

Managing southern speargrass

a grazier's guide

Ian Partridge



Managing southern speargrass

a grazier's guide
Ian Partridge

PUBLISHING SERVICES

EDITORIAL COPY

**Information Series QI93037
ISSN 0727-6273
ISBN 07242 53890**

First published 1993

This book has been published with funding from the



**NATIONAL
LANDCARE
PROGRAM**

©Queensland Government 1993

**Department of Primary Industries
GPO Box 46
Brisbane Q 4001**

Contents

Contributors	iv
Preface	v
In a nutshell	vi
Introduction	1
Speargrass country	2
Property management planning	6
Land management types	6
Management guidelines	8
clearing or thinning trees	8
altering stocking rates	13
moving stock	18
burning	21
improving speargrass	26
Monitoring pastures	31
estimating feed	31
Recognise the indicator grasses	34
identifying important species	35
What is the condition of your grazing? .	41
Further reading	42

Contributors

The information in this book comes from many sources, ranging from research and extension staff of the Department of Primary Industries to local graziers through the Local Consensus Data program.

The following have contributed information, ideas and comments:

Col Paton, David Orr, David Burrows, Ken Day, Greg Robbins, Greg McKeon, all now or formerly working at the DPI Brian Pastures Research Station, Gayndah.

Bill Burrows and Richard Clark, now at the Tropical Beef Centre, Rockhampton.

Damien O'Sullivan, Jim Wright, George Malcolmson, Ian Crosthwaite, Phil Anning and John Day, from various DPI Extension services at Monto, Bundaberg, Ipswich, Kingaroy, Bowen and Mundubbera.

Dick Jones and Cam McDonald of CSIRO Division of Tropical Crops and Pastures, Brisbane.

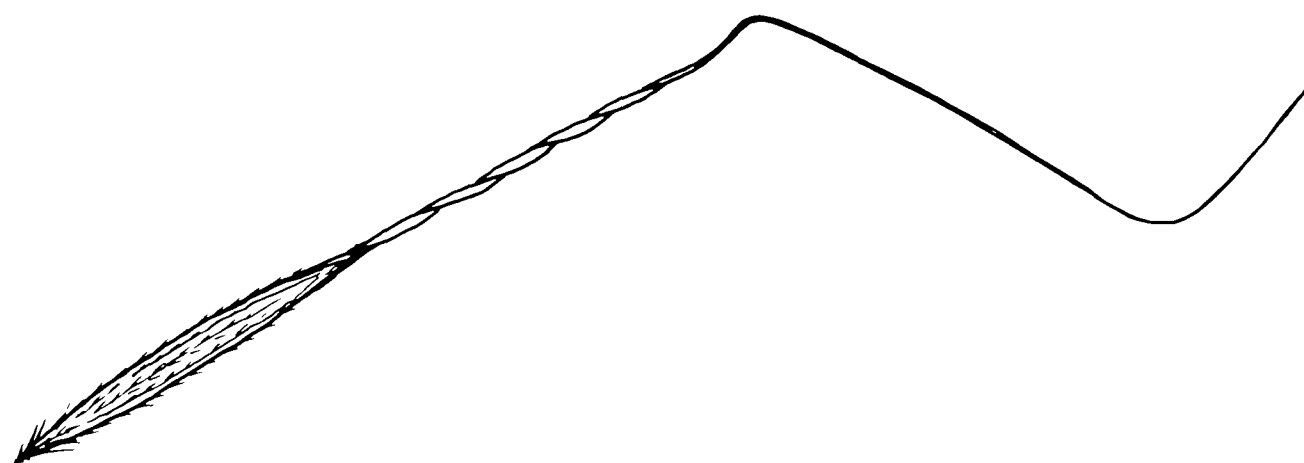
Richard Silcock of DPI Toowoomba.

Karen Forge and Malcolm Letts of DPI Land Management Division, Indooroopilly.

I also wish to thank the following for permission to include their photographs and artwork:

Col Paton, Eric Anderson, Mick Quirk, David Burrows, Greg Robbins, Tony Pressland, Vicky-Lee Hansen, Jeff Clewett, DPI Land Management Division, and Gordon Burrige.

Other photography by the author.



Preface

Successful graziers are successful because of their capabilities in managing their livestock. Sales from these animals provide the money for the needs of the family and for future development of the property.

These livestock will spend most or all of their lives eating native pastures. 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 stress—some of it has even been degraded too far to be recovered 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.

Overgrazing may have arisen for a good technical reason, for example, following the introduction of breeds of cattle better able to survive periods of feed shortage, and aided by supplements and introduced legumes, or sometimes because of economic pressures on properties with a marginal living area—and in a few cases because of deliberate management decisions.

In some cases, short-term profit has appeared more important than the future or, more generally, grazing managers did not have the knowledge to understand what was happening to the pastures.

The federal and state governments regard protection and maintenance of our natural resources as one of their more important functions. 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:

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

Managing speargrass —in a nutshell

There can be no fixed recipes for managing speargrass; rather you need:

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

This book gives guidelines for:

- tree management
- altering the stocking rate
- moving stock
- burning
- adding legumes

The guidelines for speargrass pastures can be summarised in just a few words—

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
 - re-establish from new seedlings
 - compete against weeds
 - accumulate crown reserves
- killed many woody weed seedlings
- kept woody weed saplings under control.

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
- improved average calving rates
- minimised the need for winter supplementary feeding
- minimised the need for drought feeding.

If you feel you have to stock more heavily and cannot burn regularly, remember that you will be increasing the chances of degrading your basic asset—the native pasture—, and you will most likely have to pay for:

- more chemical or mechanical control of woody weeds
- more supplements in winter and droughts
- more pasture improvement and fertiliser.

Introduction

The aim—production with care

Good grazing management aims to achieve a level of production that can be maintained over decades. The condition of the pasture must not be allowed to deteriorate because of invasion by woody or other weeds, loss of productive species or soil erosion.

A recent survey of the southern speargrass region suggests that less than a quarter of the area is in top condition. Although plenty of pasture on the less productive soils has deteriorated, much of it can still be restored by suitable management practices—and some rainfall.

No fixed recipes

Managing native pastures needs a little effort; it is not always as simple as it looks. Rainfall varies from droughts to floods, beef herds take years to build up, and costs have to be kept low for this type of country. Major changes in the pasture occur slowly, and may be difficult to identify. There can be no fixed recipes for managing native pastures, unlike crops or intensive sown pastures.

You need to

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

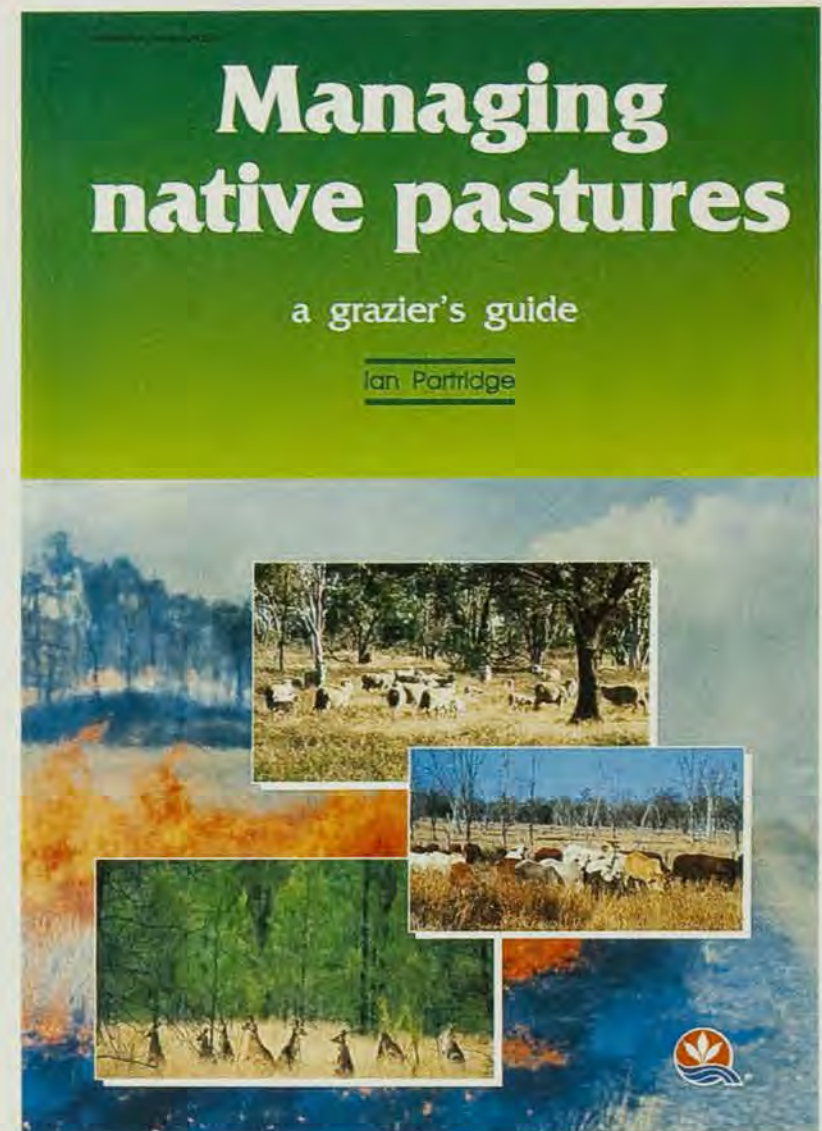
The ecology. The basic principles of native pasture ecology have been described in the DPI publication *Managing native pastures: a graziers guide*.

Monitoring. Methods of monitoring are described in a companion DPI publication – GRASS Check. This book helps you to identify important species found in your pastures.

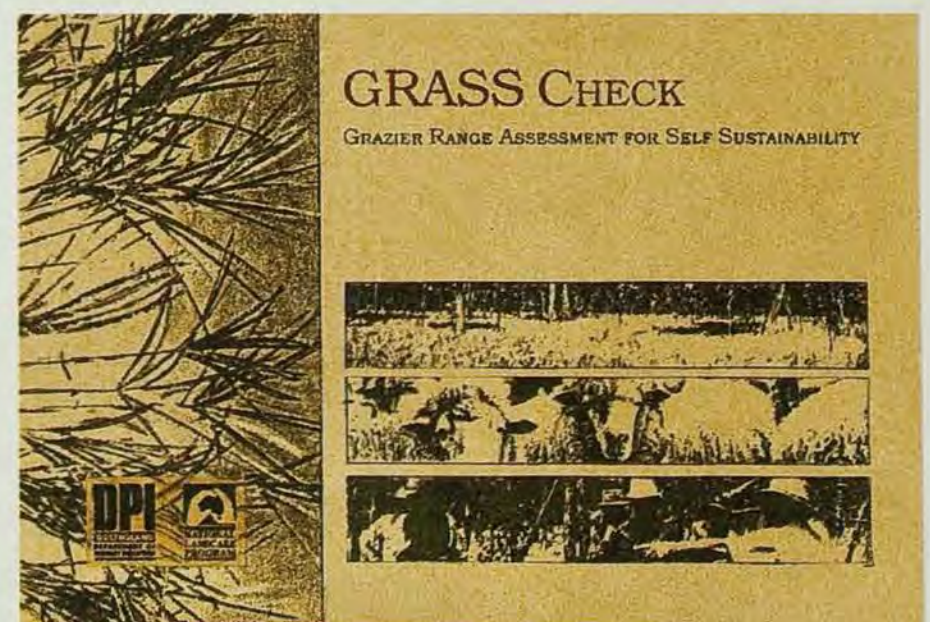
Guidelines. This book provides guidelines for managing speargrass in the southern region.

You probably already know many of the individual guide-lines, but we try to help you understand the reasons for them, and to bring them together so that you may be able to devise a suitable grazing management strategy for your property.

We hope that this book will further stimulate your interest in the herbage side of grazing, so that you will give your native pastures the same care as you give your livestock.



▲ describes the principles of grazing management and ecology.



▲ describes how to monitor pastures.

Speargrass – black speargrass

Black speargrass (*Heteropogon contortus*) provides the most extensive grazing resource in Queensland. It covers a broad belt of medium to low rainfall (1200–700 mm) country from Cooktown in the north to the New South Wales border, a total area of 25 million hectares.

Most of this grass community is under woodland and open forest of eucalypts, growing mainly on infertile duplex soils (sand over clay) and earths. Many other grasses are found within the speargrass community, and these may indicate the local fertility of the soil or past grazing management.

Speargrass was not always the predominant species in this region. When the country was first settled by European graziers in the 1840s, kangaroo grass (*Themeda triandra*) was the main species, but, within 20 years of grazing by sheep and cattle, speargrass had started to take over.



▲ Kangaroo grass remains where grazing pressure is low—roadstides and hillstides.



▲ Wire grass or blue couch can invade heavily grazed speargrass.

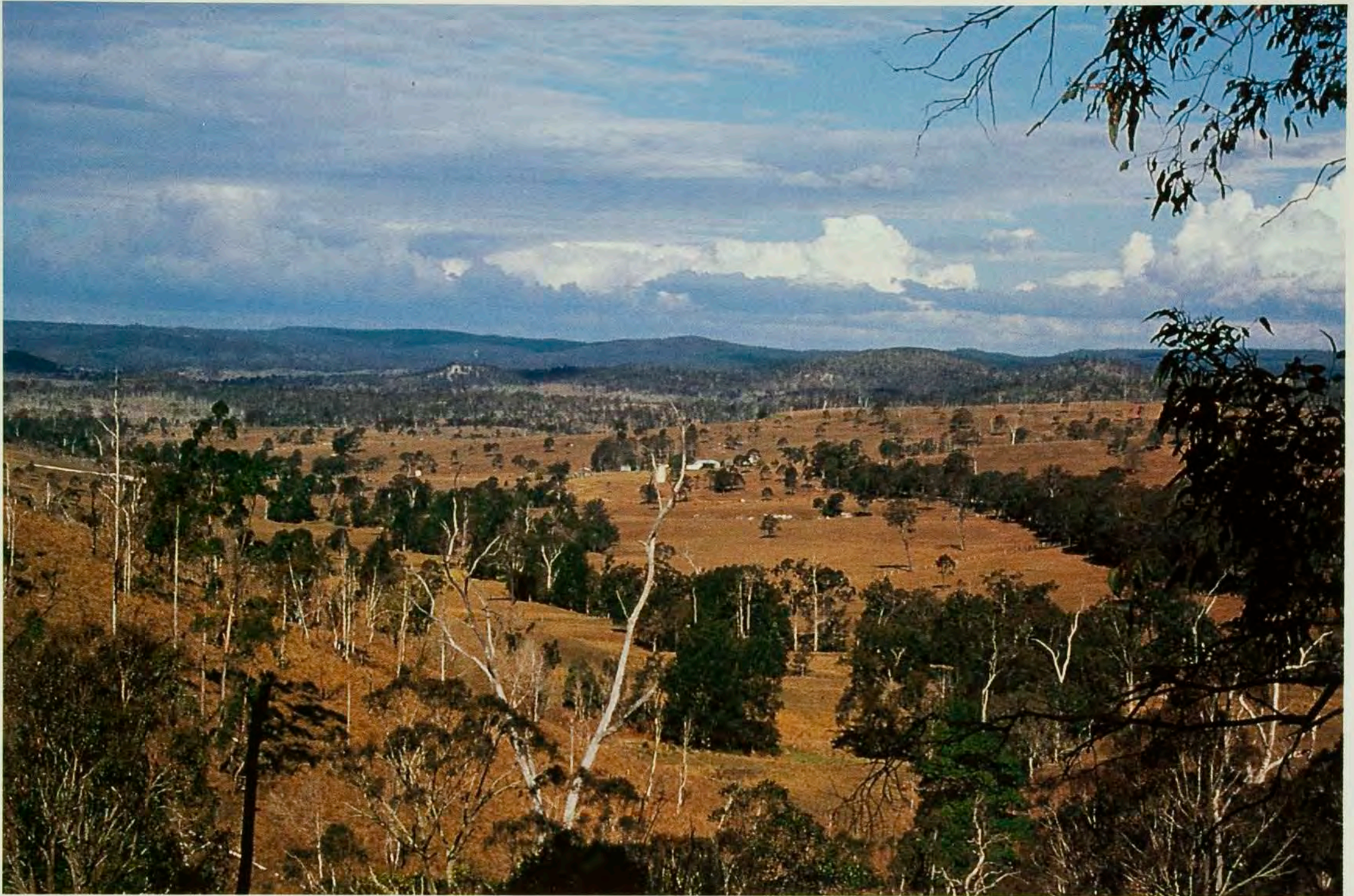
Why kangaroo grass was speared

When winter ends with the first showers and storms, kangaroo grass is often the first grass to shoot, being fairly tolerant of the cold. The shoots emerge together because the buds of the tillers of this grass emerge simultaneously; the erect new leaves are easily bitten off leaving little green leaf to use sunlight.

All that is needed to put kangaroo grass pastures at risk is a few years of heavy grazing of the new growth, as may occur with a combination of dry winters and spring rains without any follow-up. This pattern of rainfall occurred in 1876 and from 1882 to 1885 in southern Queensland.

