



Managing for healthy pastures on the Western Downs



References

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Summary



This booklet discusses grazing land condition concepts, best practice management principles and land condition problems which are typical on the Western Downs.

Six demonstration sites were established in the Brigalow Jimbour floodplain catchment to trial strategies for improving land condition on degraded, C condition paddocks. Five of the six paddocks were old cultivation and all had ongoing problems with broadleaf weeds, patchiness in pasture composition and soil surface condition. All cooperators based their recovery strategies around the principles of wet season spelling and good stubble retention over the dry season.

The quickest return to A land condition occurred using a combination of broadleaf herbicides and wet season spelling. In this demonstration, pasture basal area increased from 0.9% to 4.2% within three years. This effect was accelerated by increased summer rainfall.

More details about the economics can be viewed in the full project report, available from the Meat & Livestock Australia website (www.mla.com.au under 'Research & development').

The strategy which had the best economic return was also the strategy which saw the quickest return to A land condition. The benefit-cost ratio in this case was 1.91:1 which indicates that for every dollar invested, \$1.91 was generated. In this scenario, costs were minimised by only treating the worst affected area of the paddock and then spelling the whole paddock each wet season.

The strategy which had the lowest return after three years had a high capital outlay to construct a dividing fence and the lowest improvement in land condition. This strategy took an extra year to break even.

Paddocks that returned to A land condition within three years performed the best economically regardless of strategy and capital outlay.

Where Perennial, Productive and Palatable (3P) species comprised less than 30% of the pasture, re-sowing was found to be the quickest means of improving pasture condition.

Maintenance of the improved pasture condition will depend on persisting with strategic wet season spelling and year-round grass stubble retention.



Improving land condition

Assessing grazing land condition



Grazing land condition is the capacity of grazing land to respond to rain and produce useful forage. It is a measure of how well the grazing ecosystem is functioning.

If in doubt ask yourself: ‘How would this paddock respond to rain?’ Pastures in good condition will respond by growing Perennial, Palatable and Productive (3P) pasture species with few weeds and will suffer no erosion.

Grazing land stability is the pasture’s ability to persist and retain, or recover, its function following disturbances such as drought, wildfire, overgrazing or infestation by pests or disease.

Different land types in a paddock are assessed independently of each other because of the variable soil and vegetation characteristics. For example, open bluegrass downs country in good land condition will have different soil and vegetation indicators to narrow-leaved ironbark country in good land condition.



Land condition is rated from A (good) to D (very poor). Country in A land condition facilitates the most efficient water and nutrient cycling, and energy capture and flow for the land type in question. This results in higher quality and more resilient pastures.

A (good) condition land has the following characteristics:

- healthy 3P grasses suited to the land type dominate the pasture
- no erosion and the soil surface is in good condition
- no significant weed infestations
- no (or only early signs of) woodland thickening
- 100% of original carrying capacity.

B (fair) condition land has one or more of the following characteristics:

- some decline in 3P grasses and an increase in less-favoured grasses and weeds
- some decline in soil condition and some signs of previous and/or current susceptibility to erosion
- some thickening in density of woody plants
- 75% of original carrying capacity.

C (poor) condition land has one or more of the following characteristics:

- general decline in 3P grasses, leaving weeds and annual grasses to dominate the pasture
- obvious signs of past erosion and/or high susceptibility to erosion
- general thickening in density of woody plants
- 45% of original carrying capacity.

D (very poor) condition land has one or more of the following characteristics:

- general lack of any perennial grasses or forbs
- severe erosion or scalding, resulting in a hostile environment for plant growth
- thickets of woody plants cover most of the area
- 0–20% of original carrying capacity.





Spell in the wet

Why is it more important to spell in the wet than the dry to maintain pasture health?

