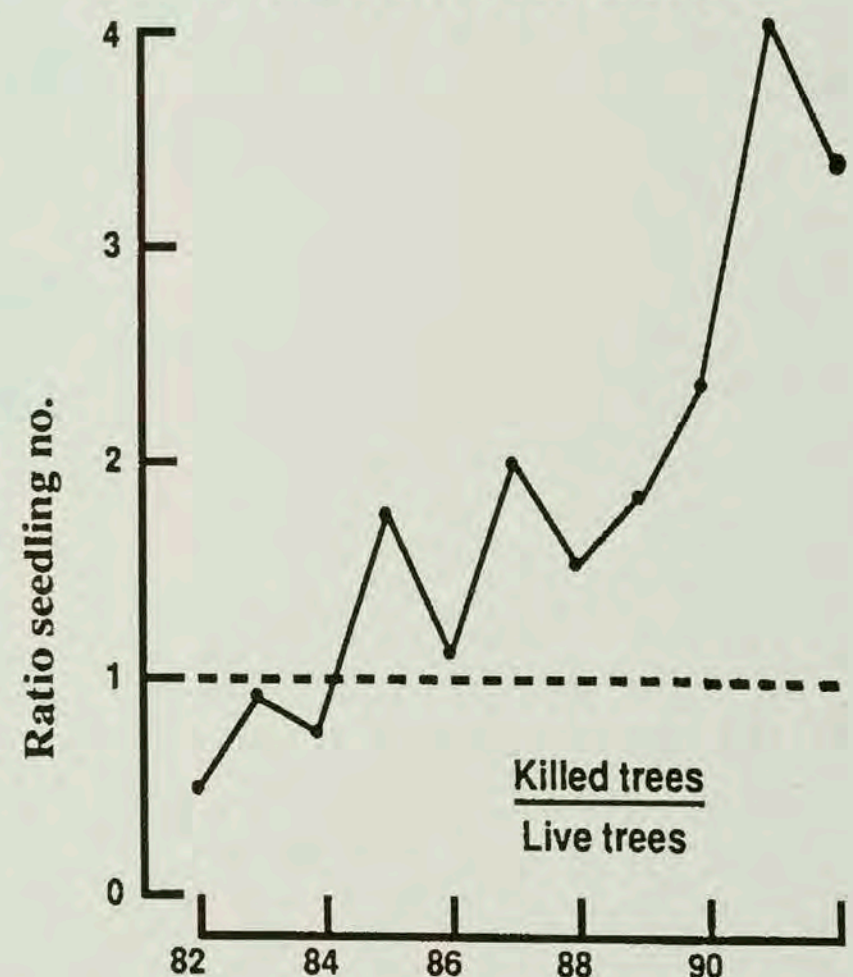
- the grass will grow faster and be of better quality
- there may be less regrowth as there are fewer understorey shrubs; good grass growth is more competitive and allows hotter fires.
- you can afford to spend money on regrowth control because economic returns are better.

However, as trees are often less dense on this good land, the grass response may be less than expected.



Regrowth a few years after pulling

The ratio of seedlings and suckers under killed trees to those under live trees each year



There are always some seedlings and suckers under trees, but their numbers increased fourfold after trees were killed



Little country is cleared normally, but there may be advantages on the best soils

Develop only an area that you can look after.

What are the guidelines for clearing trees?

Even if it is worth clearing trees, there are areas that should never be cleared.

Plan to leave all these areas—

- steep hillsides
- intake ridges for potential salting
- useful timber
- dense understorey growth
- silver-leaved ironbark country
- erodible soils
- those with scenic value
- those as a haven for your own nature reserve.

On the land to be developed, keep at least 20% of the original tree population in strips 100 or more metres wide. The strips should connect the water courses and areas of retained timber on your, and neighbouring, land.

- Do not clear on slopes greater than 8%.
- Do not clear free-draining intake areas on ridge-tops.
- Keep clumps for cattle camps at least 3 to 5 ha in area
- Do not clear within 100 metres of ‘permanent creeks’ (those able to hold waterholes); tree roots prevent bank collapse better than grasses.
- check local guidelines for broadscale clearing.

Check any legislation before you start. On leasehold land, you will need a Tree Clearing Permit from the Department of Lands, and may need to provide a Tree Management Plan.

Thin the stand or clear the lot?

If you are going to clear, we recommend alternating uncleared forest and cleared grassland on the area to be grazed rather than thinning the whole area. The ‘savanna’ of scattered trees may look scenic, but you need only 5 mature trees per hectare to reinfest the whole area with seed. Many of the large trees that are left are old and will die sooner or later, although they may provide homes for native birds and small animals.

Alternating forest and cleared land has benefits for both. The forest of mixed species and ages of trees is self-regenerating, can be a source of timber for farm and sale, and provides shelter for stock and wildlife; the grasses in the open space will grow vigorously without being re-infested with tree seeds.

Do not spend so much money on pulling too large an area that you cannot afford to manage the regrowth that is sure to come.

What is the best way to kill trees?

There is no best way. If you have decided that you need to clear some land, you will find that every method has problems.

Pulling. Pulling is usually the fastest and cheapest method where trees are dense. It allows a rapid response from the grass, and legumes can be sown into the disturbed soil. But saplings and seedlings are missed and start growing quickly; also weeds can germinate in the disturbed soil, and gully or tunnel erosion may start on solodic soils.

Stem injection with chemicals. This method is more common in the southern speargrass region than in this region. It is reliable, can be selective, and does not disturb the soil; however, it is labour-intensive, slow and hence fairly expensive on larger properties. Suppressed saplings are usually missed, and some eucalypt species are fairly resistant to herbicide.

Stem injection can give a short-term flush to pastures so that cattle concentrate on the treated area.

Graslan. Pellets of Graslan (tebuthiuron) spread from the air are effective against all stages (seedlings, saplings and mature) of most species for which it is registered, and the effect can last for many years. It can be spread over large areas quickly, but with good accuracy, to leave watercourses, corridors and shelter belts. But Graslan is expensive, the aerial contractors have minimum areas for treatment (250 ha), and many species such as wattles are resistant at the lower application rates.