Speargrass is better able to tolerate these conditions of rainfall and stocking because it shoots later in spring and its buds emerge progressively. The more prostrate tillers of speargrass can keep on photosynthesising even under heavy grazing.

Now, under continual heavy grazing, speargrass itself is being replaced—in some inland areas by useless species such as wiregrass (*Aristida* spp.), in other areas, by useful creeping grasses such as Indian bluegrass (*Bothriochloa pertusa*) or Queensland blue couch (*Digitaria didactyla*).



▲ Mixture of land management types on typical speargrass country.

Northern and southern speargrass

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

The most important difference in grazing management is concerned with the need to clear the eucalypt woodlands for satisfactory grass growth. Based on the need to clear, 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 southern region which we have designated as lying from the New South Wales border (Boonah Shire) to the Shires of Mirani and Proserpine.

Rainfall

Annual rainfall varies from 1200 mm near the coast to about 700 mm inland, and is typically highly variable. Winter rain, and hence the proportion of winter herbage growth, decreases from south to north.

Droughts are a normal, if irregular, part of the weather.

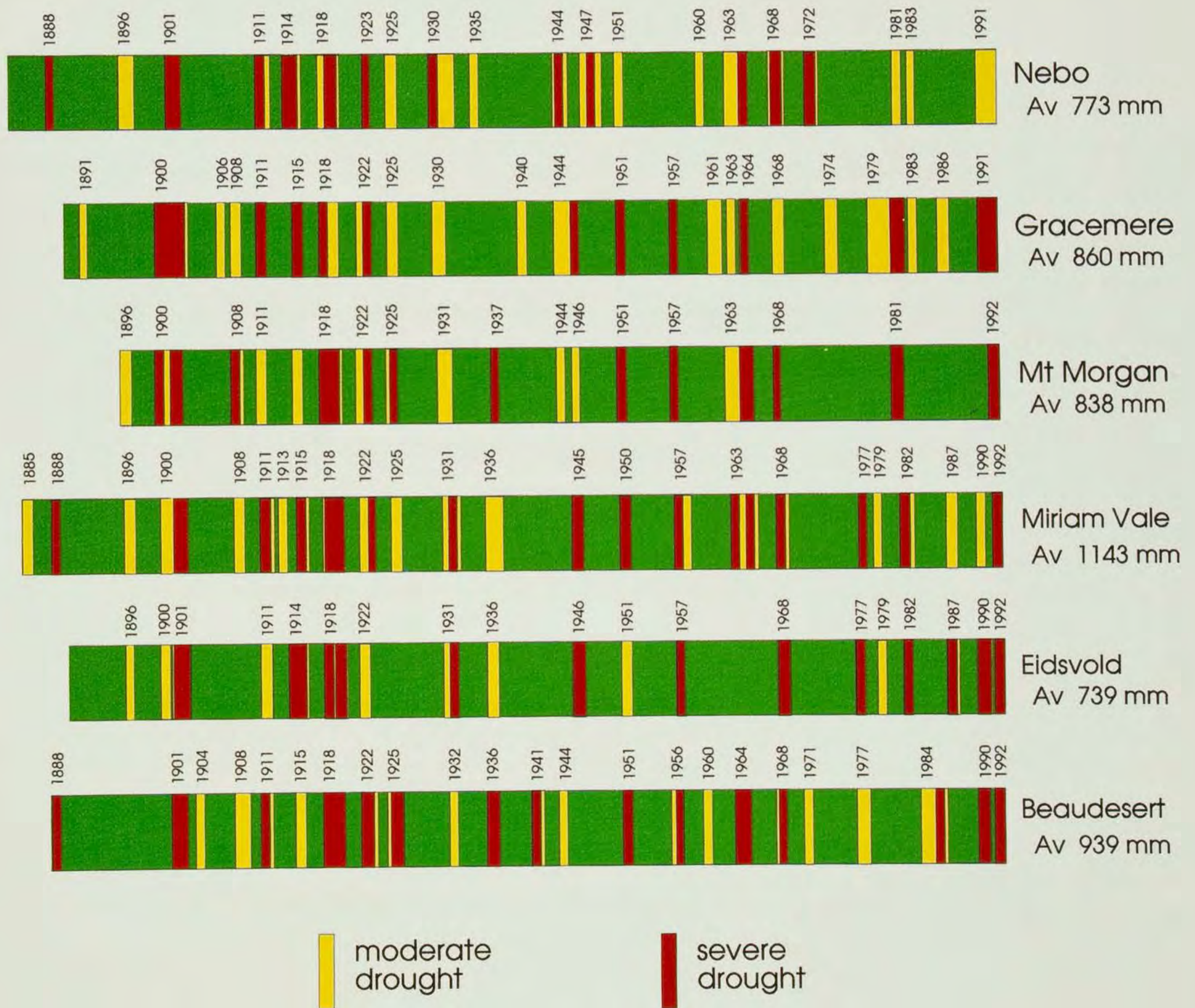


▲ In the southern region, eucalypt woodland has to be cleared for satisfactory grass growth.

Droughts

Droughts are a normal part of the weather. They are defined here as severe rainfall deficiencies over a period of at least 12 months. A severe drought has less rainfall than that received in the driest 5% of calendar years—at that location; a moderate drought receives rainfall between the driest 5% and driest 10% of calendar years.

The occurrence of moderate and severe droughts at several locations is shown below. While droughts have not occurred at regular intervals, they are going to keep on occurring in the future, and must be planned for as a normal part of property and pasture management.



▲ Occurrence of droughts over the past 100 years at selected locations.

Property management planning



▲ Map your resources.



▲ Map your developments.

'My property plan is something I'm always scribbling on. I keep a copy of it, a small one, behind the seat of the Toyota and pull it out all the time to refer to it'

What is property management planning?

Property Management Planning (PMP) helps you develop a clear plan for the future by pulling together information on all your resources—land types, vegetation, grazing, livestock, labour and finances. PMP workshops are held to explain the process.

How do I develop a property plan?

PMP starts with a property plan and this includes mapping, usually on an aerial photograph, your physical resources—different land management types and present farm infrastructure.

The next step is to map future developments, making sure they are suitable for the land types and that proposed permanent changes integrate with all other paddocks. This may prevent mistakes that are costly to both yourself and to the land.

The maps allow you to measure paddock areas more precisely, and thus determine stocking rates, or the costs of new fencing or pasture seed, more accurately. Planning can improve your productivity by making the property easier to work and manage.

Land management types

Most properties are made up of different classes of land, differentiated by the eucalypt species growing. If these land types need different management, they should be separated by fencing.

Cattle often graze different parts of the landscape at different times of the day or in different seasons, and will gain most weight when allowed to do so.



▲ Blue gum flats

Blue gum flats

(*Eucalyptus tereticornis*)

– the old 'bullock' paddocks, now preferably called the 'finishing' paddocks.

Land use: finishing steers, fodder or cash cropping.

Blue gum flats often carry more forest bluegrass and paspalum than speargrass. Although the natural pasture is of good quality, the flats are often cultivated and sown with improved grasses and legumes or with fodder crops.

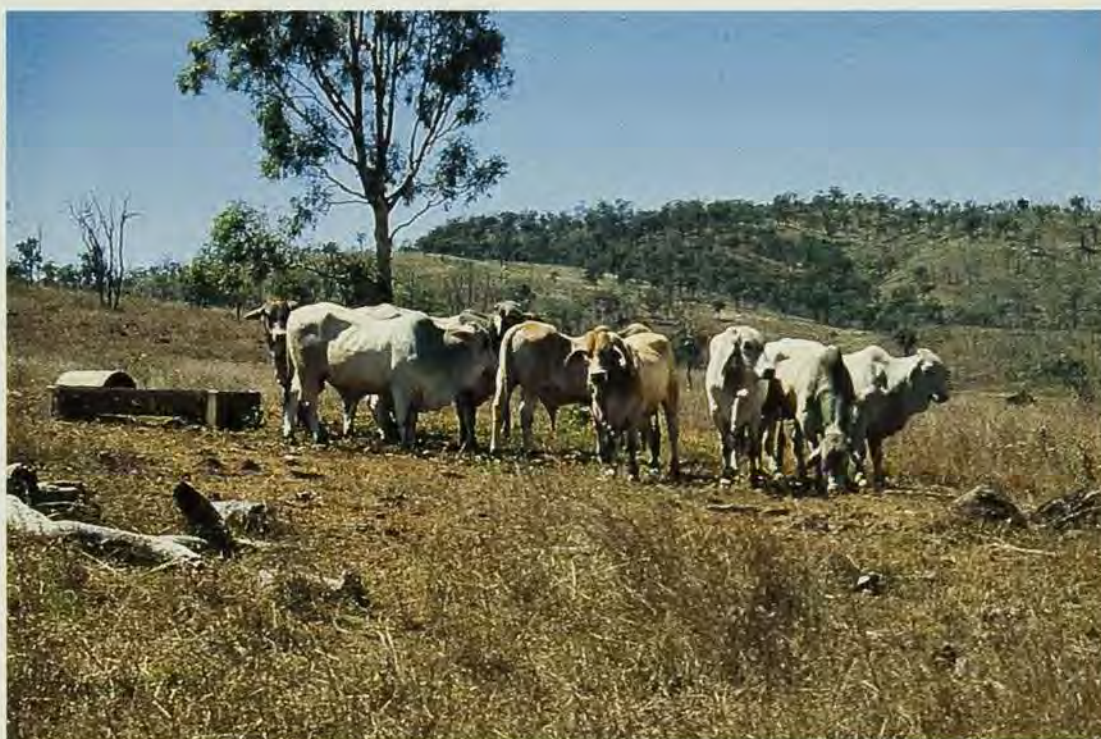
**Silver-leaved ironbark slopes
(*Eucalyptus melanophloia*)**

Land use: breeding and finishing; pasture improvement with legumes.

Silver-leaved ironbark is more common inland than in coastal regions. It indicates deeper loam and duplex soils, and the speargrass pastures often carry a high proportion of forest bluegrass where the soils are clays.



Silver-leaved ironbark slopes ▶



**Narrow-leaved ironbark slopes
(*Eucalyptus crebra*)**

Land use: breeding and growing; pasture improvement with legumes; farm timber.

Narrow-leaved ironbarks, often with Moreton Bay ash (*E. tessellaris*), grow on more shallow duplex soils and stony loams. Pasture on this land is more susceptible to change under heavy grazing pressure.

◀ *Narrow-leaved ironbark slopes*

**Spotted gum ridges
(*Eucalyptus maculata*)**

Land use: sawn timber and poles; cattle breeding and growing; drought reserve.

Spotted gum, and lemon-scented gum (*E. citriodora*) grow on poor duplex and thin stony soils. Grass cover is often sparse; speargrass being found with kangaroo grass and coarser species such as barb-wire grass (*Cymbopogon refractus*), wiregrass and pitted bluegrass.

In coastal districts, spotted gum country with duplex soils can be developed to reasonably productive grazing; in inland districts, spotted gum usually grows on thin stony soils better left uncleared and for timber production.



▲ *Spotted gum ridges*

Management guidelines

The options for managing speargrass are limited. They are:

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

Clearing or thinning trees

All speargrass pastures once carried an open forest of eucalypts, and the land is trying to revert to woodland.

Mature or regrowing trees compete strongly with the grass for water and markedly reduce productivity; the effect becomes more pronounced in drier inland areas.

While stock carrying capacity may be doubled by killing the trees, this does not mean that all trees should be removed; some areas should never be cleared.

What are the guidelines for clearing trees?

Some areas should never be cleared—

too steep	erodible soils
potential salting	useful timber
bad understorey regrowth	scenic value
wildlife haven	your private nature reserve

- On the land to be developed, keep 10–20% of the original tree population in strips 100 metres or more wide. The strips should connect the water courses and areas of retained timber, both on your land, and neighbouring land.
- Do not clear slopes greater than 20%. (In NSW, it is an offence to clear land steeper than 30%)
- Make sure shade clumps are at least 3 ha in area.
- Do not clear within three times the height of the main trees along permanent water courses (those able to hold waterholes); steeper and narrower gullies are often better cleared and grassed to encourage ground cover.
- Check any legislation before you start.

Remember that in the next few decades, sawmill timber is going to become much more valuable than it is now. DPI Forestry Extension Officers can advise on strategies for producing timber and on harvesting options.



▲ *Don't clear steep land.*



▲ *Keep shade clumps at least 3 ha in area.*

Thin the stand or clear the lot?

We recommend alternating uncleared forest and cleared grassland on the area to be grazed. The 'savanna' of scattered trees may look scenic, but you need only 5 mature trees per hectare to reinfest the whole area with seed. The large trees left standing are often old and prone to attack by disease and insects. If they die within one or two decades, there may be no younger trees to replace them.

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



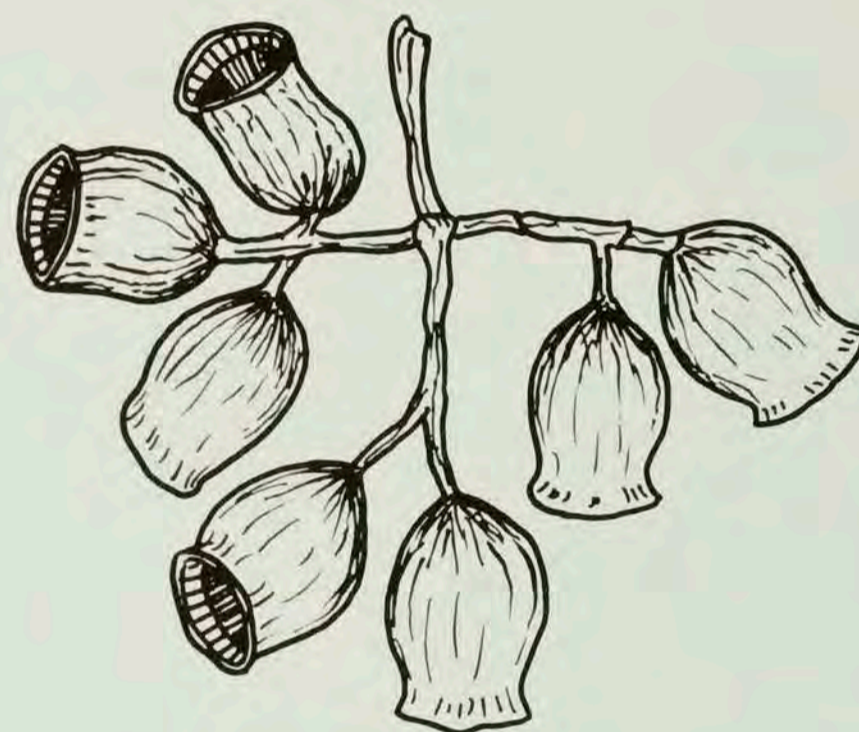
▲ Thinning looks good but may perpetuate the regrowth problem.

How long do eucalypt seeds last in the soil?

A single tree can drop about 40,000 seeds each year. Most of the seed is soon picked up by insects, birds and small mammals, and the rest usually loses viability within a year under conditions of reasonable rainfall. So after the first year following total clearing, most regrowth will be from missed seedlings, suckers and ligno-tubers.

Every 10 to 20 years, ideal rainfall conditions following a burn or disturbance can result in a mass germination of eucalypt seed over wide areas, mostly from new seed.

Wattle seeds have a hard impermeable coat and can last for years in the soil.



▲ Seed capsules of Moreton Bay ash, a bad species for seedling regeneration.

Do spaced trees provide any benefit?

Animal production may be slightly higher under a light canopy in higher rainfall districts where there is less competition for water. The shaded grass is more digestible, the grass may be protected from light frosts in winter, and the grazing stock may suffer less heat stress in summer.

Some plant nutrients may be cycled from greater soil depth, but their overall effect on pasture growth is minimal. Growing, then killing a dense stand of wattles would probably release more plant nutrients, but this is hardly a desirable management option!

What about regrowth?

Control of regrowth can be the largest single expense on a beef property. As a rough rule of thumb, chemical or mechanical control of regrowth is going to cost you \$5 per hectare per year, whether you do it at intervals of 5, 10 or 20 years. And trees do not stop growing through droughts or beef price slumps.

The eucalypts on the better country may have already



▲ Control of regrowth is a constant expense.



- ▲ *By the time you recognise a woody weed problem, it's already too late.*



- ▲ *Tree seedling on left controlled by fire, seedling on right keeps growing.*



- ▲ *Lignotubers make some eucalypts resistant to fire.*

been thinned at some time, ring-barked earlier in the century, or stem injected with Tordon in the past 25 years. However, almost half the total population of eucalypts in a natural woodland are saplings under 1½ metres high, and these are usually missed during treatment.

By the time you recognise a woody weed problem, it's already too late.

Local eucalypts take about 20 years to grow into mature trees and there have often been cycles of treatment at this interval.

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.

If you pull a stand of mature trees, you can end up with 40% more woody plants than before; if you follow the pulling with a good fire, you can end with 20% fewer

Burning should become the basis for managing your grazing.

Control doesn't always mean kill

When football officials control a crowd, they keep it manageable—it doesn't mean they kill all the fans.

Similarly controlling woody regrowth means keeping it manageable so that you can still grow good grass and graze cattle productively. There are ways of dealing with the problem permanently with chemicals, but this is usually a more expensive option.