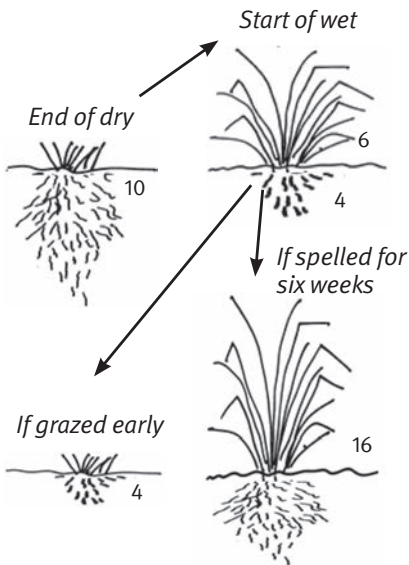
As perennial grass tussocks start to set seed and hay off at the end of summer, they relocate nutrients and energy from the top of the plant to the root system. This is why dry, hayed off grass is poor quality feed relative to new green shoots. At the end of the dry season the tops of the plants are grazed down, but the plant maintains a good store of nutrients and energy in the root system.

At the start of the wet season, the plants draw on nutrients from the roots to grow the first shoots. If these fresh shoots are immediately grazed, the plant has to keep drawing energy from the roots rather than the sun. This leaves the plant with a weak and shallow root system. If the plants are spelled early in the wet season, both the root and shoot systems can develop, building robust, high-yielding plants that are much more resilient to dry conditions and high grazing pressure.

Rules of thumb for wet season spelling

If the paddock is in poor or very poor (C or D) condition, spell the pasture during the wet season at least until the grasses have set and preferably dropped seed, phase 3 of pasture growth (see page 8 for phases of pasture growth). The amount of time it takes to reach phase 3 is determined by the weather. Hot, dry conditions will accelerate this process, but plan on the paddock being spelled for at least three months. The more time allowed, the greater the opportunity to build up grass seed reserves. The current best-bet guide is that pastures need two growing season rests to improve by one ABCD condition class (McIver et al. 2011). When growing conditions are poor, more rest periods are required.

If the paddock is in good (A) condition spell the pasture during the wet season at least until the grasses are well into the vegetative growth stage (phase 2). Plan on spelling for at least six weeks.



Wet season spelling builds robust pasture plants. Numbers represent units of energy



Phases of pasture growth

Things to keep in mind in the wet season

- Rotate the paddocks your stock graze during the wet season, to maximise the pasture growth so that different paddocks are spelled for at least part of the growing season in different years.
- Growing a forage crop can provide an opportunity to spell pasture paddocks for a couple of months.
- A small core breeding herd allows more flexibility to adjust stock numbers based on seasons.
- Big breeders are your most feed-demanding animals. A 550 kg breeder eats about 60% more on average than a 450 kg steer. So they need a lot more pasture!
- Stock smaller animals, such as weaners, at the rate you would normally stock with fully-grown animals to do the first grazing after a wet season spell. They have a much lower intake demand and put less pressure on the rejuvenating pasture.



Phase 1: Early new growth



Phase 2: Vegetative growth before seeding

Stocking rate is the fundamental management issue for any grazing enterprise. If this is not appropriate for the conditions then other management options are unlikely to overcome the resulting problem (McIvor et al. 2011).



Phase 3: Plant seeding

There are four phases of pasture growth. These phases are illustrated on the right hand side of the page.



Phase 4: Plant mature and haying off



Leave stubble in the dry

Grazing heavily in the dry season (generally the cooler months) does less damage to the health of a pasture than grazing heavily in the wet season. However, how you manage your pastures in the dry sets them up for how quickly they will respond to rain.

If you can, remove stock from the pasture before they eat down to the butts of the tussocks. The tussock butts provide the 'scaffolding' for the new shoots to grow as soon as the soil moisture levels are high enough. Additionally, these grass tussocks are an important source of attached ground cover to protect the soil surface and minimise run-off when rain falls. They also help in allowing more rain to soak into the ground and minimise evaporation.

Rules of thumb for dry season spelling

Aim to come out of the dry season with some good grass stubble left in the paddock and a minimum of 50% ground cover.

Estimate feed on hand in April/May. Calculate the number of stock that the paddock can sustain until you would normally expect a break in the season. The month of December has the highest probability of receiving 2 inches (50 mm) in less than two weeks in the Western Downs. Make sure you have enough feed to get through to at least December.