Because the effect can be long-term, there may be little opportunity for regeneration in the future if you find that you have overcleared.

No clearing should be undertaken until you have prepared a detailed plan

What is the best way to control regrowth?

The cheapest control is to burn the speargrass while the woody weed seedlings are small. Fire will keep saplings up to 2 metres tall under control by destroying the topgrowth.

Fire should become the basis for managing your grazing. If you can burn every three or four years, it means that your stocking rate is about right.

How soon can I graze after killing the trees?

The grass under the trees will start to grow faster as soon as the dying trees stop using water.



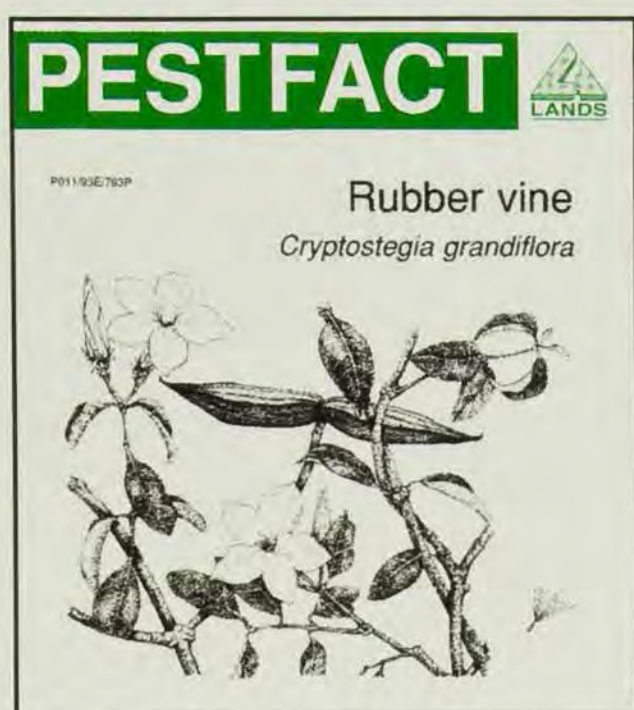
Chaining is the cheapest method of clearing good country



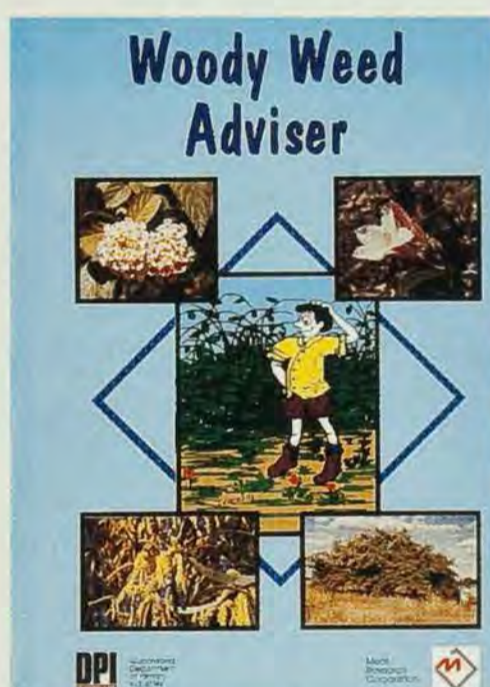
Stem injection and Graslan leave trees standing



Berry bush controlled by fire before stands become too dense



Lands weed control notes



Woody Weed Adviser—
weed control information
on floppy disk



Rubbervine is one of our most serious problems

Do not try to recover the costs of treatment quickly by putting in more stock right away. If there is an understorey of small trees and shrubs, rest the paddock to build up fuel for a hot fire—or you will just be starting another cycle of regrowth.

If Graslan kills the suppressed understorey, you may be able to start grazing earlier than with other treatments.

What are the other methods to control regrowth?

In this region, eucalypt saplings grow out of reach of fire after about 3 years, become small trees in about 10 years, and mature trees after 20 years.

Dry years favour trees, wet years favour both trees and grass. If the regrowth gets away from you, the young trees and shrubs will have to be killed in some other way besides fire—all will involve major expense.

The DPI decision support program *Woody Weed Adviser* and the Lands Department's Pestfacts can help you to decide the best chemicals and most practical methods for controlling the various woody weeds that you may have.

Broad area regrowth control. Repulling with a light chain can be cheap and fast—if there are no stumps or standing trees. It misses flexible-stemmed seedlings under 5 years old.

Graslan is effective if there are no resistant species present, but it is expensive and may prevent pasture legumes being established in the short term.

Blade ploughing can be effective if the land has already been cleared of tree stumps and roots, but it is generally too expensive for this low value land.

Individual tree treatment. It is usually impractical to treat individual trees over large areas, but this may still be the best method against scattered introduced weeds, such as rubber vine.

Trees aren't my problem, rubbervine is!

Rubbervine has become one of the most serious weeds since it was introduced to the region over 100 years ago. It has invaded and taken over much of the best frontage country, and has spread out along smaller watercourses and open country.

How can I kill rubbervine?

Rubbervine is not difficult to kill when it is a single plant; several herbicides are effective. Rubbervine is a problem because of the scale of the invasion and the logistical difficulty of getting at the plants.

An ecological approach and biological control would be the most cost effective.

Will biological control save me the effort?

Biological control using insects and fungi is being investigated. Rubbervine leaf rust is being field-tested in the Northern Territory and around Charters Towers, but dry conditions have reduced its effectiveness so far. Even when the rust is released, it will only reduce the vigour of rubbervine, not wipe it out.

You will still need to integrate biological and chemical control.

Start treating rubbervine now! Don't wait for a 'miracle' from biological control.

What are the recommended herbicides?

Lands and DPI list a number of herbicides and methods of application for rubbervine on a range of sites. Among these are:

For frontage country

Overall spray with water-based mixtures – Grazon DS (triclopyr with picloram), Brushoff (metsulfuron methyl), Dicamba 200, Tordon 50-D (picloram with 2,4-D), and AF Rubbervine spray (2,4-D ester). Grazon DS and AF Rubbervine spray can be applied from a helicopter where access is difficult.