Are some species more resistant to fire?

Species with thick insulating bark—iron barks, corkwood wattle—and those with lignotubers—bloodwoods—escape the worst effects of fire. Species with thin bark, like most wattles, are susceptible, but they compensate by setting masses of hard seeds.

What are the other methods?

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. Burnt saplings, especially those that produce ligno-tubers, may sprout again from the base.

Dry years favour trees, wet years favour grass. If

regrowth gets away from you, the young trees and shrubs will have to be killed some other way.

The DPI decision support program *Woody Weed Adviser* can help you to decide the best and most practical methods for controlling various woody weeds.

Stem injection (with herbicide e.g. Tordon TCH, in water) is possible only when the stems are large.

Cut stump treatment (with herbicide in water) works well if the mixture is applied immediately after cutting.

Splatter gun (using herbicide like glyphosate in water) works well with young regrowth.

Overall spraying e.g. with Grazon DS in water can be effective with many seedlings, although hoses to hand-held spray guns can get caught round stems.

Basal-bark spraying (from ground level to 30 cm up the stem) with 1% herbicide ester in distillate usually works well on wattles, but the cost for labour and distillate is high.

Repulling with a light chain can be cheap and fast—if there are no standing trees—but misses seedlings. Good for the eye, not for the pocket.

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

And if the regrowth has become tall trees?

Stem injection with Tordon has been the most common and effective method in speargrass country, and works well on the eucalypts and most wattles. Tordon must be applied correctly and while the trees are growing actively—not during a very dry winter or a drought.

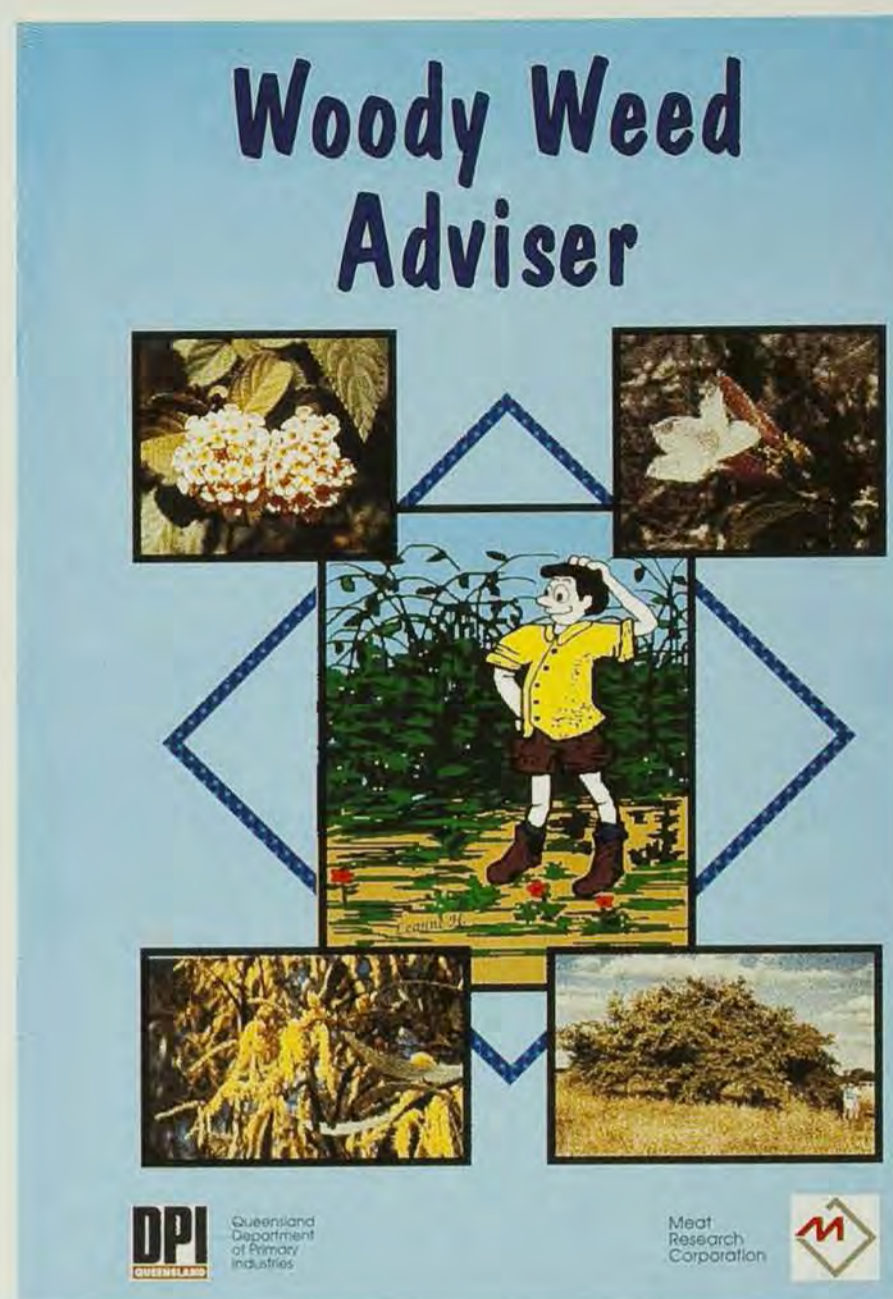
But Tordon gangs usually miss the small understorey saplings, and when the mature trees die, these take off—unless controlled by fire.

Pulling can be effective on large areas *if* the soil is moist, *if* the tree species do not have ligno-tubers, *if* the understorey of eucalypts and wattles is minimal, or *if* the pulling is followed fire or by raking and cultivation to plant fully improved pastures.

How soon can I graze after treating the trees?

Grass under the trees will start to grow as soon as the dying trees stop using water.

Do not try to recover the costs of treatment quickly by stocking 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.



▲ Advice on best methods of control for 65 woody species.

Whenever you use chemicals, read the label first



▲ Stem injection with Tordon has been the usual method of killing large trees.

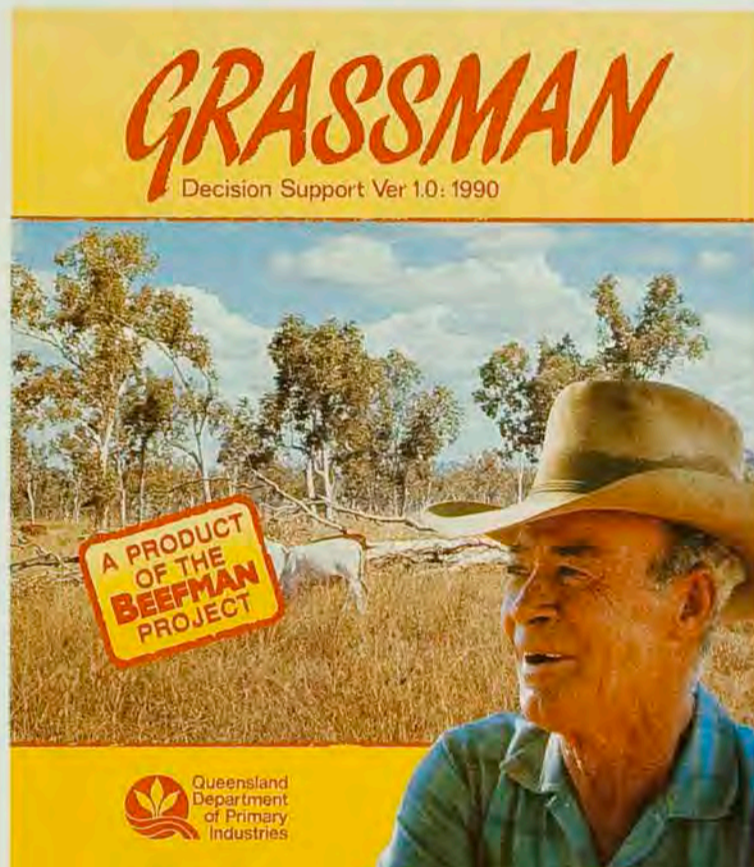
How can I compare management options for controlling regrowth?

You can use local experience, or you can use a decision support computer program to look at highly complex interactions.

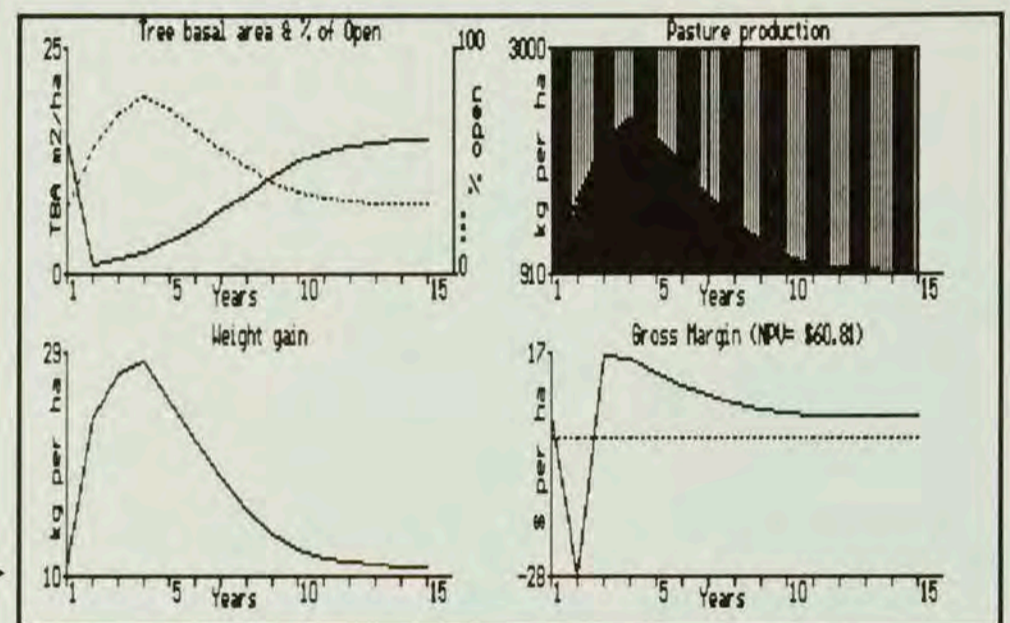
There are so many combinations of stocking rate, tree type and density, wet years, dry years, timber treatment and cost that they cannot be presented in bookform. By using DPI's GRASSMAN: a computer program for managing native pastures in eucalypt woodlands, you can run dozens of 'What if?' questions for your paddock in a few minutes.

You can check the effect of heavy stocking on your ability to burn in wet or dry years, see how quickly woody weeds regrow, check which is the most effective control method, and see what these mean to your profitability over a fifteen year period.

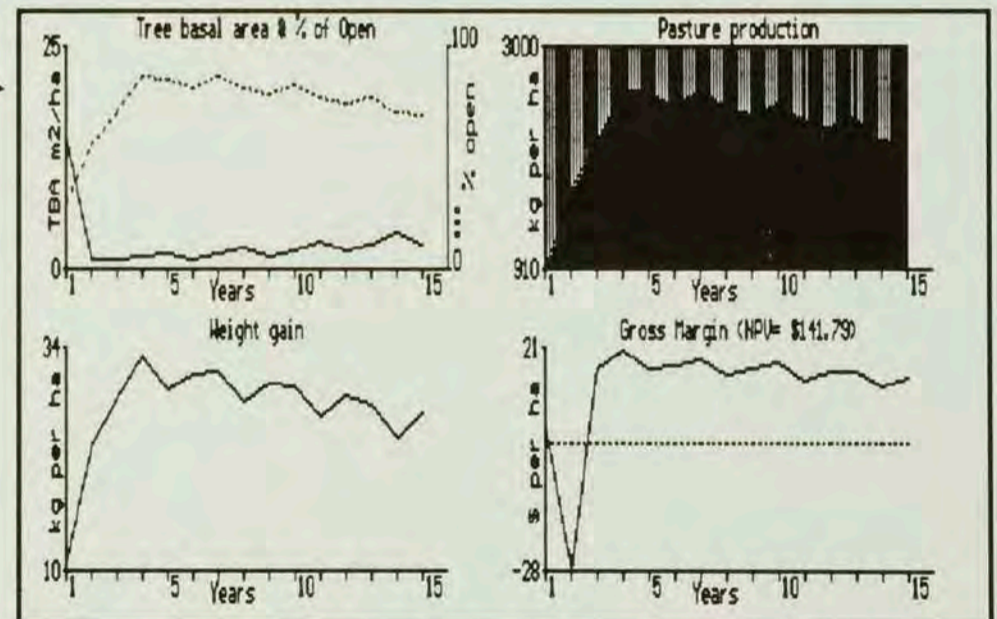
The three images below, taken directly from the GRASSMAN screen, are used to illustrate how fire and heavy grazing can affect woody regrowth, pasture growth, steer weight gains and financial returns after a stand of narrow-leaved ironbark was cleared by stem injection.



1 'What if I...?' ▶



2 'What if I burn regularly?' ▶

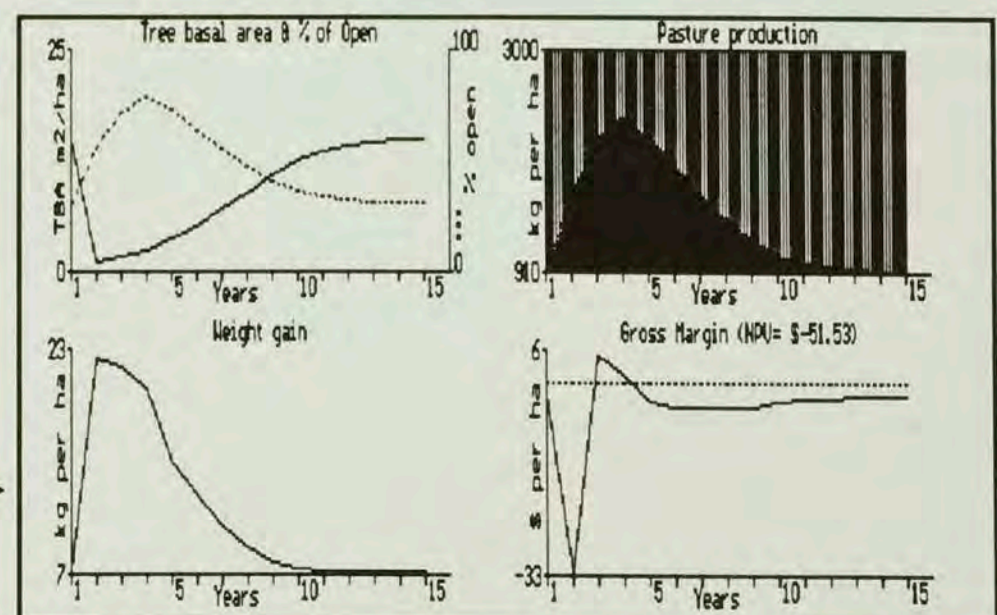


1. ...stem inject trees in second year, graze lightly (eating 30% of summer grass growth), but don't burn—woody regrowth takes over by year 10. Gross margin: \$ 61/ha

2. As for 1, but with a fire every third year—regrowth is kept under control, pasture stays productive. Gross margin: \$ 142/ha

3. As for 2, but with heavy grazing (using 50% of summer grass growth)—restricted feed so cattle put on less weight, no fuel for fires so woody regrowth takes over. Gross margin: \$ -51/ha

3 'What if I put in more stock?' ▶



Altering stocking rates

Stocking rate (the number of hectares per beast) is the major factor in grazing management, whether the grazing is under trees or on fully cleared land. Stocking rate has the over-riding effect on pasture stability and animal production.

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

Heavy stocking weakens the valuable species, encourages undesirable grasses and forbs, exposes the soil surface to erosion, prevents fires so allowing woody regrowth to take over, and produces lighter cattle.

Much of the deterioration seen in pasture land can be attributed to over-stocking.

Picky eating gives faster growth

Cattle do not naturally eat like lawn mowers chopping off all the herbage; they carefully select a diet of parts of plants that are palatable, green, and digestible.

When heavily stocked cattle are forced to eat more of the herbage, the quality of their diet is reduced, and their performance is lowered.

What happens when the pasture is over-stocked?

When speargrass is overstocked, its tussocks become smaller as the crown reserves and number of buds are reduced, and other grasses increase. If these are less palatable and are not eaten, they compete for more of the soil moisture. Cattle seek out the remaining speargrass plants, putting even more pressure on them.

The stocking rates at which speargrass starts to decline will naturally depend on the local rainfall and type of country.

On narrow-leaved ironbark country in drier inland districts, speargrass declines fairly quickly when the stocking rate is over 1 beast per 4 hectares. It is usually replaced by wiregrasses and pitted blue.

In the south of the region, speargrass is often replaced by Queensland blue couch, especially on the lighter soils. This occurs when the stocking rate exceeds a beast per 2 hectares with the higher rainfall in the Wide Bay–Burnett region, or a beast per 3 hectares in the drier Brisbane Valley.



▲ The number of stock in the paddock has the over-riding effect on pasture stability.



▲ Dense stands of wiregrass following heavy grazing and no fires.

Many of the indicator species which increase, decrease or invade when stocking rates become too high are illustrated later in this booklet.