Forage budget

A basic forage budget allows an estimate of how many animals can be grazed in a paddock over a defined period while maintaining a conservative amount of grass stubble. To do this you need to know how much usable pasture is available and the intake needs of the grazing animals.

Usable pasture is everything you see in the pasture minus:

- desired residual—how much stubble you want left in the paddock at the end of the grazing period
- unpalatable—species that the stock will not eat by choice, e.g. wiregrass
- detachment/wastage—on average 15% of pasture grown ends up on the ground as litter. This figure increases with grazing intensity.

Animal demand is calculated by factoring in:

- animal class—species, age, weight and lactation state (growing, heavy or lactating animals consume more than mature, light or dry animals)
- number of stock
- quality of feed—less is consumed as quality decreases and digestion slows down
- supplementation—more dry feed is consumed with a protein supplement and less with an energy supplement.



Things to keep in mind in the dry season

- If there isn't enough feed to get you through and still leave sufficient stubble, the best options are to either reduce stock numbers or buy supplements early (end of growing season) before they are in short supply and expensive.
- Make sure you know what to feed. If there is still good dry feed left in the paddock you may only need a protein-based supplement. If there is no dry feed left you will need to consider using whole cottonseed, grain, hay and the like to supplement the energy requirements of your stock.
- Decide which classes of animals are close to reaching their production targets and identify what feed will most economically do the job.
- Pregnancy testing cows will determine if there are any dry animals that you can off-load—remember that big breeders are your most feed-demanding animals.

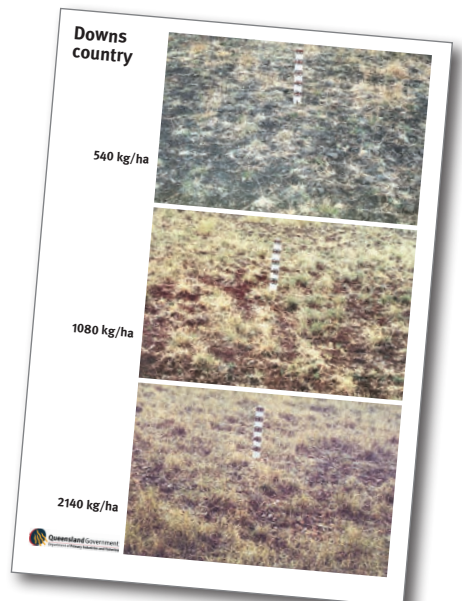
Downs country photostandard example demonstrates how feed quantity is assessed

When the dry season keeps going

If there has been little or no rain by January, it might be worth reducing stock numbers earlier rather than later.

Generally a late start to the wet season means less bulk of feed will grow before the following dry season.

If other regions have had some rain, there is usually some 'mud money' around early in the year and there may be an opportunity to off-load some dry stock while prices are at a premium.





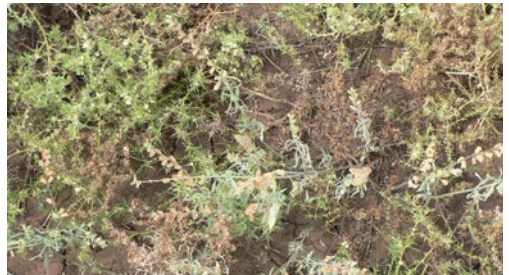
Managing problems in old cultivation

Broadleaf weeds and annual grasses often dominate pastures growing in old cultivation country. These paddocks are often abandoned due to declining productivity. Years of cropping and conventional tillage have left them starved of nutrients and organic matter. Most are chronically low in nitrogen. Weeds can be controlled and pastures regenerated using a combination of the following strategies:

- Spell after rain to allow 3P species to seed and spread.
- Spray broadleaf herbicide to remove problem weeds.
- Cultivate, fallow and re-sow pasture using best-practice techniques. This includes correcting any soil nutrient deficiencies with fertiliser at sowing, and where possible, incorporating a legume into the pasture to minimise future productivity decline due to nutrient run-down.
- In smaller paddocks it may be feasible to slash the upper canopy early to allow better coverage of herbicide and allow small grass seedlings to better compete for light, nutrients and water.