Basal bark spraying (with distillate-based mixtures) – Garlon 600 (triclopyr), AF Rubbervine spray.

For open country without trees

Aerial application – Graslan, except on cracking clay soils, deep sands or where there is deep leaf mulch.

Spot treatment - Velpar.

Both Graslan and Velpar can kill non-target trees.

What are good mechanical methods of control?

Rubbervine and shrubs can be cleared with a dozer. The plants must be cut off below the ground, and then stickraked and burned. Because this soil disturbance leaves a good seedbed, seeds of rubbervine and other weeds can germinate and establish unless a good cover of grass is established as soon as possible.

Smaller plants can be controlled by slashing.

What is an ecological approach?

The ecological approach is to minimise bare ground by keeping it filled with useful species—grasses.

If there is an open space, and soil moisture, some plant is going to fill it.



Rubbervine leaf rust is being field tested for biological control



Overall spray with water-based herbicide



Basal bark spraying with distillate-based herbicide



Dense rubbervine cut off with a dozer



The robust Crocodile seeder digs small pits to hold moisture and silt for better seedling establishment



Rubbervine spreading from creek flats

Managing native pastures to maintain them in good condition without open spaces through control of stocking rates and by periodic burning will keep down woody and vine weeds. This is described later in this booklet.

If it is feasible, frontage country can be fenced with a temporary electric fence to prevent localised overgrazing, to build up a fuel load for a hot fire to prevent weeds spreading.

The ecological approach of establishing a grass is vital after rubbervine has been dozed and the soil disturbed, or after dense growth of rubbervine has been killed with herbicides.

You should aim to prevent rubbervine seedlings from re-establishing or try to control them while they are young and susceptible to treatment.

What is the best way to establish a grass?

Grass seedlings tend to be small and fragile; grass seed tends to be expensive.

The small grass seeds need close contact with moist soil particles. If the land has been stick-raked, there may already be some sort of seed bed, and seed could be broadcast over the surface to be washed in by rain. If the surface has not been disturbed, after chemical treatment of rubbervine, a seed bed must be created.

The Crocodile seeder has been cost-effective, being robust and almost indestructible. The seeder drops seed into small pits which concentrate water and silt to keep the seedlings growing.

What are the best grasses?

Any grazable species that will establish reliably and spread to cover the area.

Running species tend to give best ground cover, and pertusa is well adapted to a range of infertile soils. Pertusa spreads better than buffel or urochloa, but the latter grow well on better country.

What further treatment is needed?

Follow-up treatment, usually by spot spraying, is essential on any woody weed, whatever the initial treatment.

Don't start on a new area until you have followed-up treatment on the last area.

Improving native pastures

Native pastures are moderately productive when managed well. The nutritive value of young speargrass is as good as that of any other grass for 4–6 weeks—until the plant runs out of nitrogen and phosphorus because of the infertile soil.

The concentration of nitrogen in the leaf becomes diluted from about the middle of February; by mid-March, available soil nitrogen has run out and, although the leaf is still green, there is no new growth. Even green speargrass may not provide enough protein or minerals for cattle to grow well. Quality begins to drop further once flowering is initiated.

This declining quality means that the herbage cannot be broken down quickly in the grazing animal's rumen; the animal eats less and production falls.

Quality of grazing can be improved and extended into autumn by sowing legumes into the existing pasture.

What is the main benefit from legumes?

The animals benefit through improved diet from higher levels of protein and minerals, and from the better digestibility of the legume leaf. The benefit is an extra 40 kg of gain to a steer each year at about the same stocking rate.

The hardy legumes usually have little or no effect on the growth of grass unless they are fertilised.

Which are the best legumes for my country?

You need well-adapted species which will naturalise and spread over your paddocks; the DPI recommends different legumes for different soil types, so seek local advice.

The main legumes are the shrubby stylos (Seca and Siran) and the Caribbean stylos (Verano and Amiga), with Wynn cassia in the higher rainfall regions.

The shrub legume, leucaena, may have a place as a permanent high-quality fodder on sites with deeper, more fertile soils than those supporting speargrass. Leucaena needs special care during establishment, should be planted in the same way as a crop, and may need irrigation.

How useful are the native legumes?

There are many native legumes in speargrass pastures; some of them are illustrated here, others can be identified in *A Guide to Herbaceous and Shrub Legumes of Queensland* and in *Plants of central Queensland*.



Native grasses are moderately productive for a short time



Hardy stylos improve protein and digestibility levels in grazing



Wynn cassia behaves as a free-seeding and fast-growing annual



'Abingdon clover'— a native desmodium on black basalt soils

The most common species (native glycines, rhynchosia, and desmodiums) are eaten by stock and are probably beneficial. However some may contain alkaloids—Birdsville indigo (*Indigofera linnaei*) can cause Birdsville disease in horses.

Native legumes rarely comprise more than about 10% of the total herbage, but even that amount may help to produce some of the relatively good growth rates of cattle on speargrass.

What are the risks from growing legumes?

Any risks arise from management rather than the legume. The higher quality of the legumes allows the cattle to eat more grass when its quality has fallen in autumn; this might encourage more stock to be kept over the critical winter period. Do not increase stocking rates above 3–4 ha/beast.

Use legumes to put more weight on each animal rather than to greatly increase the stocking rate—unless you fertilise or sow a grass.

Which country should I improve first?

Improve your best country first. 'Better country' for oversown legumes has soil with at least 4 ppm of available soil phosphorus, and a loose soil surface.

How should I sow the legume seed?

In this region, oversowing after a burn generally gives reliable establishment on soils with a loose surface. Some form of cultivation is needed on hard-setting soils.

Oversowing works well because, once the wet season starts, it usually continues with humid conditions ideal for seedlings.

Sow in October–November with hard seed or scarify it for later plantings

Do not destock oversown paddocks as grazing will reduce competition from the grasses

Plant a good seed rate on a small portion (say a tenth) of the paddock and allow stock to carry the seed over the paddock. Although only 30% of the seed in dung is viable, there will be a large amount of seed to spread. Putting a few kg of seed in molasses-based supplements can be a waste of time. At that time of year, most of it ends in cattle camps when and where seedlings cannot survive.