How good is blue couch?

Queensland blue couch is palatable, has a high proportion of digestible leaf and, being a creeping species, provides much better ground cover against erosion or weed invasion than wiregrass or pitted blue grass.

While blue couch is a good type of grass for lawns, it can also provide valuable grazing for steer production in higher rainfall areas. However animals rarely fatten quickly on blue couch, partly because of the high stocking rates but also because they find it difficult to bite off a full mouthful. In the Moreton, steers on blue couch put on 10–20% less weight than those on good speargrass pasture.

The greatest failing of Queensland blue couch is in dry or frost-prone areas; the leaves shatter and provide no standing roughage to hold stock until the next rain. The paddock carries no more leaf than a frosted lawn in winter. Woody weed regrowth can become a problem because there is insufficient fuel to carry a good fire.

Indian couch behaves in much the same way in the north. Its virtues and failings are described in *Managing northern speargrass*.

When is speargrass most affected by grazing?

Speargrass is most susceptible to overgrazing just after the first showers at the end of the winter, or after a drought. Grazing a grass heavily early in the season, when it is starting to grow from its crown reserves, will weaken it.

Poor ground cover at the start of the wet season leaves the soil open to intense storm rains and the risk of erosion. The soil needs a cover of about 40% and 500–1000 kg of dry matter per hectare for good protection.

Burning and then grazing heavily will weaken speargrass.

What is the right stocking rate?

It is not easy for a grazier going to a new area to *calculate* stocking rates, but they have been determined by long-term local experience. Groups of local graziers have been asked what they consider to be the most suitable sustainable stocking rate for each land type. These 'Local Consensus Data' (LCD) stocking rates agree with scientific calculations based on soil type, rainfall and safe levels of utilisation of the pasture growth. (See box on page 16.)



▲ Blue couch can give good grazing in the wet; bare boards in the dry.



▲ Give speargrass a chance to recover before grazing.

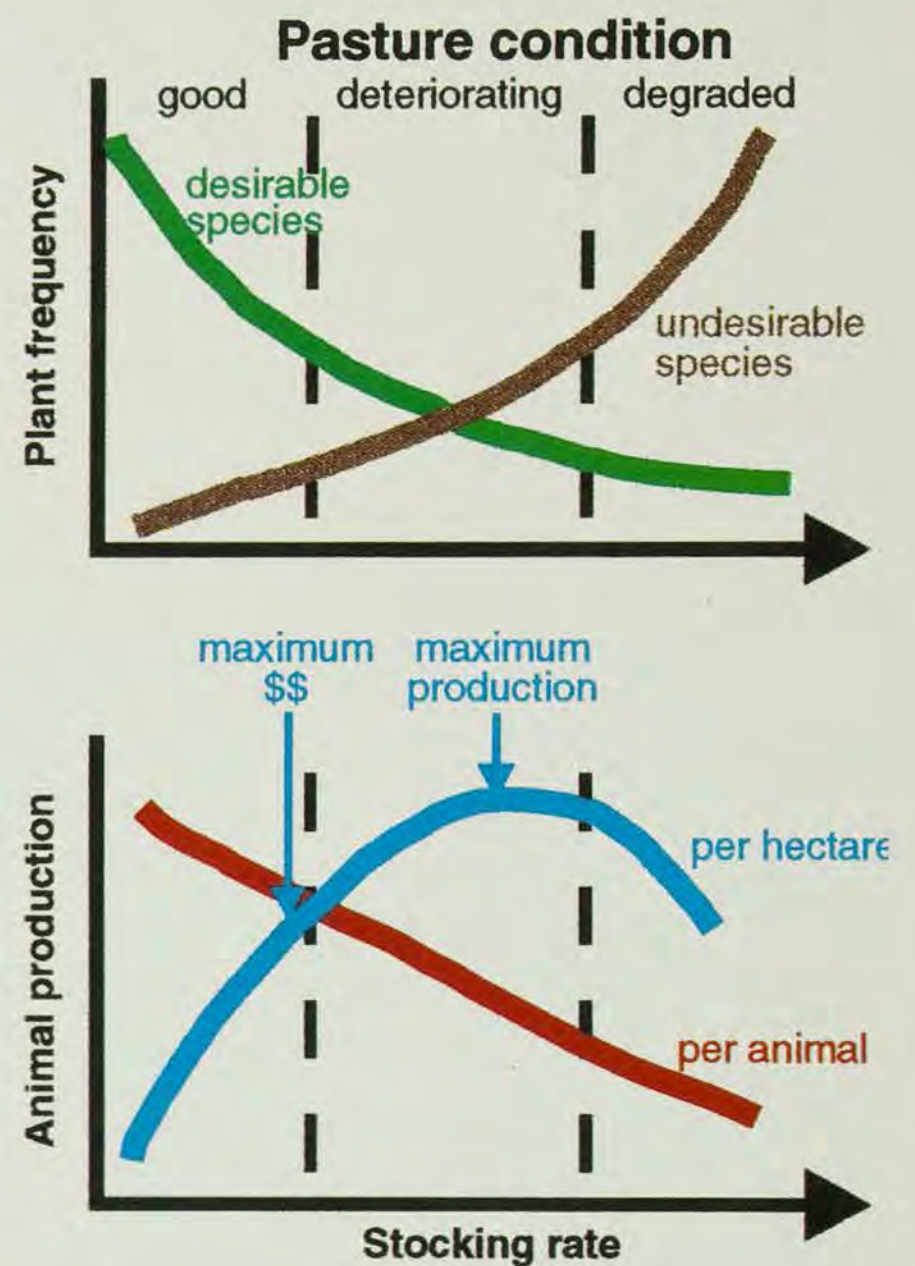
Is this stocking rate right for my paddock?

The LCD recommended stocking rates are fairly broad; they may range from 3 to 5 hectares for a beast within a land type. You can refine this by monitoring your pasture each year.

You can check how much feed is left over at the end of summer to calculate a safe stocking rate, and you can check the botanical composition of the species to see whether the condition of the pasture is improving or deteriorating. Remember that high or low rainfall causes year to year changes in pasture composition, but genuine changes may take several years to become apparent.

Guide to recommended sustainable stocking rates for native pastures (1 Animal equivalent (AE)=400–450 kg steer)

Land management type	stocking rate ha/AE	steer growth rates kg/head/yr
Blue gum flat native pasture (cleared) fully sown pasture	3–4 2–3	150–180 180–200
Silver-leaved ironbark untreated thinned thinned + legume	8–10 3–5 3–5	110–130 110–130 150–160
Narrow-leaved ironbark untreated thinned thinned + legume	10–12 3–5 3–5	100–120 100–130 150–160
Spotted gum ridge untreated thinned thinned + legume	10–20 3–5 3–5	90–120 100–130 130–150



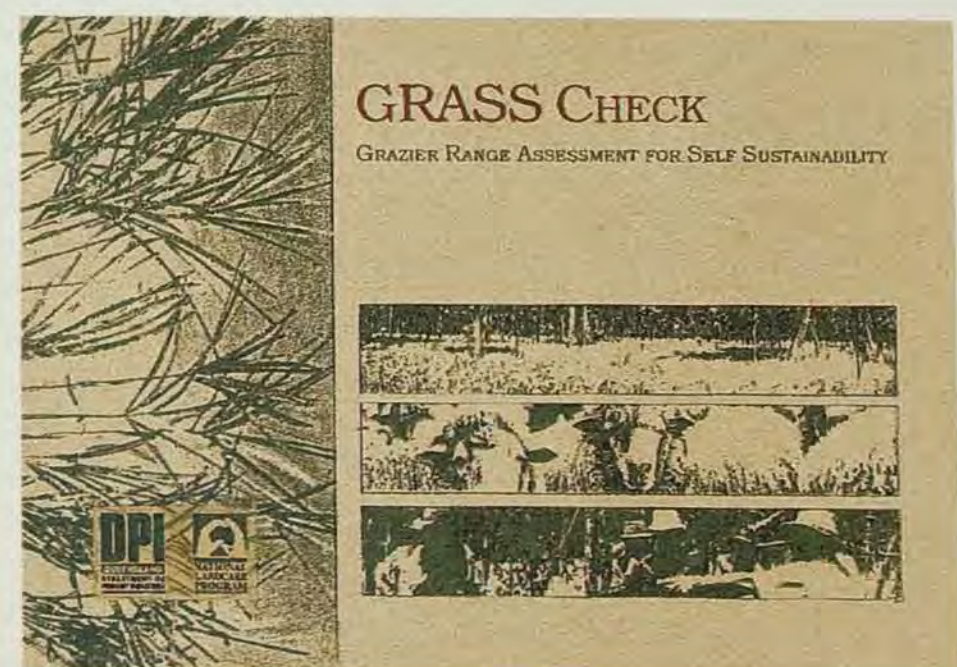
What is the best way to monitor pastures?

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

Memories are short and selective.

The various methods that can be used are described simply in a companion DPI booklet – GRASS Check.

[Many agriculture-class students in secondary schools are learning the same techniques for monitoring native pastures in their Pasture Watch program and may appreciate a chance to make practical use of their new found skills.]



Calculating safe long-term stocking rates the scientific way

Rainfall has the main effect on grass growth. Speargrass grows 3–8 kg of herbage/ha for every millimetre of rainfall, depending on the depth and fertility of the soil. You can calculate this Rainfall Use Efficiency (RUE) for your land type:

1. **Estimate the summer growth of grass** as – the feed standing in the paddock in May plus the feed eaten by the stock over summer. Assume that any carry-over feed at beginning of summer is lost through trampling. (Summer is 6 months – 182 days from November 1 to April 30; a mature animal eats about 10 kg of dry feed/day in summer.)

Example:

There is a stand of 2000 kg/ha of dry herbage in the paddock in May.

Each animal (stocked at 1 Animal Equivalent on 5½ ha or 0.18 AE/ha) eats 10 kg of grass (dry matter) a day, for 182 days, thus

Feed eaten/ha during past summer = $0.18 \times 10 \times 182 = 328$ kg

Total grass grown/ha = $2000 + 328 = 2328$ kg

2. **Calculate the Rainfall Use Efficiency** for this land type by dividing the grass total by the rainfall during the past summer (655 mm).

Grass Rainfall Use Efficiency = $2328 \div 655 = 3.6$

3. **Calculate average grass growth.** Use your grass RUE and average summer rainfall to calculate the growth of grass in an average summer.

If your average summer rainfall is 550 mm,

Grass growing in average summer = RUE x av. summer rain
= $3.6 \times 550 = 2013$ kg

4. **Calculate expected grass growth.** Summers are hardly ever average! You need to know how much grass is likely in 7–8 years in 10. Scientists have calculated that this is about half the growth that expected in an average year.

Grass expected in 7–8 years in 10 = $2013 \div 2 = 1006$ kg

4. **Calculate a long-term safe stocking rate.** Stock can eat only 30% of the grass growing over summer without starting to cause degradation,

Grass available for stock = 30% of 1006 = 302 kg

Since an Adult Equivalent can eat 1820 kg over summer (10 kg/day for 182 days), divide the need by the feed

Safe stocking rate (ha/AE) = $1820 \div 302 = 6.0$ ha

This base stocking rate is safe for all but the two drought years in ten. In a good season, extra stock could be brought in, but preferably the paddock should be spelled to allow the pasture to recover from the previous drought or for a fire to control woody regrowth.

This Rainfall Use Efficiency takes into account the effect of the existing trees in the paddock; it will decrease if regrowth is increasing or increase if you kill the trees. Your RUE may improve with time as the condition of your pasture improves under more lenient stocking.

The DPI program RAINMAN can show you the long-term average summer rainfall for your district if your own records are only recent.

How can I calculate a stocking rate for the winter period?

You can estimate how many stock you can carry from the existing standing feed and how much you want to have in spring as follows:

- estimate the amount of feed standing in the paddock at the end of summer (April–May), either by comparing with the photo-standards shown in this book, or by more direct measurement. (If you have plenty of feed, the chances are that your present stocking rate will be right for winter.)
- determine how much herbage you want to remain in spring. The minimum ground cover for protection against erosion from spring storms is about 750 kg/ha, but you would need about 1500 kg/ha for good burn to control woody weeds.

Leave enough roughage for ground cover or for a fire in spring.

- subtract the desired spring weight of plant material from the existing autumn weight to work out how much *feed* you can use.
- calculate the *need* for an animal of the relevant type and age over winter (5kg/day/AE) from the table in GRASS Check (feed consumption in winter may be half that in summer because quality is so low). Cattle will trample an equivalent amount but this material will still provide ground cover.
- calculate how many stock you can carry over the next 6 months by dividing *need* by the *feed*, as on page 16.

An early (March) decision may let you sell excess stock while the market is still reasonable.



▲ A pot of gold with pasture in good condition.

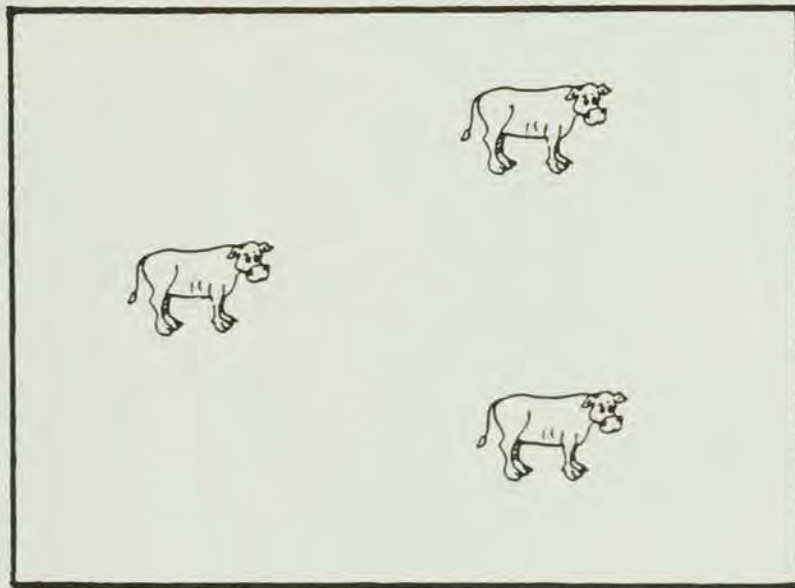


▲ Small property size and high stocking rates can put too much pressure on pasture and occupier!

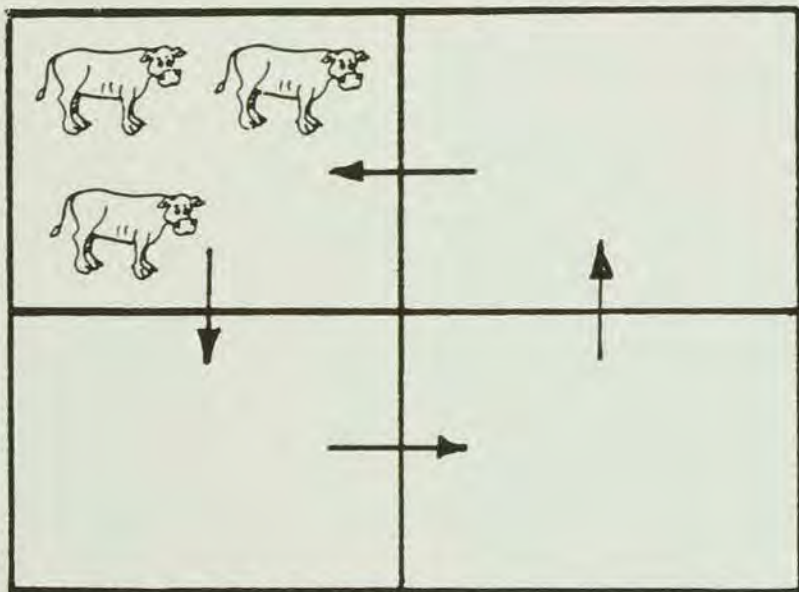
Moving stock



▲ The number of stock is more important than the grazing system.



Continuous grazing



Rotational grazing

Stock can be moved off the grazing (for example, for agistment, sale or into a feed-lot) so altering your stocking rate, or the same number of animals can be moved between paddocks under various grazing systems.

Most graziers have paddocks stocked continuously all year round, others may move stock regularly around a series of paddocks. Much interest in rotational grazing has been created recently by proponents of cell or '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 favours continuous grazing, with the number of stock adjusted to the feed available, but with periodic spelling.

Is continuous grazing the same as set-stocking?

Not necessarily! 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.

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

What if it is not practical to keep adjusting stock numbers?

Where it is not practical to alter stock numbers in the paddock, a safe constant stocking rate has to be used (see box on page 16).

This stocking rate is set to be suitable for 7 years out of 10; you cannot profitably set stock to allow for the droughts (about 2 in 10 years).

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. The effects of over-grazing that are bound to occur during a drought may take two years for recovery.

Why not rotational grazing?

Mostly because the extra costs of management and sub-division fencing bring little or no benefit in terms of animal production or pasture condition compared

to continuous grazing at the same stocking rate.

Under rotational systems you will get quieter stock as they are handled more frequently.