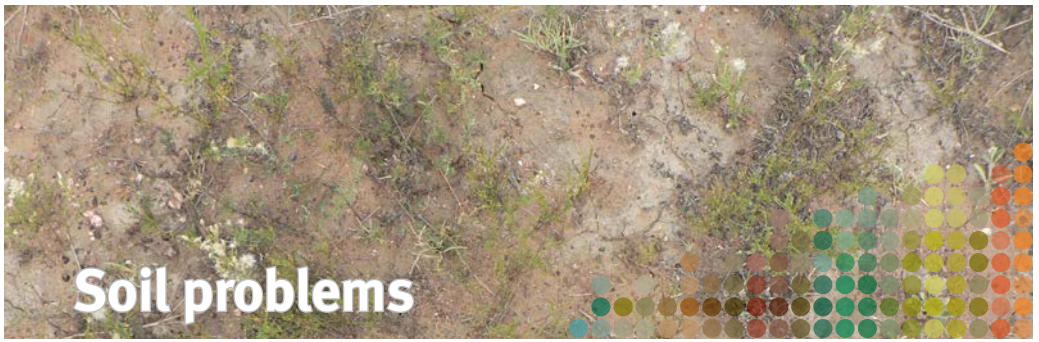
Broadleaf weeds dominate old cultivation



Roly poly and mintweed provide short-term ground cover in this paddock



Cotton bush and small annuals have taken over this old cultivation



Soil problems

Over time, established pastures experience nutrient run-down, structural problems such as compaction and surface sealing, and low organic matter levels.

Strategies to improve soil condition include:

- **Spelling and accumulation of organic matter.** Similar to putting hay on your garden, the more organic matter on the soil surface, the more favourable the environment for primary decomposers to incorporate organic matter into the topsoil.
- **Cultivation to break sealed and compacted surface layers** to improve water infiltration. This is a short-term strategy and its value is quickly lost unless followed by spelling and accumulation of organic matter.
- **Slashing weeds and rank grass** to provide mulch on the soil surface and stimulate old grass plants to reshoot. A similar result can be achieved with a large mob of cattle grazing the paddock for a short period of time.
- **Applying fertiliser at sowing**, and where viable, throughout the life of the pasture, to prolong pasture vigor.
- **Sowing legumes** into the paddock to boost long-term soil nitrogen levels.



Rocky paddocks are difficult to cultivate and best managed as perennial pasture



Yellowing pastures indicate nitrogen deficiency



Little water is absorbed and available to plants when the soil surface becomes hard and compact



Case studies



Case study 1—Talmoi

Talmoi is in the Jinghi subcatchment.

Land type

Cleared brigalow, belah and softwood scrub on a brown cracking clay.

Rainfall

Long-term average 653.8 mm

07–08 738 mm

08–09 776.5 mm

09–10 502 mm

Historical management

This paddock was continuously and conventionally farmed until 2003 when it was sown to a mixture of Rhodes, bambatsi, premier digitaria, floren blue, creeping blue and lucerne. Marginal germination and poor follow-up rainfall resulted in the death of a significant proportion of established plants over the following three years. Rhodes grass suffered the most in the dry conditions.

Land condition problems

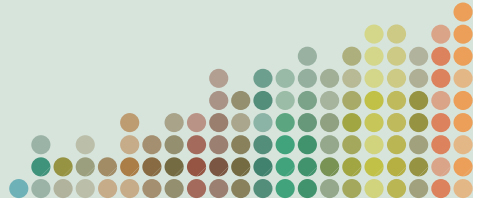
Although this paddock had an overall land condition rating of C, there were areas that were still in fair condition (B condition), particularly along the contour lines and lower margins of the paddock. The worst affected area of the paddock was along the top contour, which was dominated by broadleaf weeds.

Recovery strategy

1. **Slash the weeds** along the top contour in late spring to provide ground mulch and open up the canopy to allow small grass plants to grow.
2. **Scarify the soil surface** to improve short-term water infiltration and stimulate weed germination.
3. **Follow-up spray** with a residual broadleaf herbicide to kill existing and newly germinated weeds.
4. **Spell** over the subsequent wet seasons.