Urochloa sown with stylos improves pasture stability

Do I need fertiliser?

The hardy legumes may not need fertiliser to establish and survive, but will grow more vigorously and set more seed with it, and so will spread more quickly.

Some phosphorus should be applied where the soil phosphorus levels are below 4 ppm as both plants and animals then need extra phosphorus. The extra nitrogen from the legume increases the animal's demand for P.

If the soil phosphorus levels are between 4 and 8 ppm, the legumes will grow well and will provide the animals with protein. However, phosphorus levels may still be too low for the animals and supplements are needed.

If the soil is above 8 ppm, there is enough phosphorus for both plant and animal.

Fertiliser will always give better animal growth rates and carrying capacity than direct supplements, but it is rarely economical on extensive pastures.

What about feeding phosphate supplement?

Feeding supplement P is the only practical way to supply phosphorus on extensive properties with large paddocks.

Phosphorus feeding systems are well described in the DPI book *Phosphorus nutrition of beef cattle in northern Australia*.

Supplement requirements and expected steer weight gains

Soil P (ppm)	Supplement phosphorus	Carrying capacity (ha/steer)	Annual LW gain (kg/steer/yr)
Legume in native pasture under live trees – 800 mm rainfall			
4	yes	5	130
6	yes	4	140
8	no	3	150
10	no	2.5	150

What nutrients are deficient in speargrass country?

Generally speargrass soils are very low in nitrogen, low in phosphorus. Sulphur may be deficient in some soils, for example granodiorite and basalts, and extra sulphur can be mixed into a supplement. Check local advice.

When should supplements be fed?

Phosphorus supplement is needed on low P soils during the wet season when the animals are growing, and when there is adequate nitrogen from sown legumes.



Develop the best country first, but apply fertiliser if soil is below 4 ppm P



Feed P supplement during the wet season when cattle are growing

During the dry season, stock need less phosphorus, but more nitrogen so that they can use standing dry herbage. This nitrogen may be fed as non-protein-nitrogen (urea) or in protein form as, for example, cotton seed.

What problems arise from dry season supplements?

Dry season supplements are now part of routine stock management in the region although they are needed less with early weaning or lower stocking rates.

Dry season supplements allow an animal to increase its intake by 30–40% over the dry season, equivalent to keeping 30% more stock and so putting excessive pressure on the native pastures.

Will fire damage my sown legumes?

New plantings of legumes must be allowed to drop good seed before the first fire.

After this, stands of most hardy legumes can be rejuvenated by a fire, even if the top growth is killed. Seca and Verano stylo and Wynn cassia can drop masses of seed, and new seedlings will establish. The legumes may also shoot from the base or crown.

Sensibly used, fire can help maintain a good balance of grass and legume. Over-optimistic stocking rates and lack of fire could lead to legume dominance and lower pasture stability.

What about fodder crops?

Some forage sorghums can give a great bulk of feed, allowing speargrass paddocks to be rested. However, they are hungry for soil nutrients, should be planted only on cropping-type soils, and they need farming machinery.

What about fully sown pastures?

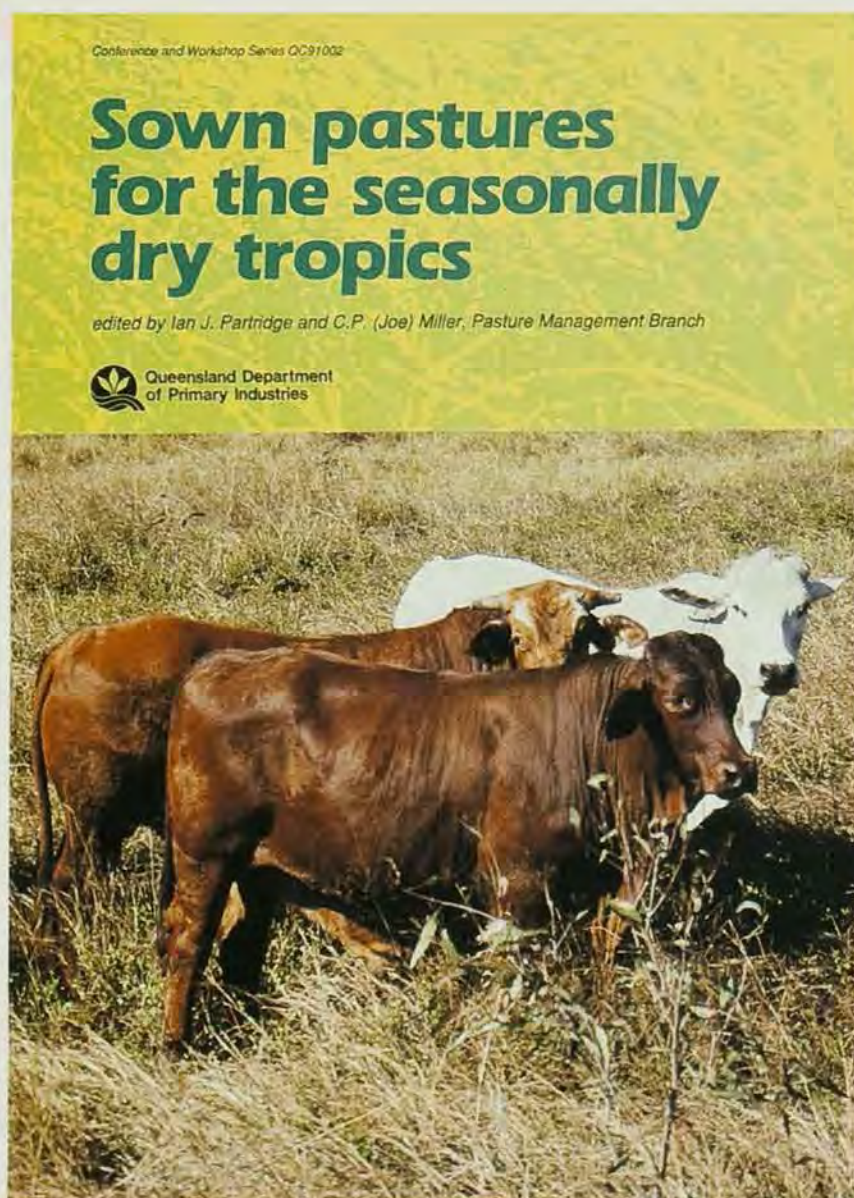
Fully sown pastures are more versatile than fodder crops. They provide better feed for more of the year and will last longer provided you plant well-adapted species and manage them properly. Urochloa and buffel grasses are the most commonly planted species, but Bisset creeping bluegrass and the recently released Jarra digit grass have shown promise on poor country.