Rotational grazing may be the most efficient system for high levels of utilisation with high quality temperate pastures in New Zealand or Europe. But it shows no advantage under the more marginal productivity of our variable quality native pastures. Our native grasses cannot stand heavy grazing (high utilisation).

Many trials have compared rotational and continuous grazing of native pastures in Australia and the rest of the world. They generally show that animals gain the same or more weight when able to select their diet over the whole area under continuous grazing than when forced to eat more older leaf before being moved to the next sub-division in rotational grazing.

Doesn't short duration grazing benefit stock and pasture?

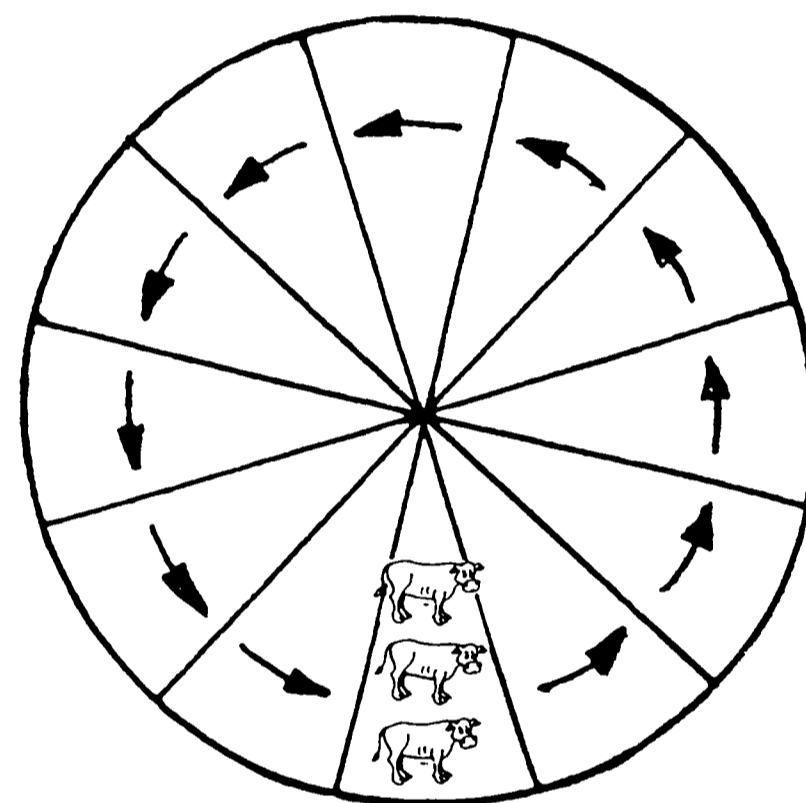
The claimed benefits of short duration grazing (SDG) are increased carrying capacity, better animal performance, reduced soil capping, better pasture and reduced regrowth of woody weeds. Unfortunately SDG has never shown these benefits in objective trials on native pastures anywhere in the world.

The main concern with SDG lies in the choice of stocking rate. Our highly variable rainfall and lack of growth in the cold season also mean that pasture production is unpredictable and sporadic. Many of our native pastures in Queensland are already being stocked close to, or in excess of, capacity; this suggests that most stocking rates should be lowered rather than raised.

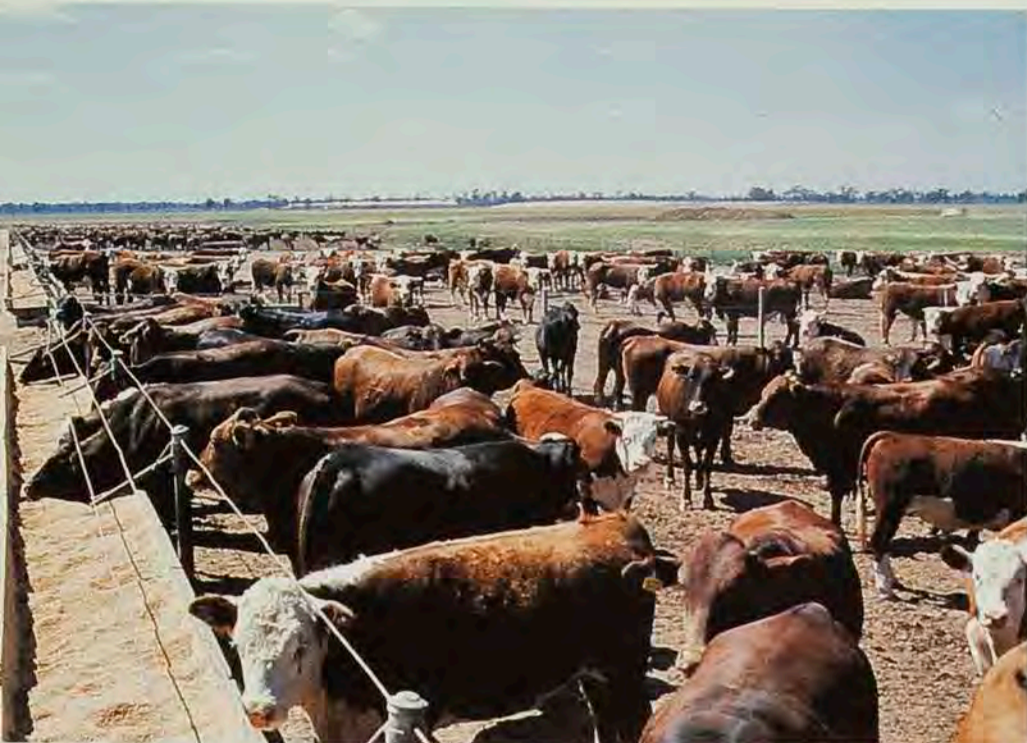
The benefits claimed for new grazing systems often come more from the excitement stimulating graziers to look more carefully at their stock and pastures than from the technique itself. We encourage this stimulation but suggest that, on most properties, controlling woody regrowth and improving pasture, along with fencing separate land management types and better water distribution, should offer more productive returns than fencing for short duration grazing.

When do I adjust stocking rates?

Stock numbers can be adjusted to the rainfall expected in the coming season. The probability of less-than-average rainfall, or drought, can be checked using the Southern Oscillation Index in the RAINMAN decision support program. If the SOI is strongly negative, selling off earlier than can beat a depressed market.



Short duration grazing



▲ Feeding grain in feedlot or in paddock may take pressure off the pasture.



▲ Spelling well-grazed pastures allows desirable species to drop seed.

How can I make my system more flexible?

Selling stores, lot-feeding, operating your own opportunity feed-lot, feeding grain supplements in the paddock or establishing an area of improved pasture on better soils may provide greater flexibility than being forced to try to finish cattle off native pastures.

Even when these alternatives appear economically marginal, they can take pressure off your grazing, allow the remaining stock more feed at a critical time, and may save future costs in pasture maintenance. Feeding grain in the paddock also allows stock to eat less grass.

Weaning calves early in dry years will take pressure off susceptible breeders, while pre-determined drought management strategies allow you to move stock before the markets and pastures collapse.

Why should I spell my speargrass?

Spelling, particularly in late summer, allows the desirable grass plants to set seed; the less desirable ones can set seed every year because they are not eaten.

Spelling also ensures a good build-up of fuel for an effective fire to control woody regrowth. How long you need to destock depends on rainfall and stocking rates during the early summer.

When should I spell?

Paddocks stocked under a safe stocking regime will rarely need spelling. Under more intensive use, spelling may be needed every three or four years, particularly where speargrass and forest bluegrass have not been able to set seed.

Spell these paddocks for 2–3 months starting in January—preferably by removing all stock or at least by reducing numbers by half.

Are kangaroos a problem on spelled paddocks?

Fortunately kangaroos in this region are not usually numerous enough to negate your efforts at good management.

Sometimes wallaby numbers in areas adjacent to scrub land have to be controlled, but wallabies grazing adjacent to timbered shelter lines may help to prevent grass fires spreading into the trees.

Burning

The reasons that graziers give for burning their native pastures range from increasing green pick, controlling regrowth, safeguarding against bush fires and loss of fence posts, to a love of fire. The red steer can seem like a spring clean of winter's rubbish.

In this chapter, we concentrate on the benefits to the pasture.

**Never burn just to see the flames.
Work out why and where you need to burn.**



If you are able to burn with a good fire, it means that your stocking rate has been about right.

Why should I burn speargrass?

Fire is an integral part of speargrass management. It stimulates the growth and seedling regeneration of speargrass, reduces undesirable species such as wiregrass, and controls woody regrowth.

Fire favours speargrass

After a good season and light stocking, speargrass can drop up to 200 seeds per square metre. 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. (Forest blue seed has a similar, but smaller, awn.) Fire may kill seeds of other grasses on the soil surface, but does no harm to the buried speargrass seed.

If the soil is moist, fire stimulates speargrass seeds to germinate early, in August–September, as the bare, blackened soil surface warms more quickly. Without a fire, speargrass seeds usually germinate in October when they have to compete with other species.

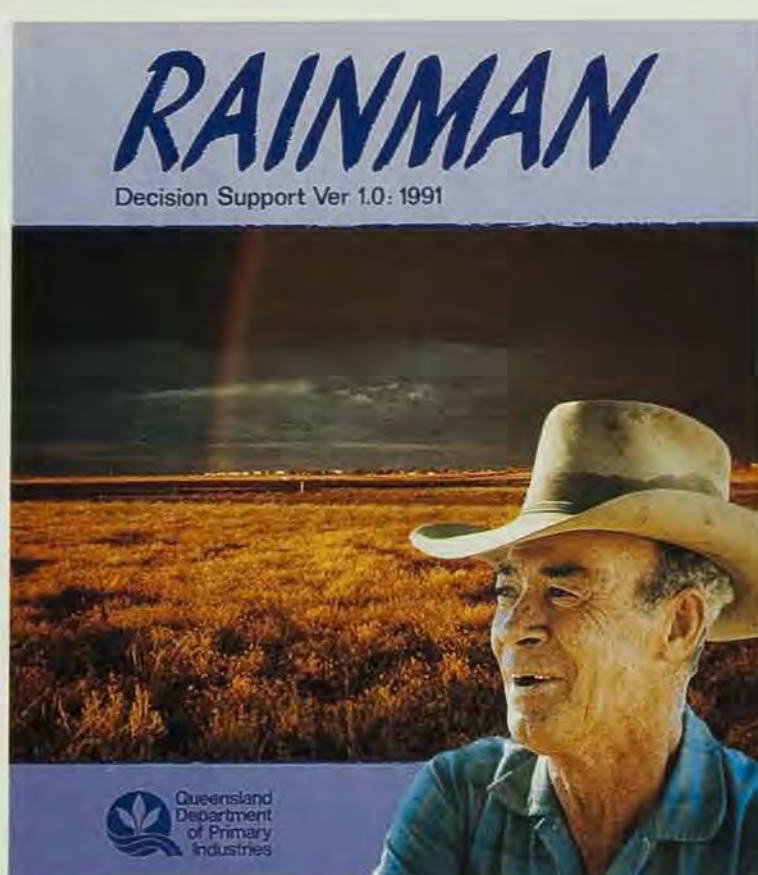
The seeds of wiregrass are much smaller than those of speargrass, and wiregrass seedlings grow slowly. Wiregrass plants compete poorly against the more vigorous speargrass—unless animals check the more palatable grass by heavy grazing.



▲ Awn of speargrass seed twists when wetted driving seed into soil.



▲ Don't let regrowth become too tall before burning.



▲ RAINMAN shows how the SOI affects your chances of rain.

How often should I burn?

This depends on the condition of your pasture. If poor grasses such as wiregrass are starting to dominate, plan to burn each year for 2 or 3 years. But if the pasture is in good condition, plan on a good fire every 3 or 4 years, even though insufficient summer rainfall may spoil your plans sometimes. Much depends on how quickly your woody weeds grow as they must not be allowed to become too tall—over 2 metres high.

The smaller the plant, the better fire kills woody seedlings

Paddocks of clean speargrass improved with legumes need be burned less frequently than paddocks with regrowth.

Should I burn every year?

Only for a good reason. You may need to burn every year for a few years to get on top of wattles or wiregrass.

Many graziers in higher rainfall districts burn every year saying it gives their stock better quality and more accessible feed. This practise becomes less and less desirable further inland as there is an increased risk of feed shortage if the season stays dry. Burning every year may also reduce the build-up of leaf litter and hence organic matter in the soil, while promoting cooler, less effective fires.

When should I burn?

Burn in spring, but not until there is sufficient moisture in the soil, generally after 25 mm of rain has fallen. Speargrass in the Burnett and Brisbane valley is traditionally burned in late August when the first spring rains have fallen, and temperatures and wind speeds are low; it is burned later in the central region. Burning soon after rain can prevent leaf litter from being burned and so help to maintain ground cover.

Most graziers light up in the afternoon because the evening dew and calm air help to prevent the fire getting out of control.

What if it has not rained?

If there has been no rain by late October or early November, do not burn the existing herbage because this could leave you with no feed at all.

The Southern Oscillation Index for the winter months can be a useful guide to the likelihood of rain in the spring. If the monthly SOI drops by 7 units between June and August, it is likely to remain dry—so do not burn; if it goes up by 7 units, the chances of rain are improved and the risk may be worthwhile.

For example, the risks of running short of feed in the Gayndah area are:

all years	25% risk or 1 year in 4
when SOI (Jun – Aug) drops by 7 units	50% risk or 1 year in 2
when SOI (Jun – Aug) rises by 7 units	10% risk or 1 year in 10

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

When should I restock after burning?

Speargrass and bluegrass plants are susceptible to grazing immediately after a fire (or drought) when trying to grow from the crown reserves. Grazing management that favours speargrass also favours the highly-regarded forest bluegrass on clay soils.

Try to keep stock out of good speargrass pastures for about 10 days after burning, or until the grass is 10 cm high.



▲ Let grass get 10 cm of leaf before grazing.

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 Wednesdays.

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 comments on the implications for the coming season.

How much fuel is needed for a fire to control regrowth?

Although 800–1000 kg of fuel per hectare will allow a fire to spread, at least 1200 kg, preferably 2000–3000, is needed for an effective fire. This will damage woody saplings up to 2 metres in height, and kill seedlings up to 1 metre high, provided they have no ligno-tuber.

Remember fire does not *kill* all woody regrowth, but it checks or controls it. A slow fire will 'cook' a woody stem better than a flash fire.

What about a late fire?

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



▲ 2000 kg/ha of fuel for an effective fire.



▲ *Burning can even up patchy grazing.*



▲ *Dense speargrass where protected from grazing.*

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 or four years, another burn in this period will prevent more seed dropping.

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

What about burning part of the paddock?

It is much better to burn the whole of the paddock so that stock do not concentrate on the burnt areas and weaken the new regrowing grasses. However in paddocks with patchy grazing, burning the ungrazed areas will encourage cattle to move to these newly burnt patches and so to graze over more of the paddock.

How can I get rid of wiregrass?

This needs more drastic treatment than the burning every 3 or 4 years on good speargrass. Burning reduces the size of the wiregrass plants while encouraging speargrass seedlings, but needs to be repeated every year. You may need to reduce the normal stocking rate in late summer to allow the remaining speargrass to seed and to build up a good fuel load.

Then burn in spring and then graze about half the normal number of cattle, or even destock completely, for 4–6 months of summer.

This burning and half-stocking may have to be repeated for 2 or 3 years if the wiregrass problem is bad, before you return to more normal stocking and less frequent burning.

Will slashing help to control wiregrass?

Slashing may make the paddock look neater for a short time, but does nothing to control wiregrass. It is obviously not practical anyway on large paddocks or rough country.

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 green pick. Because fire leaves a bare and blackened soil surface, the soil may warm up faster in spring; this can promote herbage growth and aid mineralisation of nitrogen from soil organic matter.

Steers can gain an extra 25 kg in the first 3 months after a fire, but those on unburnt pasture usually catch up by the end of 12 months.

What nutrients are lost in a fire?

Plant nutrients that combine with oxygen and become gases are lost to the atmosphere. These are mainly nitrogen and sulphur. Potash remains the same, 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%), but burning 3 tonnes of dry matter per hectare may lose about 20 kg nitrogen. This is small compared to the 3-6 tonnes of total nitrogen in each hectare of soil.



▲ *Some nutrients go up in smoke.*

What about the effect on soil organic matter?

Very frequent burning probably reduces the soil organic matter as too much of the dead leaf and stem is lost. Surface litter has to be incorporated into the soil by earthworms and soil insects—whereas the old root system is already intimately mixed with the soil particles.

Dead plant material has to be broken down by soil bacteria and fungi to become humus, and these bacteria may take extra nitrogen from the soil before they can decompose low-nitrogen leaf litter.

Burning less frequently and after rainfall reduces the loss of surface litter.



Fire removes rubbish and improves feed quality for about 3 months.



Improving speargrass



▲ *Seca stylo* for the warmer region.



▲ *Fine stem stylo* for sandy soils in the subtropics.



▲ *Wynn cassia*—fast growing, free seeding, but not so palatable.

Speargrass pastures provide cheap feed and are moderately productive when managed well. The value of young speargrass leaf is as good as that of any other grass for 6–8 weeks—until the plant runs out of nitrogen and phosphorus because of the infertile soil. After this, even green speargrass may not provide enough protein or minerals, while quality falls rapidly once flowering is initiated in February. This poor quality means that the herbage cannot be broken down quickly in the grazing animal's rumen; the animal cannot eat as much and its growth slows.