Results

After three years this paddock was turned into A land condition with an average ground cover of greater than 80%. The pasture was dominated by healthy 3P grass tussocks and many new seedlings were establishing. Where bambatsi and Queensland blue appeared to be the only recognisable 3P species in 2007, by 2010, creeping blue, premier digitaria and floren blue were common species.



November 2007: After slashing



November 2007: Bambatsi regenerating



May 2010: Diversity of 3P grasses improving and dense population of healthy plants





Case study 2—Ivory Creek

Ivory Creek is in the Jinghi subcatchment.

Land type

Loamy alluvial flat of cleared poplar box on a hard-setting sodic duplex soil changing to a deep yellow-brown sand with narrow-leaved ironbark, rough-barked apple and cypress along the upper slopes of the paddock boundary.

Rainfall

Long-term average 653.8 mm

07–08 610.5 mm

08–09 689 mm

09–10 407 mm

Historical management

This demonstration paddock was continuously and conventionally farmed until 2002, when it was returned to pasture by spreading Rhodes grass. A creek bounds the north-eastern side of the paddock and provides the only water to livestock. Stock could only graze the paddock when the creek was holding water. Kangaroos living in the dense timber in the hills of the neighbouring paddock significantly increased the grazing pressure in the paddock. Old fences were ineffective at preventing stock from entering the paddock even if they were locked out. When gates were open, cattle preferentially grazed this paddock over neighbouring paddocks.

Land condition problems

Broadleaf weeds and annual grasses dominated this paddock. Common species included slender chloris, pigweed, liverseed

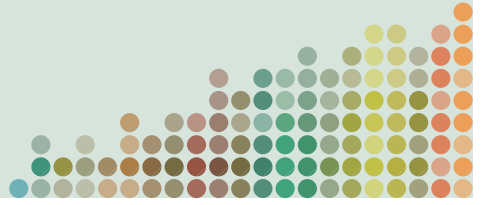
grass, daisy burr, fairy grass, peppergrass, euphorbia species, Mueller’s saltbush, Mayne’s pest and Queensland blue. Sheet erosion of soil near the creek had rendered the soil surface hard, gravelly and relatively impermeable to water and in the poorest condition.

Recovery strategy

1. **Install fence** to split the paddock in half and secure the perimeter to exclude stock.
2. **Cultivate, fertilise and sow** one half of the paddock with a light soil pasture mix (Rhodes, premier digitaria, creeping blue).
3. **Break surface seal** using offset discs in the worst areas of the other half of the paddock.
4. **Spell** both sections of the paddock over the following wet seasons.

Results

Cultivating and re-sowing grass resulted in a quick return to A land condition in the cultivated area due to an almost immediate increase in 3P grass density. There is a risk that the Rhodes grass dominated sown pasture could quickly deteriorate in condition due to the cultivar’s sensitivity to prolonged dry conditions and hunger for nutrients. In the other half of the paddock, spelling alone saw a slower improvement to B land condition. This was accounted for by an improvement in the health of existing species plus the seeding and germination of new native grass plants.



November 2007: Paddock dominated by small annuals and cottonbush; hard-setting soil



2010: Spelled only treatment



2010: Sown and spelled treatment



Case study 3—Diamondy

Diamondy is in the Jinghi subcatchment.

Land type

There are three dominant land types: mountain coolibah ridge on clay; poplar box and moreton bay ash on alluvial sandy loam; and undulating eucalypt forest on shallow gravelly sand.

Rainfall

Long-term average 653.8 mm

07–08 715.75 mm

08–09 532.5 mm

09–10 536.5 mm

Historical management

The paddock has been continuously set-stocked with breeders that have preferentially grazed the ridge. Most paddocks on Diamondy are burnt every few years to improve feed quality and control eucalypt regrowth. This practice has not occurred in recent years due to poor soil moisture levels.