Fully sown pastures with improved grasses and legumes are outside the scope of this short book on native pastures, so seek local advice.

Plenty of good information is available in the DPI book ***Sown pastures for the seasonally dry tropics***.



Allow sown legumes to drop plenty of seed before grazing heavily or burning



Monitoring pastures

Traditionally graziers have monitored pastures through the condition of their cattle. However, pastures have to be monitored in their own right to obtain early notice of changes that are occurring.

Monitoring is one of the three basic parts of managing a native pasture.

You need to understand the ecology of grassland, follow the local guidelines and check (monitor) the effects of your management on your paddocks.

Monitoring encourages you to look more closely at the pasture, and it provides a record so that you can detect if gradual changes occur over the years.

This book does not tell you how to monitor pastures because the various methods are described in another DPI publication – **GRASS Check**.

What is the best way to monitor pastures?

Monitoring is a fundamental part of managing native pastures. Monitoring and recording species may seem a little daunting at first, but once tried, it is quite simple—and very interesting, your own small research project in your paddock, not someone else's results from miles away.

GRASS Check offers you a number of techniques, with varying levels of detail, for looking at the amount of dry herbage in the paddock, at ground cover, at desirable and undesirable species, individual species and at the density of mature or regrowth timber.

The DPI runs training workshops to explain and demonstrate the various methods described in GRASS Check.

The DPI also has a programme called Pasture Watch which encourages secondary school children to understand the need for monitoring.

When is the best time to monitor pastures?

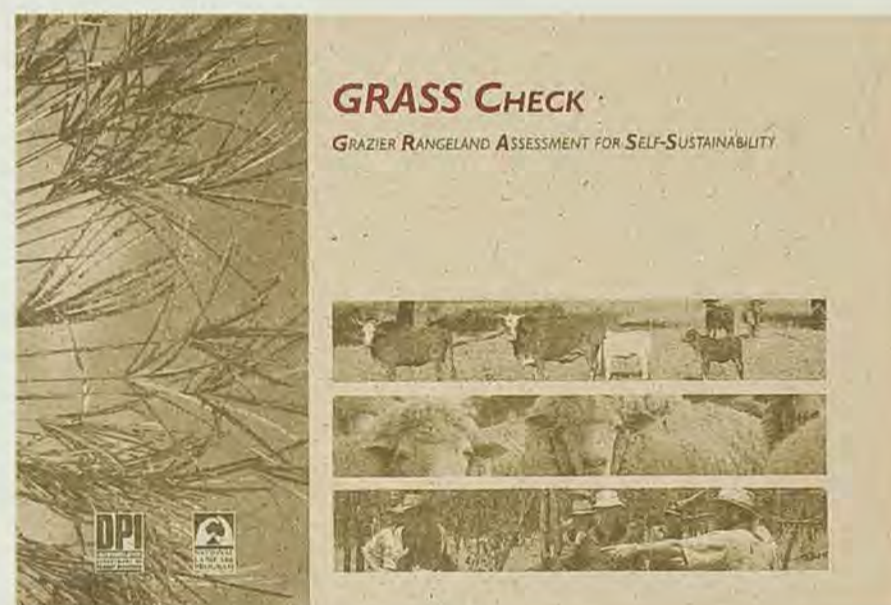
Monitoring is best done at the end of the growing season, around April, and before the first muster. For a start it is a cooler time than summer, and it allows you to make decisions on stocking rates based on the amount of grass that has grown.

You can estimate the amount of feed standing in the paddock either by comparing with the photo-standards shown in this book, or by more direct measurement.

Making this decision even earlier in autumn (March) could mean that you can sell any excess stock while they are in good condition and the market is still reasonably attractive.



The cattle look good but the pasture is full of weeds



describes various systems (simple or detailed) of monitoring

Memories are too short to remember gradual changes.



Estimating feed in a paddock

Knowing the amount of herbage in the paddock allows you to assess what your stocking rates should be. The yield or weight of herbage (total dry matter, not wet green leaf) can be measured directly by cutting to ground level, drying and weighing (modern electronic kitchen scales are cheap and can weigh to 1 gm). Alternatively herbage can be estimated by comparing your paddock against photo-standards—photographs of typical pastures where the amount of feed is known.