The quality of grazing can be improved and extended in autumn by sowing hardy legumes *into the existing pasture*.

What is the main benefit from legumes?

The main benefit to the animal from the hardy legumes is an improvement in diet from higher levels of protein, minerals and digestibility in the legume leaf. This can add an extra 20–30 kg of weight gain to a steer each year—if the stocking rate is kept the same.

The hardy legumes usually have little or no effect on grass growth or total herbage yield 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 each district and soil type, so seek local advice.

In the southern shires, subtropical species, such as lotononis and fine stem stylo, are better than autumn-flowering tropical species in which seed set may be checked by the onset of cool weather or by frost. Lotononis and fine stem stylo flower before Christmas and so need early rainfall, while Wynn cassia flowers throughout the growing season. Tropical species like Seca, Verano or Amiga stylo suit the northern areas.

Siratiro can be very productive when fertilised adequately, grazed leniently and allowed to seed every few years—similar to the grazing management we are recommending for speargrass.

The shrub legume, leucaena, may have a place as a permanent high quality feed on the better soils, but it should be established in the same way as a crop—with adequate fertiliser and attention to weed control.

Which legume for my soil type?

In general, fine stem stylo, Wynn cassia, lotononis and siratro prefer sandy or loamy free-draining soils, whereas Seca will also grow on clays. The choice for clay soils is more limited; leucaena grows well if they are well-drained clays and over half a metre deep, desmanthus was recently released as a summer-growing legume. Annual medics may naturalise where there is enough winter rainfall.

How useful are the native legumes?

There are many native legumes in speargrass pastures; they can be identified in *A Guide to Herbaceous and Shrub Legumes of Queensland*.

The most common species (native glycines, *Rhynchosia*, and desmodiums) are eaten by stock and, as legumes, must be beneficial—it's the meal that matters, not the menu. However some may contain alkaloids; an indigo (*Indigofera linnaei*), for example, can cause Birdsville disease in horses.

Native legumes rarely contribute 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. Creeping tick trefoil (*Desmodium triflorum*) can provide as much as 30–40% of the herbage in fertilised blue couch pastures.

What are the risks from growing legumes?

If total herbage is not increased by the legume growth, grass production has been reduced; the higher quality of the legumes allows the cattle to eat more of the grass and this may put extra pressure on the speargrass plants.

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

How should I sow the legume seed?

Establishment is more reliable when competition for soil water by the roots of established grasses is removed.

These grasses can be checked by cultivation (one or two workings with disc harrows or chisel plough) preferably along the contour, or with herbicide, as in the Band-Seeder, on steep or stony country. Preparing a seed-bed costs money, but tropical legume seed is expensive, and good establishment may give useful grazing from the legume in the first year.



▲ *Rhynchosia* is found on heavier soils.



▲ Naturalised desmodium in fertilised and heavily grazed pasture.



▲ Native glycines are very common in speargrass pastures.



▲ *The Bandseeder for planting legumes in stony, steep and timbered country where rainfall is unreliable.*



▲ *Legumes regenerating from seed.*

Don't burn establishing legumes until they have dropped at least two crops of seed.

Oversowing without seed-bed preparation is generally risky in the south where the break to the dry season is unreliable, but it can work well in the north as prolonged monsoonal rainfall is ideal for seedling growth. North of Gladstone, Seca is generally oversown after a spring burn.

Country bared by overgrazing during a drought can present an opportunity for oversowing. Legume seed is protected by its hard seed coat until the rains come.

Some graziers spread legume seed from horseback in steep country, or throw seed out when Tordoning timber. This may introduce the naturalising legumes into difficult country, but it could be years before there is enough legume to affect animal production.

You generally get what you pay for at establishment!

Will fire damage my sown legumes?

You will lose the top growth of legume leaf, and sparse new stands which have dropped little seed may be wiped out. However good stands of the stylos and of Wynn cassia can drop masses of seed—hundreds of kilograms per hectare. The hard seed dormancy is cracked by the heat of the fire, and numerous new seedlings come up, rejuvenating the stand.

Burnt legumes may also shoot from the base; the low growing crown of fine stem stylo allows it to withstand grass fires, while lotononis will also recover well with sufficient rainfall. The shrub legume, leucaena, will shoot again from its base if burned accidentally, while seed on the ground will germinate.

Soft temperate legumes, such as clovers in the south of the region, may be less tolerant of fire, but annual medics and sub clovers should have set seed by early September, and so are less affected.

Do I need fertiliser?

Most speargrass country is deficient in phosphorus, but rarely in potash; some is deficient in sulphur. Most of the hardy legumes do not *need* fertiliser to establish and survive even on poor soils, but it will greatly increase their growth, spread, seeding and feed value. Although it is no longer economical to apply heavy dressings of super at typical stocking rates on speargrass, costs can be reduced by combining the use of fertiliser and feeding P supplement direct to cattle.

Apply super to bring the soil phosphorus levels to 8 ppm for reasonable growth of legume, and then, on most speargrass country, apply about 5 kg of phosphorus per hectare per year—usually applied as 120 kg of super per hectare every other year—to keep

the soil phosphorus at this level.

Minimum superphosphate needed for optimal growth of cattle and legumes

Super needed (50 kg bags/ha)	Soil P levels (ppm)		
	2	4	6
– to raise soil P to 8 ppm	5	3	1½
– to keep soil P at 8 ppm	1½/yr	1/yr	½/yr

Fertiliser will increase nitrogen fixation by the legumes, boosting pasture growth and quality.

Why not feed phosphorus direct to cattle?

Feeding supplement phosphorus is cheaper and more practical on extensive properties or paddocks; it is usually offered only during the summer on legume pastures growing on very infertile soils. Fertiliser will always give better results because both animal growth rates and carrying capacity are raised.

When soil phosphorus levels are under 8 ppm, fertiliser will boost both pastures and cattle, but supplement will only affect the cattle.

What about fodder crops?

Forage sorghum can give a great bulk of feed, allowing speargrass paddocks to be rested. However many of the summer forages grow best at the same time as speargrass—varieties with *sugar* in their name are the best for autumn feed. Also the feed quality of sorghums, when growing on most speargrass soils, is low while the crop is hungry for plant nutrients.

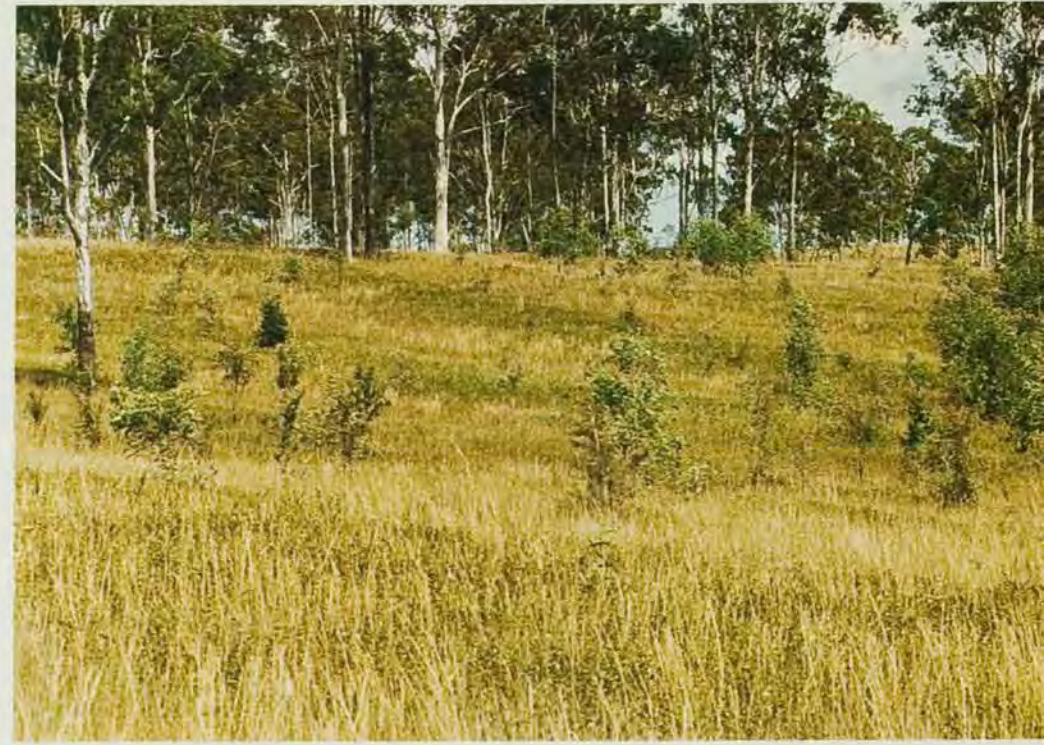
Unless you fertilise for the crop and to replace nutrients, you will probably be disappointed with animal production, and the soil may become too poor and weedy to establish a good fully sown pasture later.

Early millets or winter oats provide better quality feed, but also need nitrogen and phosphatic fertiliser. Lablab fertilised with super will provide better quality feed, but it is often difficult to manage rapidly growing sorghum with the slower growing legume.

Seek local advice for suitable soils for forage crops.

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.



▲ Dark green strips show legume's response to superphosphate.



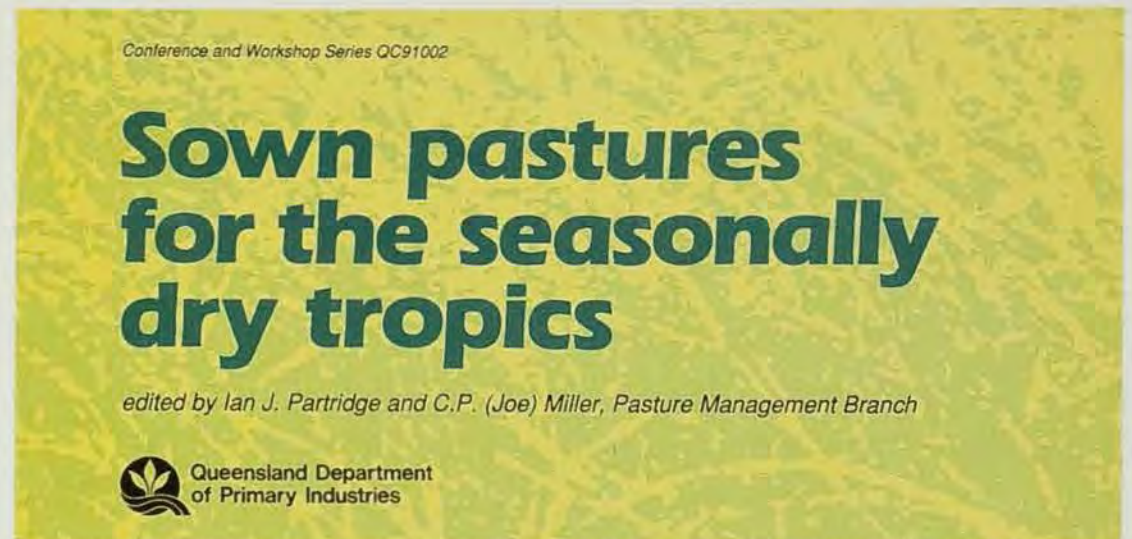
▲ Phosphorus can be supplied as supplement when hardy legumes provide only protein.



▲ Forage crops sown on poorer land must be fertilised for satisfactory growth of feed and animals.

It is difficult to establish improved grasses without full cultivation to remove all speargrass. Small improved grass seedlings cannot compete with established speargrass plants, and being more palatable, they are usually grazed preferentially so that the pasture reverts to speargrass.

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



▲ Cultivated strips for sowing legumes into speargrass pastures.

Monitoring pastures

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

Remember we said that you need to understand the ecology of grazed pastures, to follow the local guidelines, and to check what affect your management is having on pasture condition.

Monitoring has two important results. It encourages you to look more closely at the plant side of grazing, and it provides a permanent record so that you can pick up gradual changes over the years. Don't rely on memory for this detail.

This book does not show you how to monitor pastures; the various methods are described in detail in another DPI publication GRASS Check.

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

This chapter provides photostandards for estimating the amount of standing dry matter in speargrass paddocks, and illustrates some of the more important grasses, and common native legumes, found in the region.

If you become more interested in identifying plants, we suggest you get hold of some of the more comprehensive books listed at the end of the chapter.

Estimating feed in a paddock

Knowing the weight of herbage (total dry matter, not wet green leaf) per hectare allows you to check on your stocking rate. Compare the stand of feed over your paddock with these photostandards



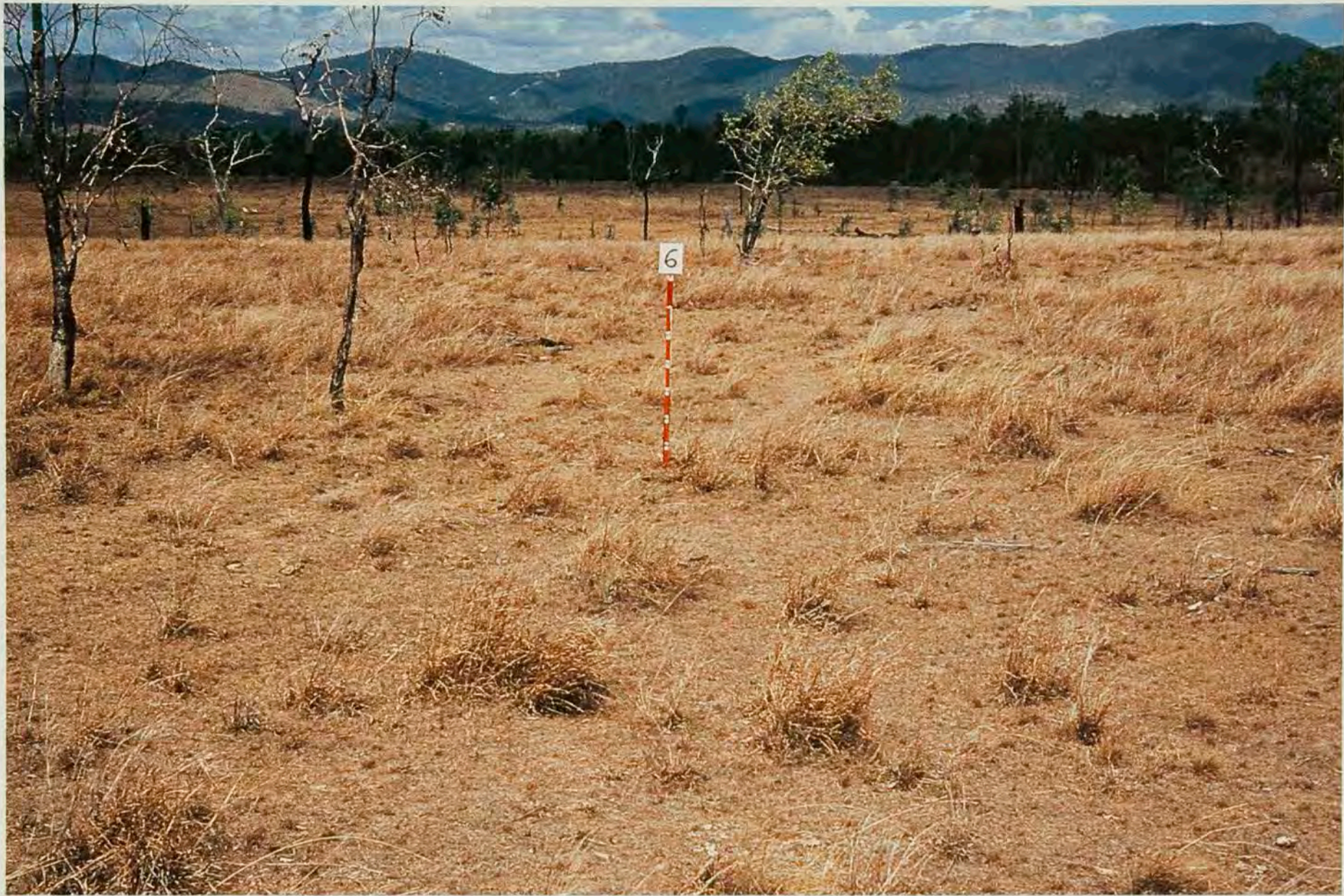
▲ 4900 kg/ha dry matter



▲ 2000 kg/ha dry matter



▲ 1400 kg/ha dry matter



▲ 450 kg/ha dry matter



▲ 300 kg/ha dry matter

Recognise the indicator grasses

Under heavy grazing—

Desirable (palatable, perennial) grasses decrease

Black speargrass	<i>Heteropogon contortus</i>
Forest bluegrass	<i>Bothriochloa bladhii</i>
Kangaroo grass	<i>Themeda triandra</i>
Queensland bluegrass	<i>Dichanthium sericeum</i>
Scented top	<i>Capillipedium spicegerum</i>