Land condition problems

On initial inspection, the ridge was sparsely covered with broadleaf weeds, such as Mayne's pest, annual grasses and wiregrass. Die-back of old trees along the ridge was evident. A mixture of land types has led to patchy grazing across the paddock with breeders spending a large proportion of their time grazing along the ridge. A water trough positioned along the ridge attracts animals to this area. The clay soil along the ridge is

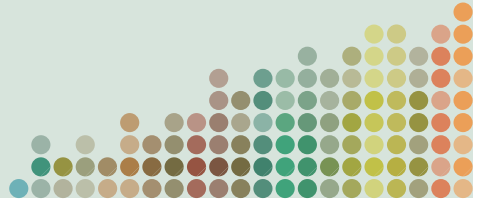
likely to have higher phosphorus levels than the lighter land types surrounding and this would entice cattle to selectively graze this land type.

Recovery strategy

1. **Spell** paddock over the wet season.
2. **Burn** rank grass along the alluvial flats and eucalypt forest to improve grazing distribution.

Results

Three years of regular wet season spelling resulted in the gradual reduction in broadleaf weeds and subsequent increase in perennial grasses on the coolibah ridge. Unpalatable wiregrass species were still the most prevalent of these perennial grasses and therefore the paddock remained in C land condition. Moving from an annual dominant pasture to a more perennial dominant pasture is the first step in stabilising the land condition. Burning to improve grazing distribution in the paddock could not be used as a strategy in this demonstration due to unfavourable weather conditions over the period of the project.



November 2007: Looking across and into the pasture



May 2010: Grass density and yield improving but wiregrass and annuals still dominant



Case study 4—Wilga Park

Wilga Park is in the Jimbour Uplands subcatchment.

Land type

Half of the paddock is cleared mountain coolibah on a heavy black cracking clay along a basalt ridge, while the other half consists of cleared vine scrub on a red loam around the sloping margins of the paddock.

Rainfall

Long-term average	660.7 mm
07–08	544.25 mm
08–09	538.5 mm
09–10	528.5 mm

Historical management

The paddock was continuously and conventionally farmed until 2002 when the paddock was sown to green panic, katambora Rhodes, purple pigeon and lucerne. In August 2007, the paddock was sprayed with non-selective herbicide and chisel ploughed twice in preparation for planting. First, silk sorghum was planted with an air-seeder and later buffel, premier digitaria, fine cut Rhodes and bisset creeping bluegrass were spread over the cultivated country using a Seabrook seeder and chains. The silk sorghum was sown mainly to provide some cover and feed in case the summer rain did not eventuate. The paddock is normally spelled over summer for three to four months; however, weaners had been fed in this paddock for the past couple of years with lick and cottonseed.

Land condition problems

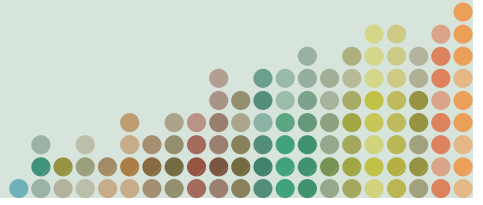
Broadleaf weeds such as mintweed, Mayne's pest, turnip weed, wild mustard, peppergrass and bogan flea dominated the paddock. Couch grass also encroached on the hill slopes.

Recovery strategy

1. **Spray, plough and sow** paddock with a cover crop of silk sorghum.
2. **Re-sow** paddock to pasture species using a Seabrook seeder and chains.
3. **Wet season spell.**

Results

Cultivating and sowing this paddock was a quick and effective means of controlling weeds and thus resulted in an immediate improvement in composition from annual weeds to perennial grasses. On the heavy clay soil this composition was dominated by the short-lived perennial silk sorghum and purple pigeon grass. It is for this reason that the overall condition rating in 2010 was B instead of A. On the lighter soils in the paddock, buffel was the dominant species. Although it was dense and healthy, the area was not great enough to warrant a return of the entire paddock to A land condition.



November 2007: Freshly sown paddock



May 2010: distinct change from purple pigeon to buffel where land type changes



Case study 5—Symsdale

Symsdale is in the Jimbour Uplands subcatchment.