Photo-standards of speargrass pastures

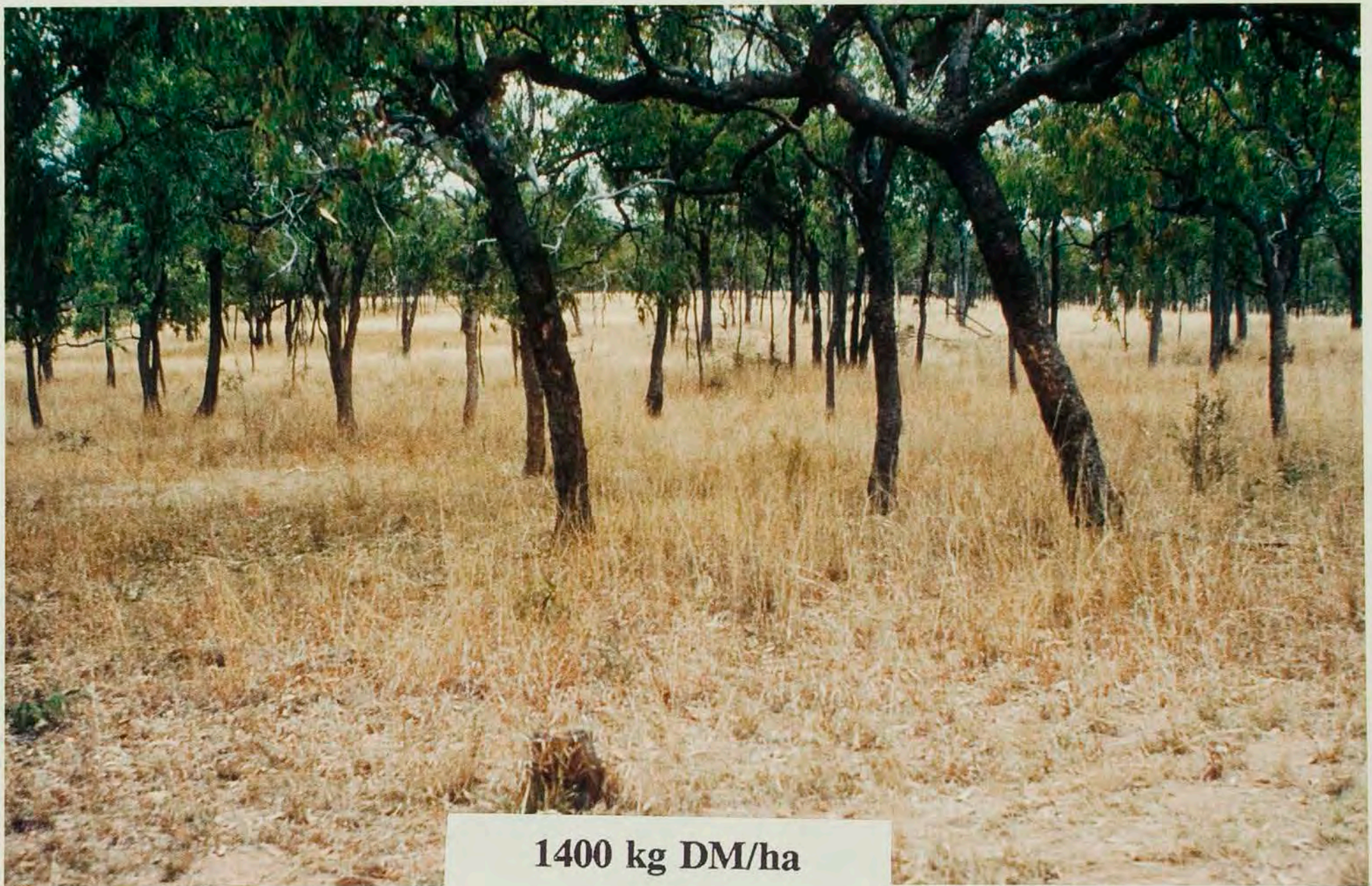
(Note the four steel posts which mark the corners of the large quadrats. The figures show the weights of dry matter in kg/ha.)



2100 kg/ha dry matter



1700 kg/ha dry matter



1400 kg/ha dry matter



900 kg/ha dry matter



250 kg/ha dry matter

Recognise the important grasses

Desirable perennial grasses

Angleton grass	<i>Dichanthium aristatum</i> +
Black speargrass	<i>Heteropogon contortus</i> –
Desert bluegrass	<i>Bothriochloa ewartiana</i> –
Forest bluegrass	<i>Bothriochloa bladhii</i> –
Giant speargrass	<i>Heteropogon triticeus</i> –
Gulf bluegrass	<i>Dichanthium fecundum</i> –
Indian couch	<i>Bothriochloa pertusa</i> +
Kangaroo grass	<i>Themeda triandra</i> –
Sabi grass	<i>Urochloa mosambicensis</i> –

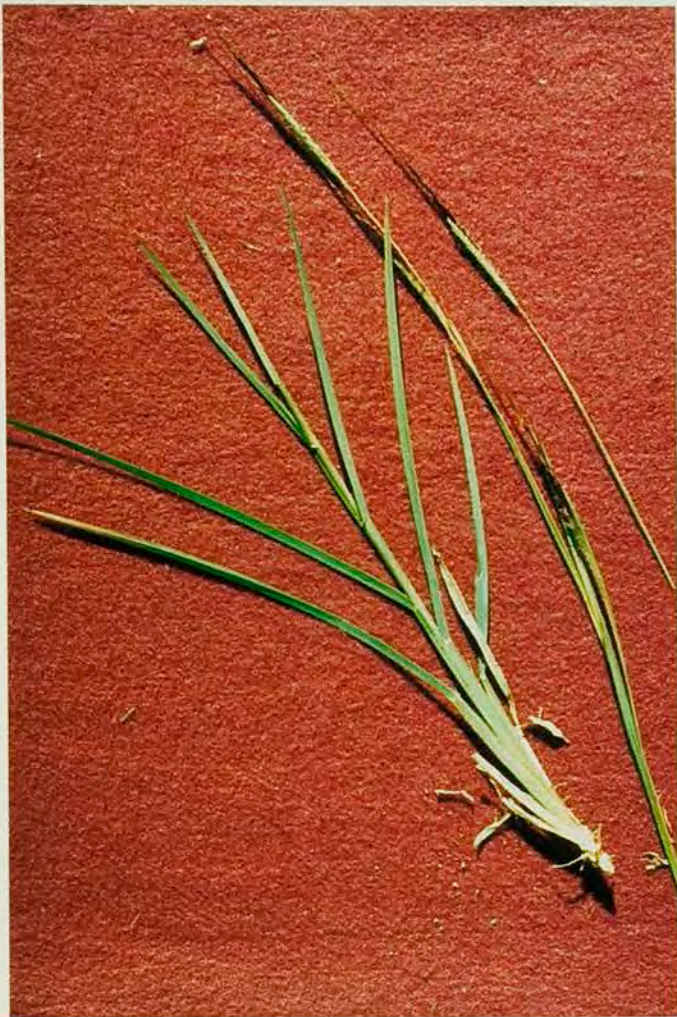
Intermediate value grasses (perennials and annuals)