Intermediate value grasses which increase

Blue couch	<i>Digitaria didactyla</i>
Early spring grass	<i>Eriochloa procera</i>
Golden beard grass	<i>Chrysopogon fallax</i>
Green couch	<i>Cynodon dactylon</i>
Pitted bluegrass	<i>Bothriochloa decipiens</i>
Red natal grass	<i>Melinis repens</i>
Shot grass	<i>Paspalidium distans</i>
Tambookie grass	<i>Hyparrhenia filipendula</i>
Thatch grass	<i>Hyparrhenia rufa</i>
Wild sorghum	<i>Sorghum nitidum</i>
Windmill grass	<i>Panicum species</i>

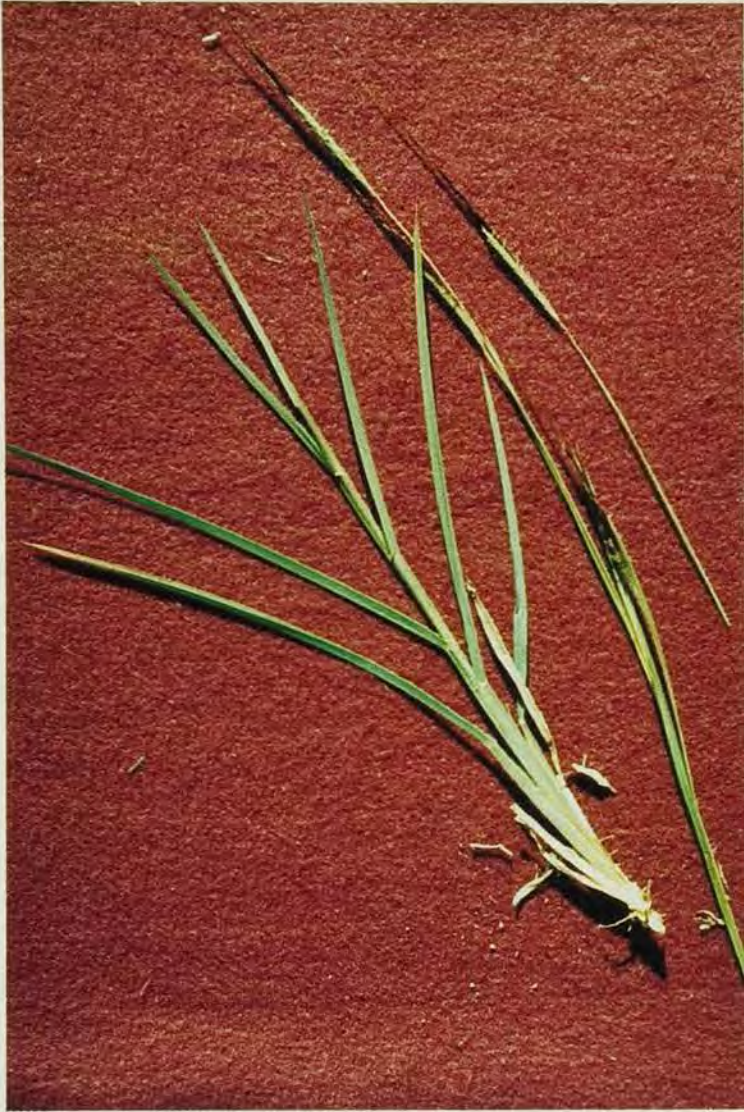
Undesirable (annual and unpalatable perennial) grasses increase

Barnyard grass	<i>Echinochloa colona</i>
Bottle washer grass	<i>Enneapogon intermedius</i>
Five minute grass	<i>Tripogon loliformis</i>
Rat's tail grasses	<i>Sporobolus species</i>
Giant rat's tail	<i>Sporobolus pyramidalis</i>
Love grasses	<i>Eragrostis species</i>
Woodland love grass	<i>Eragrostis sororia</i>
Poverty grass	<i>Eremochloa bimaculata</i>
Purple top grass	<i>Chloris inflata</i>
Slender chloris	<i>Chloris divaricata</i>
Small burr grass	<i>Tragus australianus</i>
Wiregrasses (white speargrass) . . .	<i>Aristida species</i>
Sedges	<i>Cyperaceae</i>

Other grasses found

Barbwire grass	<i>Cymbopogon refractus</i>
Cane grass, reed grass	<i>Arundinella nepalensis</i>
Cockatoo grass	<i>Alloteropsis semialata</i>

Identifying important species



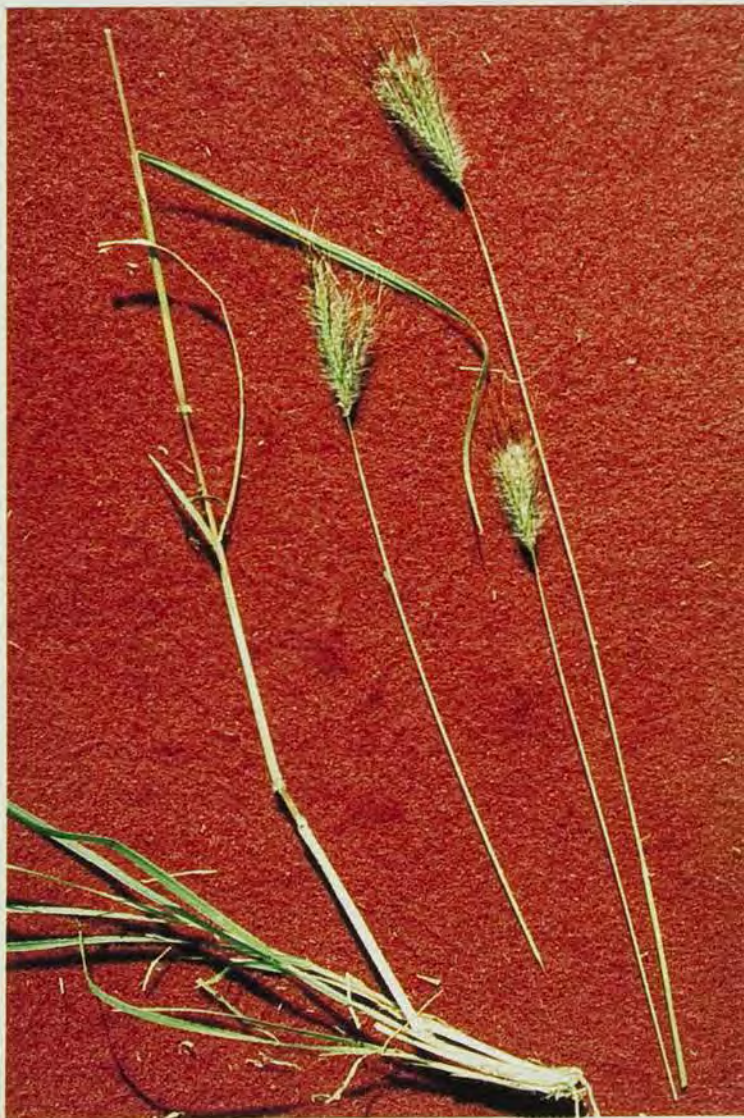
Black speargrass
(*Heteropogon contortus*)

See flattened leaf bases, bluey colour.



Forest or Burnett bluegrass
(*Bothriochloa bladhii*)

Tall vigorous grass on heavier soil,
brown seedhead.



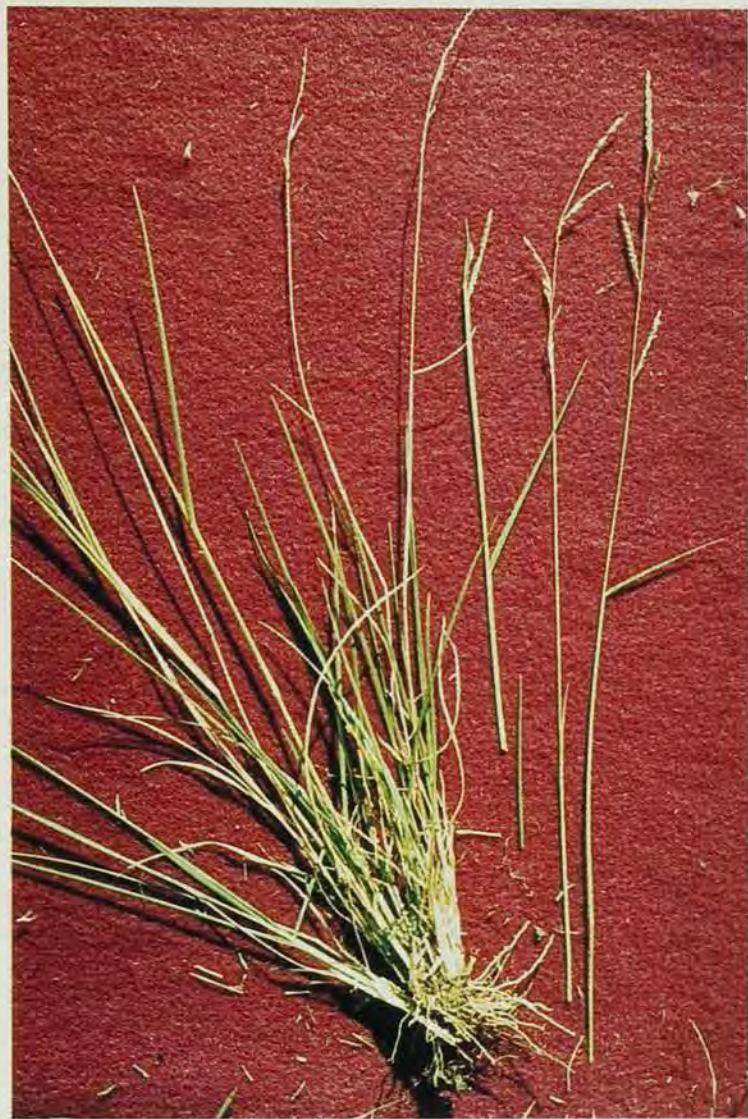
Queensland bluegrass
(*Dichanthium sericeum*)

Valuable grass on clay soils.



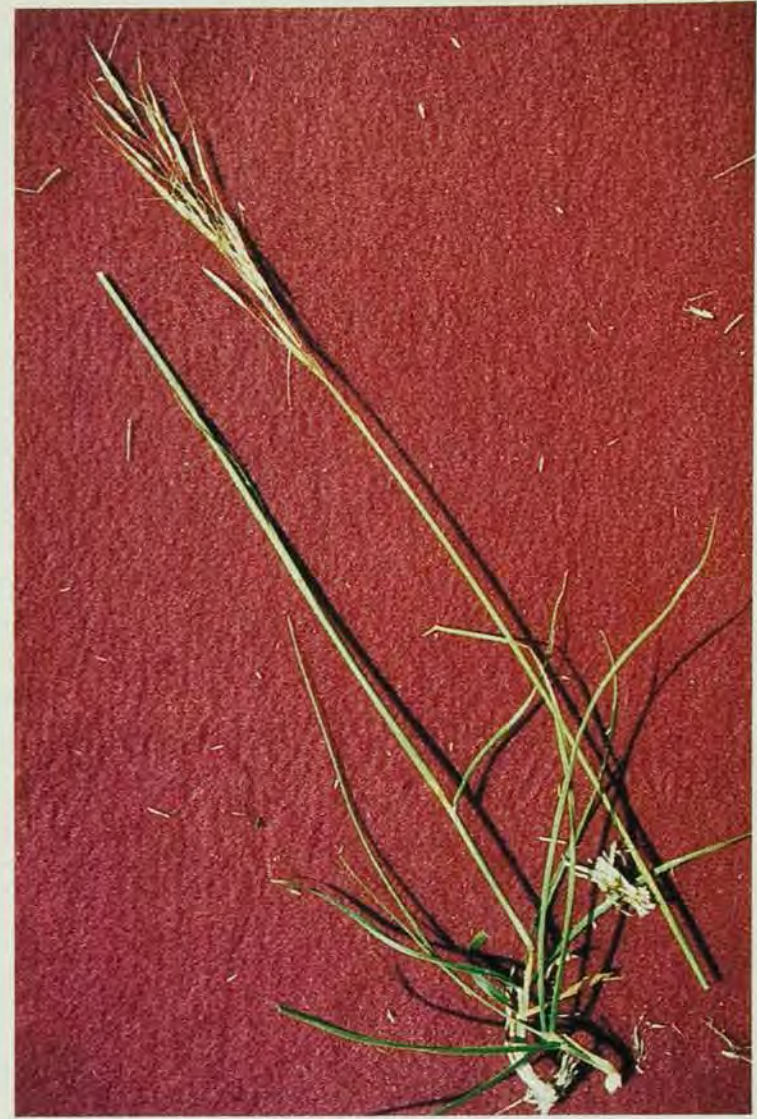
Scented top
(*Capillipedium spicegerum*)

Strong scent when seedhead crushed.



Early spring grass
(*Eriochloa procera*)

Useful grazing with spring rain.



Golden beard grass
(*Chrysopogon fallax*)

Tall under light grazing; small and sedge-like under heavy grazing.



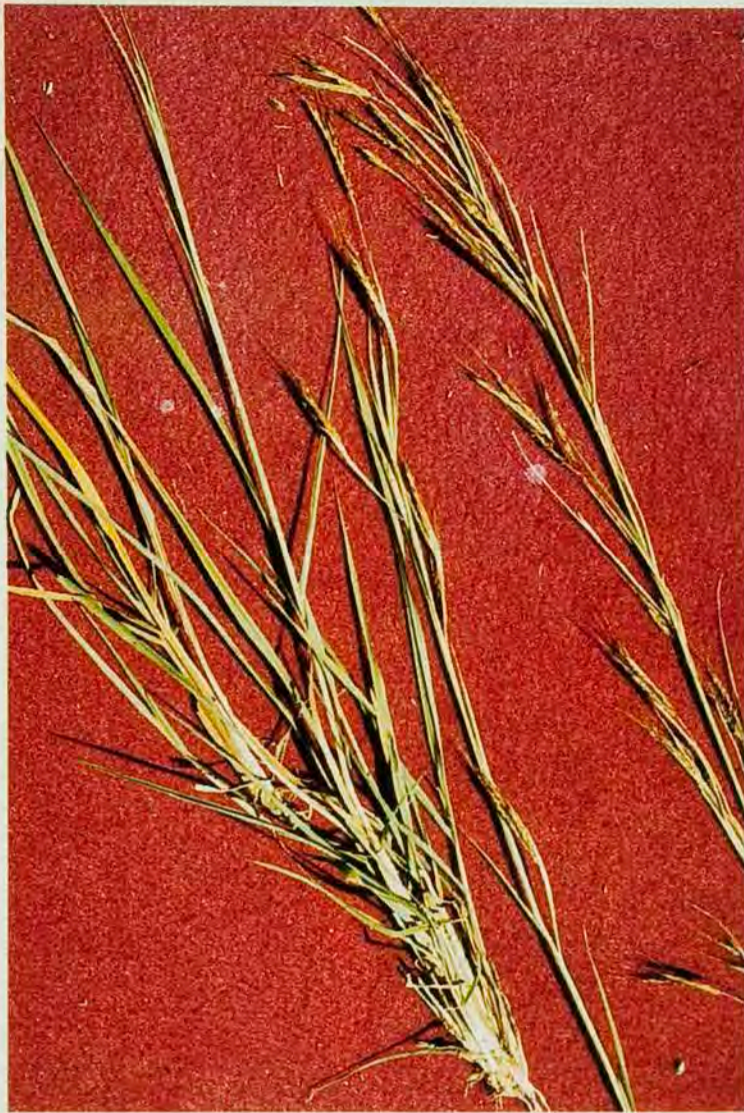
Pitted bluegrass
(*Bothriochloa decipiens*)

See pinhead depressions on seeds.



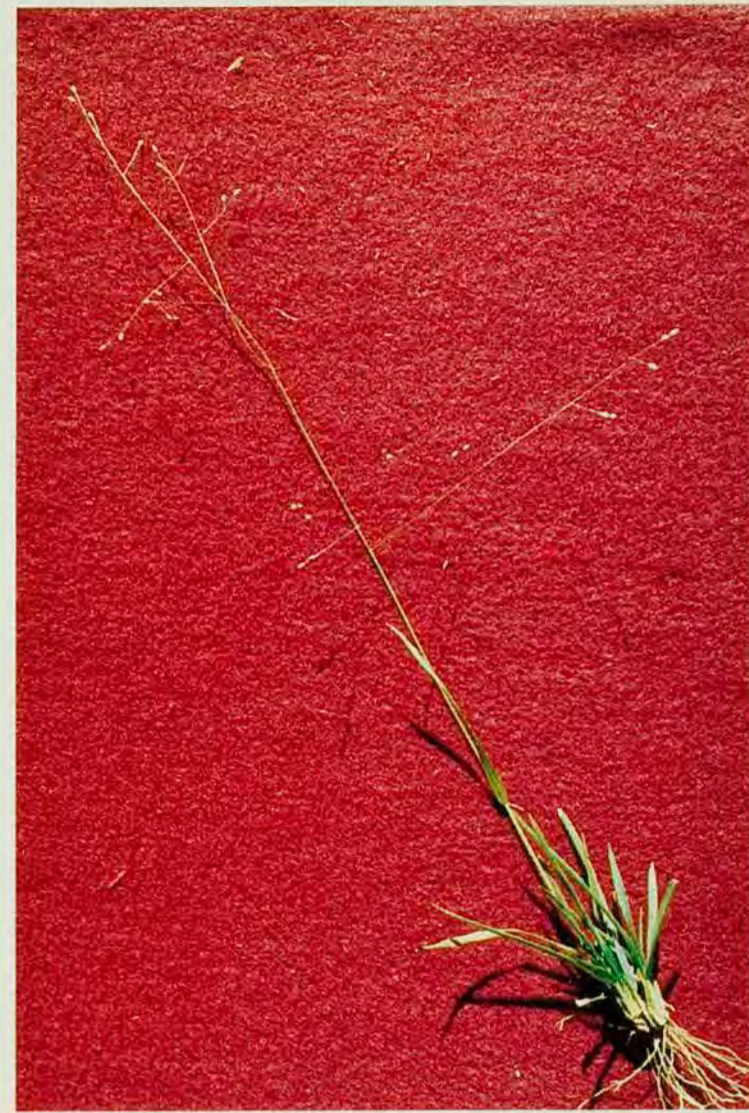
Red natal grass
(*Melinis repens*)

Common on disturbed land.