Land type

Undulating cleared brigalow softwood scrub on a brown cracking clay soil.

Rainfall

Long-term average	660.7 mm
07–08	555.5 mm
08–09	770.5 mm
09–10	408.5 mm

Historical management

This paddock was originally covered with brigalow suckers, woody weeds and native pasture. In 2000, the paddock was ploughed and contoured, then green panic and Rhodes grass were sown along the contour lines. The paddock was then cropped with oats, wheat and sorghum. Problems with erosion and grain yields prompted a change back to pasture. In spring 2007, the paddock was scarified twice and then buffel seed was spread on the surface. Monitoring on Symsdale did not commence until early 2008.

Land condition problems

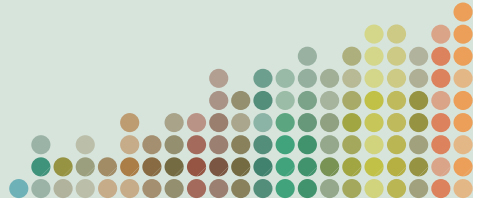
Broadleaf weeds and annual grasses dominated the paddock.

Recovery strategy

1. **Slash** broadleaf weeds prior to seeding to open up canopy for grass seedlings.
2. **Spray** a residual broadleaf herbicide to control broadleaf weeds over the wet season.
3. **Wet season spell.**

Results

Weed suppression via broadleaf herbicide was a very successful, non-invasive means of improving land condition in this paddock. By 2010, buffel grass was providing the bulk of pasture yield in the paddock; however, due to the remaining presence of weeds and the moderate density of grass it was still only worthy of a B and not an A land condition rating. The areas of the paddock which had not been sprayed with herbicide were still covered in a mat of roly poly and mintweed. It is anticipated that with continued spelling and vigilant grazing management the mat of buffel seed distributed in the bare patches should germinate and quickly fill in the bare patches and return the paddock to A condition in the following year.



March 2008: Paddock dominated by mintweed and soft roly poly



May 2010: Pasture dominated by buffel



Bare areas where herbicide not applied



Case study 6—Strath-Vale

Strath-Vale is in the Jimbour Uplands subcatchment.

Land type

Cleared basaltic, flat-topped hill with a shallow, stony brown clay loam bounded by steep eucalypt-covered slopes.

Rainfall

Long-term average 660.7 mm

07–08 564 mm

08–09 766 mm

09–10 520 mm

Historical management

This paddock was continuously and conventionally grain cropped until the early 1990s. Native pasture has gradually established. This paddock has historically grazed breeders continuously with numbers dropping in the past three years due to drought.

Land condition problems

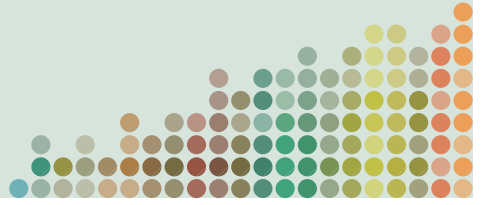
Broadleaf weeds dominate the pasture in the old cultivation country. Couch grass is encroaching over the western side of the paddock. There are limited spelling opportunities if no forage crop or grain crop residual is available in other paddocks throughout the year.

Recovery strategy

1. **Spray** broadleaf herbicide on worst affected areas to reduce competition from weeds.
2. **Wet season spell.**
3. **Fence** paddock into two sections.

Results

The greatest impact that spelling and herbicide application had on this paddock was the increase in the bulk yield and grass seed available in the pasture. However, the paddock was still in C land condition at the end of the project. Although the frequency and yield of Queensland blue had noticeably improved, pitted blue, wiregrass and annual grasses still dominated the bulk of the pasture, stopping it from moving up a condition rating. The grazing enclosure erected in the paddock received an additional year of wet season spelling and a significant difference could be seen in pasture density and composition. It is hoped that a subsequent year of spelling in the rest of the paddock will achieve a similar result and upgrade in land condition.



March 2008: Paddock dominated by mintweed and soft roly poly



2009–2010: Grasses providing bulk of yield but only a small proportion 3P species