Barbwire grass	<i>Cymbopogon refractus</i>
Bottle washer grass	<i>Enneapogon intermedius</i> +
Cloncurry pitted bluegrass	<i>Bothriochloa decipiens</i> var. <i>cloncurransis</i> +
Early spring grass	<i>Eriochloa procera</i> +
Flinders grass	<i>Iseilema</i> species +
Golden beard grass	<i>Chrysopogon fallax</i> +
Green couch	<i>Cynodon dactylon</i> +
Liverseed	<i>Urochloa panicoides</i> +
Love grasses	<i>Eragrostis</i> species +
Plume sorghum	<i>Sorghum plumosum</i> +
Red natal grass	<i>Melinis repens</i> (<i>Rhynchelytrum</i>) +
Shot grass	<i>Paspalidium distans</i> +
Silky browntop	<i>Eulalia aurea</i> (<i>E. fulva</i>) –
Thatch grass	<i>Hyparrhenia rufa</i> (–)
Windmill grass	<i>Panicum</i> species +

Undesirable or annual grasses

Barnyard grass	<i>Echinochloa colona</i> +
Button grass	<i>Dactyloctenium radulans</i> +
Desert couch	<i>Brachyachne convergens</i> +
Fairy grass	<i>Sporobolus australasicus</i> +
Five minute grass	<i>Tripogon loliiformis</i> +
Leafy nine-awn	<i>Enneapogon polyphyllus</i> +
Purple top rhodes	<i>Chloris inflata</i> (<i>C. barbata</i>) +
Rat's tail grasses	<i>Sporobolus</i> species (+)
Reed grass	<i>Arundinella nepalensis</i>
Sedges	<i>Cyperaceae</i> species +
Slender chloris	<i>Chloris divaricata</i> +
Small burr grass	<i>Tragus australianus</i> +
White grass	<i>Sehima nervosum</i> (–)
Wiregrass	<i>Aristida</i> species +
Woodland love grass	<i>Eragrostis sororia</i> +

+ indicates that this species increases under heavy grazing
– indicates that this species decreases under heavy grazing
(+) and (–) indicate the change occurs only sometimes.



Black speargrass



Desert bluegrass



Pertusa or Indian couch



Angleton grass



Kangaroo grass



Silky brown top



Wire grass (Aristida)



Golden beard grass



Plume sorghum



Liverseed grass



Flinders grass



Desert couch



Small burr grass



Button grass



Five minute grass



Leafy nine-awn



Fairy grass



A sedge

Other problem plants

Bellyache bush
Birdsville indigo
Calotrope
Chinee apple
Currant/berry bush
Heartleaf
Lantana
Mimosa bush
Parkinsonia
Rubbervine
False sandalwood

* indicates native species

Jatropha gossypifolia
*Indigofera linnaei**
Calotropis procera
Ziziphus mauritiana
*Carissa lanceolata**
*Gastrolobium grandiflorum**
Lantana spp.
Acacia farnesiana
Parkinsonia aculeata
Cryptostegia grandiflora
*Eremophila mitchellii**

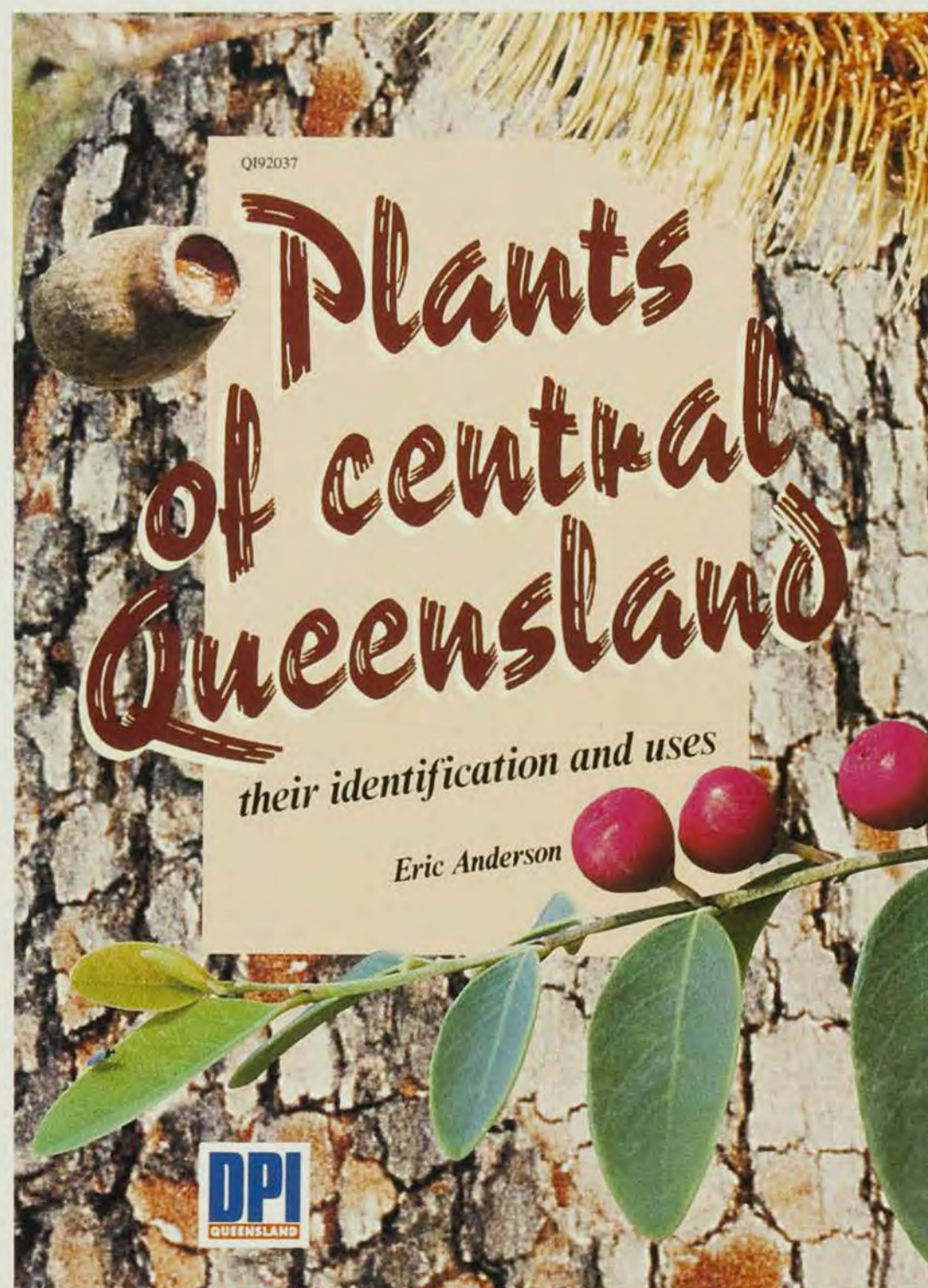
Other indicator forbs

Forbs are non-woody broad-leaved plants;
forbs are often (incorrectly) referred to as herbs.