Thatch grass
(*Hyparrhenia rufa*)

Palatable, common on roadsides,
Tambookie is smaller local species.



Windmill grass
(*Panicum* sp.)

Readily eaten.



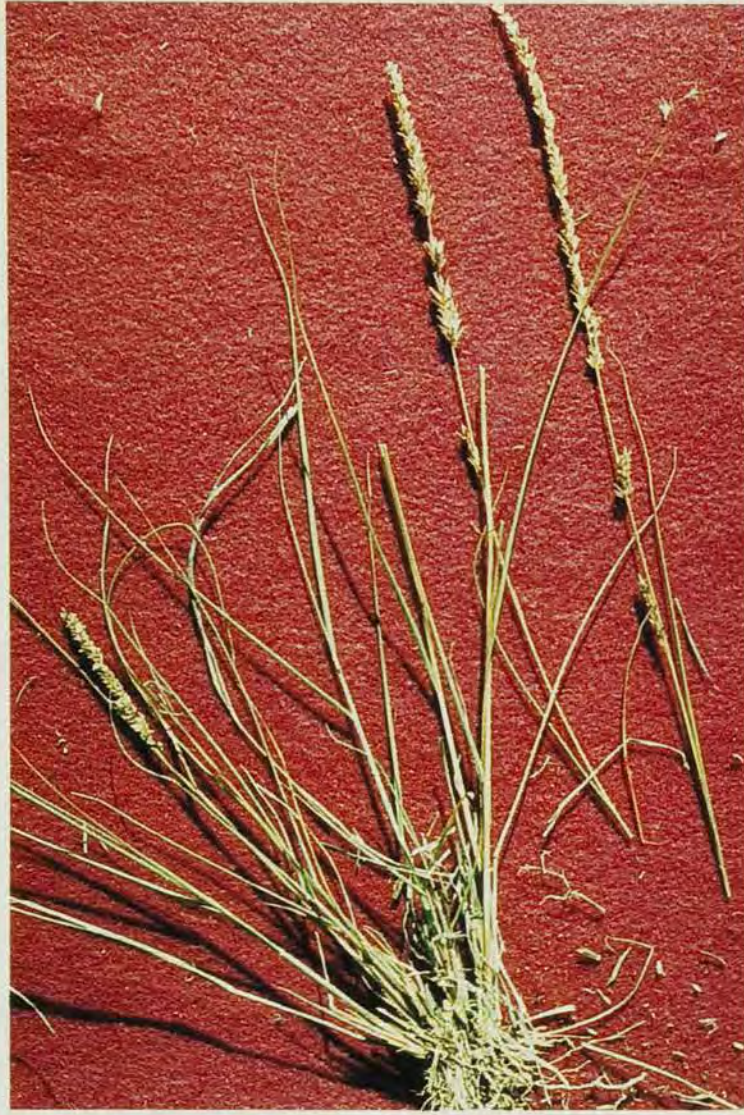
Local rat's tail grass
(*Sporobolus* sp.)

Little value, wiry leaf.



Giant rat's tail grass
(*Sporobolus pyramidalis*)

Serious weed, spot-spray when seen.



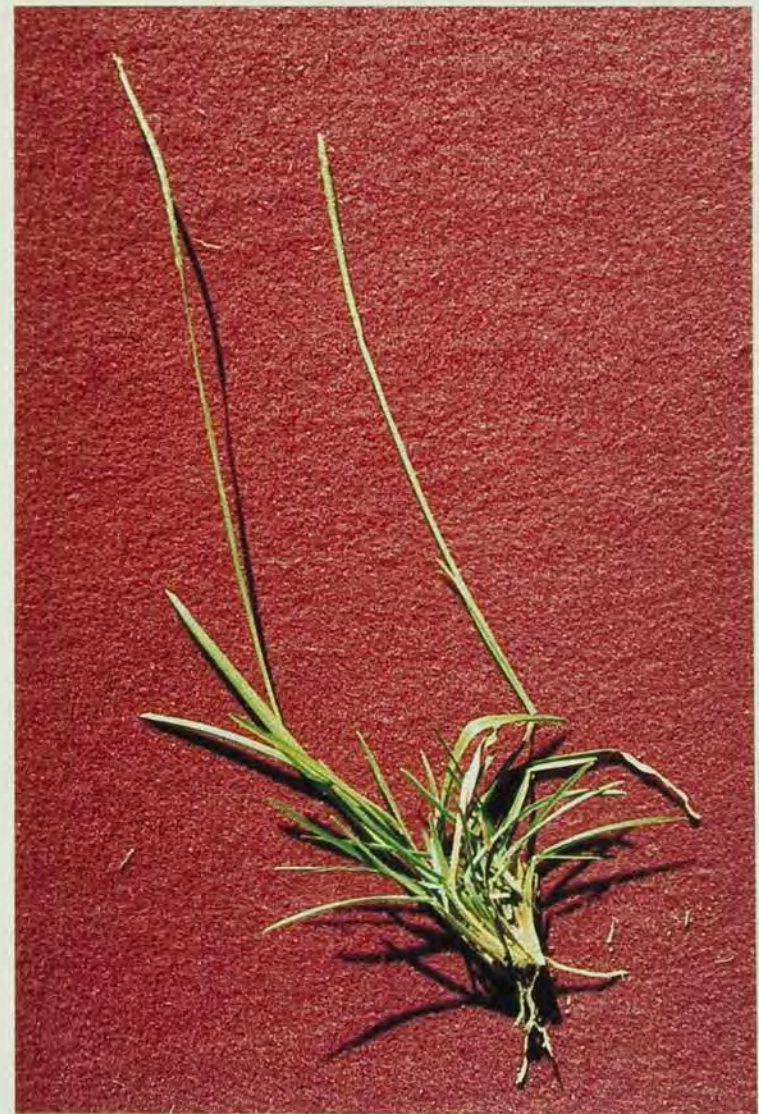
A love grass
(*Eragrostis* sp.)
Poor quality feed.



Woodland love grass
(*Eragrostis sororia*)
Poor quality feed



Slender chloris
(*Chloris divaricata*)
Leaf base like miniature rhodes grass.



Poverty grass
(*Eremochloa bimaculata*)
As its name suggests!



Wire grass
(*Aristida* sp.)



Branched wiregrass
(*Aristida armata*)



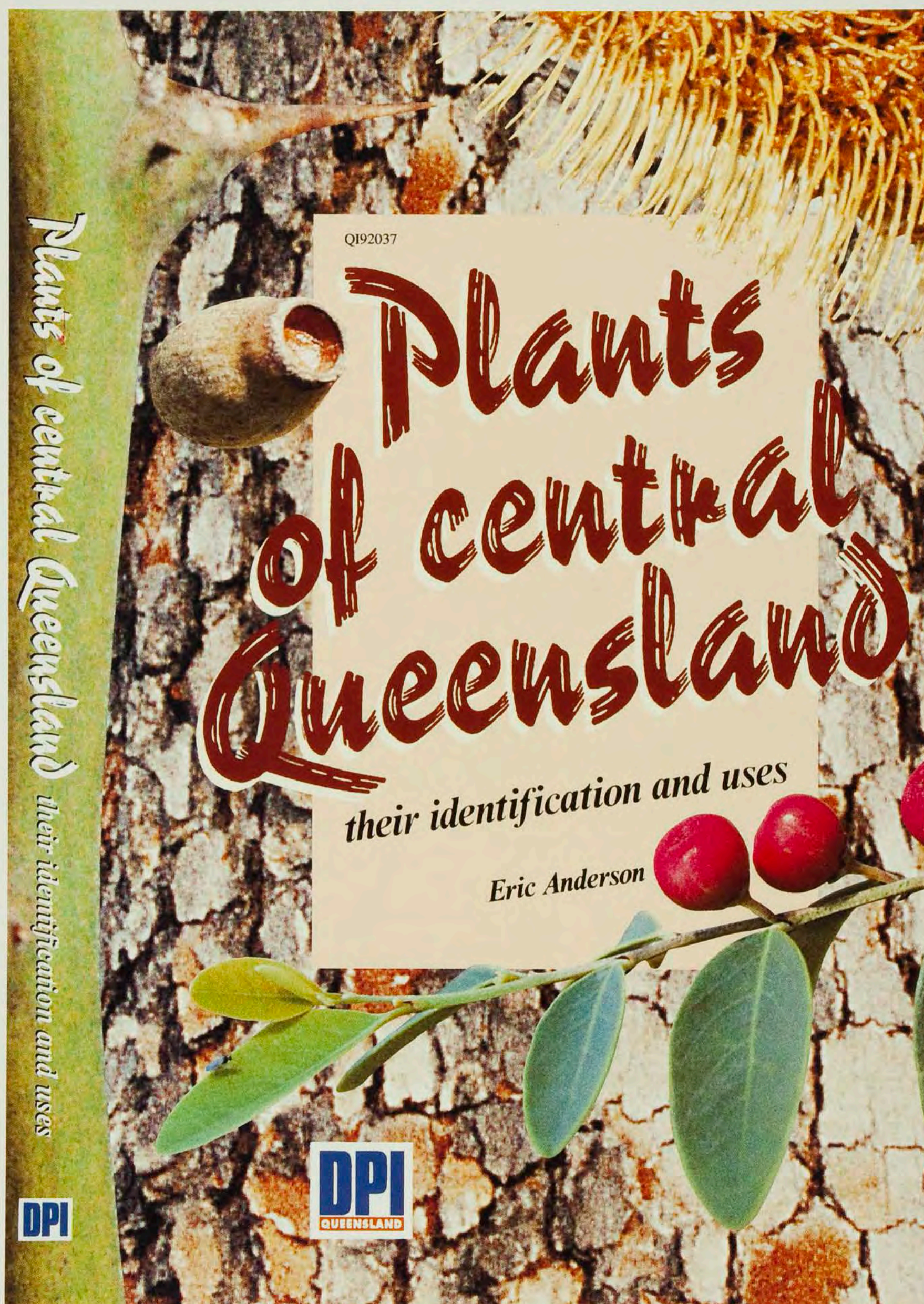
Small burr grass
(*Tragus australianus*)



Sedges
(*Cyperus* spp.)

Identifying other plants

If you are interested in identifying trees, shrubs, forbs, ferns and grasses in the region, get hold of a copy of *Plants of central Queensland: their identification and uses*.



What is the condition of my grazing?

You can check the condition of the grazing in your paddocks after monitoring. The condition can be categorised (on the amount of the species present and on the soil condition) into three states—good, deteriorating, and degraded.

Good, deteriorating or degraded?

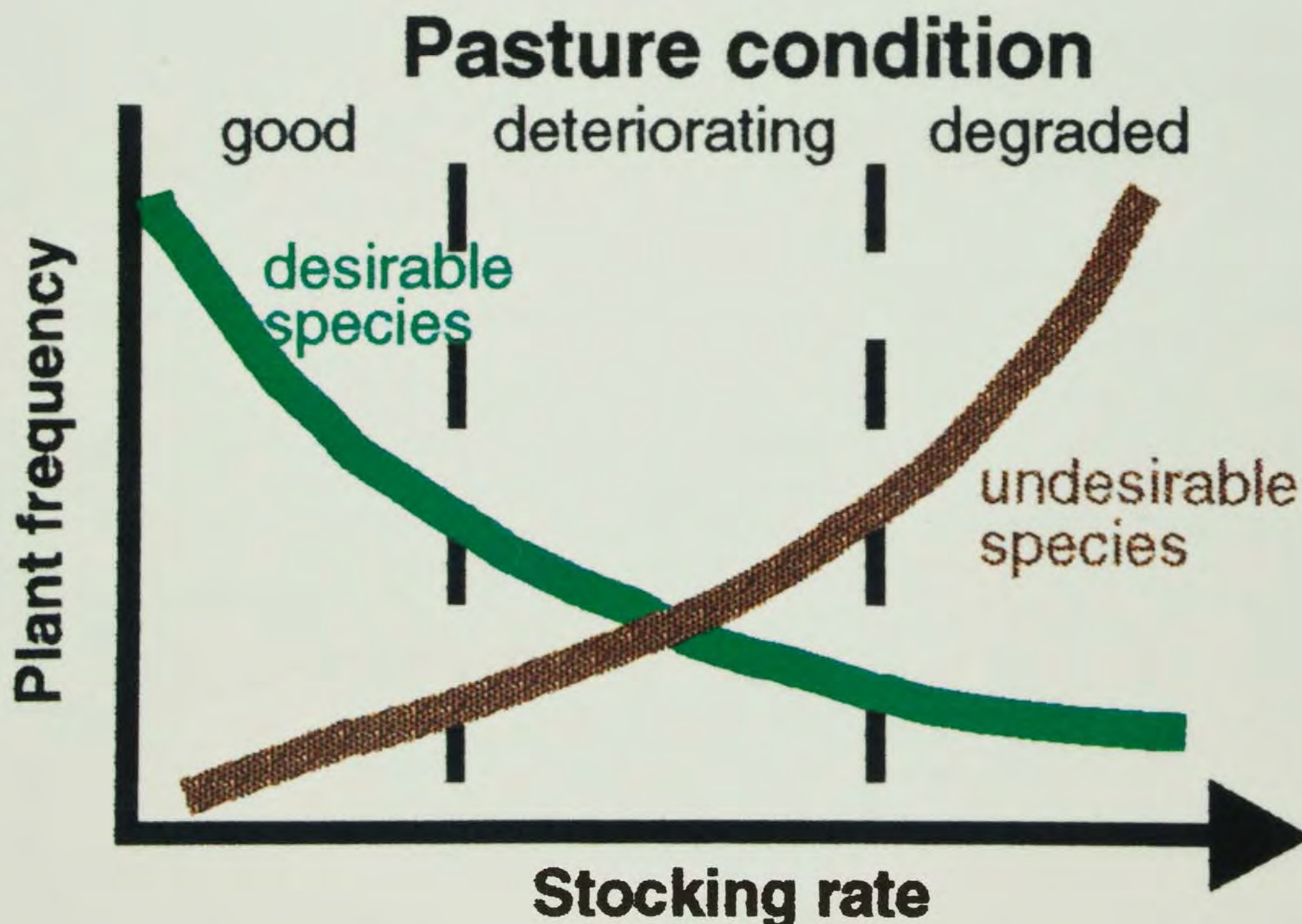
A 'deteriorating' condition can be reversed to 'good' by a change in management, for example by lightening the stocking rate and burning, or by a return to more normal rainfall patterns.

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

Check the condition of your pasture this year from the results of your monitoring.

Species	Pasture condition		
	Good	Deteriorating	Degraded
Desirable	>40–50	<(%)* 30	<10
Intermediate	30–40	30–40	10–20
Undesirable	<20	40–50	>50

* % composition by weight



Further reading

General

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

Native pastures in Queensland: their 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. Occasional Publication No.5, Brisbane.

Sustaining land for beef production in the Gladstone/Bororen Coastal Lowlands area. — Edited by R. Clark (1993) Calliope Soil Conservation Association.

Points to consider before clearing land in south Queensland — by P.J. Voller and J.M. Molloy (1993) DPI Information Series QI93017, QDPI Brisbane.

Will it rain? El Niño and the Southern Oscillation. — Edited by Ian Partridge (1991) DPI Brisbane.

Timber Management Handbook: Grazier experiences on the Darling Downs and Maranoa. — by Gordon Stone (1993) United Graziers Association of Queensland, Toowoomba.

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

Technical: land management units and soils

Land Management Manual: Coastal Burnett District. — Edited by R.N. Thwaites (1991) DPI Training Series QE 91004, Brisbane.

Understanding and Managing Soils in the Inland Burnett District. — Edited by J.M. Maher (1993) DPI Training Series QE93001, Brisbane.

Decision support programs

Grassman: a computer program for managing native pastures in eucalypt woodlands.(1990) QDPI, Brisbane.

Rainman: rainfall information for better management. (1991) QDPI, Brisbane.

Woody weed adviser: options for woody weed management (1993) DPIQ Rockhampton

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

Managing southern speargrass provides specific guidelines for the part of this native pasture community stretching from Bowen in the north to Boonah 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 southern speargrass* describes the country and the management options for sustainable production. These options are:

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

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