Pigweed *Portulacca* spp.

Tar vine *Boerhavia* spp.

Many of these plants are illustrated and described
in *Plants of central Queensland: their identification and uses*.



How are *your* pastures?

You can check the condition of the grazing in your paddocks after monitoring. Condition can be categorised simply (on the proportion of the different species present and on the soil condition) as good, deteriorating or degraded.

A 'deteriorating' pasture can be reversed to one in 'good' condition by changing management or by a return to more normal rainfall patterns, as after a drought.

'Degraded' land can only be returned to inherent productivity by practices or expenditure outside normal management for this type of country.

What 'state'?

These conditions 'good', 'deteriorating' and 'degraded' are simple descriptions. The terms 'state' and 'transition' describe more detailed changes under the various pressures. Pastures may be in a certain 'state' or moving between states — 'transition'.

Some transitions may be reversed by changing management, for example by lightening the stocking rate and burning, whereas others may need substantial and often uneconomic inputs, for example mechanical clearing of regrowth, once they have gone too far.

These 'states' are described as:

'States' recognised in the northern speargrass region:

State 1. Perennial tussock grasses. Good condition pasture dominated by palatable, native perennial tussock grasses such as kangaroo grass, black speargrass, forest and desert bluegrasses.

State 2. Perennial and annual grasses. Deteriorating pasture dominated by more grazing-tolerant native perennial (as in State 1) and annual grasses and forbs (as in State 4), for example, golden beard grass, pitted bluegrass and love grasses.

State 3. Indian couch grass. Vegetation dominated by Indian couch.

State 4. Annual grasses and forbs. Degraded pastures dominated by annual grasses and broad-leaved weeds, for example, wire grasses, fairy grass, small burr grass, pigweed and tar vine.

State 5. Woody weeds. Vegetation dominated by native or introduced woody weeds. Typical species include rubbervine, chinee apple, eucalypt regrowth, berry or currant bush, prickly acacia, other wattles and Parkinsonia.

These states, and the management conditions that cause pastures to move from state to state are illustrated in the centre-fold, pages 20 and 21.



Further reading

General

Managing native pastures: a graziers guide — by Ian Partridge (1992) DPI, Queensland.

Native pastures in Queensland: the resources and their management. — Edited by W.H. Burrows, J.C. Scanlan and M.T. Rutherford (1988) QDPI, Brisbane.

The pasture lands of northern Australia: their condition, productivity and sustainability. — by J.C. Tothill and C. Gillies Tropical Grassland Society of Australia.(1992) Occasional Publication No.5, Brisbane.

Will it rain?: The effect of the Southern Oscillation and El Niño on Australia — edited by Ian Partridge (1994) DPI Brisbane.

Phosphorus nutrition of beef cattle in northern Australia — by Terry McCosker and Lyle Winks (1994) DPI Brisbane.

Drought Notes: a collection of farm notes for beef producers — compiled by Ross Clarke (1992) DPI Brisbane.

Monitoring and plant identification

GRASS Check — by Karen Forge (1993) DPI Queensland.

Plants of central Queensland: their identification and uses. — by Eric Anderson (1993) DPI Queensland.

A guide to Herbaceous and Shrub legumes in Queensland. — by J.B. Hacker (1990) Queensland University Press, St Lucia.

Weeds of Queensland — by H.E. Kleinschmidt and R.W. Johnson, DPI Queensland

Pasture plant identification in the arid zone — by Jennifer Milson (1991), QDPI, Longreach.

Plants of the Northern Australian Rangelands — edited by Tim Wheaton (1994), DLHLG, Darwin.

Poisonous plants: a field guide — RM Dowling and R A McKenzie (1993) DPI Brisbane.

State and transition models for rangelands. Tropical Grasslands Vol 28, No. 4 1994

Technical: land management units and soils

Soil fertility of Central and North-east Queensland Grazing Lands — CR Ahern, PG Shields, NG Enderlin and DE Baker (1994) DPI Brisbane.

The management of eucalypt country in north Queensland — Dalrymple Landcare Committee

The management of basalt country in north Queensland — Dalrymple Landcare Committee

Decision support programs

AUSTRALIAN RAINMAN: rainfall information for better management. Version 2.1.— J F Clewett, N M Clarkson and D T Owens (1994) DPI, Brisbane.

Woody weed adviser: options for woody weed management – P Back , A Jamieson and G. Lambert (1993), DPIQ Rockhampton

Breedcow and Dynama: Herd budgeting package — WE Holmes (1993) DPIQ Townsville

Rangepak Herdecon: a microcomputer-based Advisory System for Pastoral Land Management. CSIRO National Rangelands Program, PO Box 2111, Alice Springs NT 0871.

Grassman: a computer program for managing native pastures in eucalypt woodlands — JC Scanlan and GM McKeon (1990) Department of Primary Industries, Brisbane.

Managing northern speargrass provides specific guidelines for the part of this native pasture community stretching from Cooktown in the north to Bowen in the south. It is a local supplement to the basic principles described in *Managing native pastures: a grazier's guide*.

Written in a readable question and answer style, and illustrated with colour photographs, *Managing northern speargrass* describes the country and the management options for sustainable production.

These options include:

- altering stocking rates
- moving stock
- burning
- clearing or thinning trees
- improving the pasture.

The booklet also describes how monitoring speargrass pastures helps graziers to make effective management decisions.

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