Sturt Plateau District

Understanding the productivity of grazing lands

Land Condition Guide

Further information on land condition can be found through the Grazing Land Management (GLM) workshops. For information about the GLM courses available in the Northern Territory please contact the Department of Resources on 8973 9763.

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Land Condition Guide
Introduction

This booklet is a pastoral land condition assessment tool that has been produced to assist land managers.

Land condition can be described as the ability of land to respond to rainfall and produce useful forage. Country in good condition is robust and can recover quickly from stresses such as grazing, fire or a few dry years.

Land in poor condition is lacking in productive perennial pastures and is often affected by soil erosion due to a decline in ground cover and the stabilising effects of perennial grass tussocks and roots.

Often land is somewhere between good and poor condition where pastures are in some state of decline or soil condition is starting to deteriorate. It is important to understand what processes are causing the decline so that changes in management can be implemented before land condition declines further.

Good condition ⟶ Poor condition

To assess a given area for land condition we look at FOUR major features of the landscape: pasture structure and composition, soil condition, presence of weeds and woodland structure. Table 1 outlines how these features change with varying land condition states and what criteria must be met to assign an area to a land condition group.

Land condition is divided into 4 categories A, B, C and D condition with A condition being the best and D condition the worst.

Table 1

Land Condition	Soil	Pasture	Weed	Woodland
A **(All** of these features)	No erosion and good surface condition	Good coverage of 3P grasses,* little bare ground (<30%) in most years	Few weeds and no significant infestations	No signs of woodland thickening
B (**At least one or more** of these features)	Some signs of previous erosion and some current signs of erosion risk	Some decline in the presence of 3P grasses and/or bare ground (more than 30%, but less than 50% in most years)	Small infestations of weeds	Some thickening in the density of woody plants
C (**One or more** of these features)	Obvious signs of past erosion and/or current susceptibility to erosion	General decline in the presence of 3P species and/or bare ground (>50% in most years)	Obvious presence of weeds	General thickening in the density of woody plants
D (**One or more** of these features)	Severe erosion, scalding or compaction resulting in a hostile environment for plant growth	General lack of any perennial grasses or forbs	Large weed infestations covering significant areas	Thickets of woody plants that cover significant areas

*3P grasses = Palatable, Productive Perennial grasses

Soil

Good soil condition is important for healthy plant growth. The uppermost layer of the soil is known as top soil or the A horizon. This layer is anywhere from a few cm to 20+ cm deep and is where seed germination occurs and plants concentrate their roots for stability and nutrient uptake. When top soil is eroded, plants struggle to establish which leads to less ground cover and subsequently higher rates of runoff, reduced infiltration of rain water and further erosion.

The key to maintaining soil condition is good plant cover. Plant tussocks and leaf litter provide barriers which slow the velocity of water and wind and reduce resource loss from the system.

Types of soil erosion

These are some of the erosional processes that may occur in land with declining land condition.

Rills and Gullies

Channels cut upslope by flowing water, often initiated by water flowing down a cattle pad, fence line or road.

Terracettes

Small abrupt walls 1-10cm high cut into the slope and aligned with the contour.

Sheeting or sheet erosion

Progressive removal of thin layers of soil across extensive areas.

Scalding

The loss of A horizon material to expose a hard-setting subsurface horizon.

Hummocking

Confined to soils with coarse textured surface layers such as sand and is the result of accumulation of wind borne material around obstructions.

Pedestalling

Removal of soil from around obstructions (commonly plants) to leave them perched on a mound above the surrounding soil surface.

Rill erosion   **Sheet erosion**   **Pedestalling erosion**

Pasture

The presence of palatable productive perennial grasses (3P's) in most cases indicates good land condition. These species are the first to disappear under heavy grazing and are often replaced by less productive grasses and forbs. Carrying capacity is therefore reduced because there is less palatable forage for stock.

Some land types such as those dominated by spinifex don't typically meet the 3P grass criteria for good land condition. While spinifex is not as productive or palatable as other 3P grasses, it is perennial and can facilitate good land condition when other land condition components are maintained.

Areas of land in good condition have healthy soils that provide water and nutrients for plants to grow. In return, the plants help protect the soil and return nutrients through decomposing leaf litter. Carbon is also captured and stored effectively where good land condition occurs. When land condition declines, the cycle is broken and resources such as nutrients and water are lost from the system.

The solid lines represent the movement of resources such as nutrients, water or vegetative cover such as leaves. The dashed lines show how the grass tussocks encourage the retention of these resources so they remain available to the surrounding plants.

Land in poor condition often has wide spaces between grass tussocks which allow resources to leave the local ecosystem. More bare ground also leads to greater rates of erosion by wind and water which accelerates the decline in land condition.

A modification in grazing strategies can assist in improving pasture condition. Wet season spelling, rotational grazing and stocking rate adjustments can encourage the re-establishment of preferentially grazed pasture species and increase ground cover.

Strategic burning can also be used to manage pastures by removing rank growth and modifying grazing distribution. In the Sturt Plateau district, a low-moderate intensity fire before the wet season can encourage cattle to be less selective when grazing new growth. At least 1500kg/ha is required to successfully burn under these conditions.

Annual-dominated pastures do not respond well to fire. As annual species only live for one year, a fire can completely remove ground cover until the next rains occur and seeds are germinated. If fire occurs before the annual species have set seed then the seed bank is depleted and even good rain may not produce much forage.

Weeds and woody thickening

A decline in land condition is not always a decline in vegetative growth. A weed infestation or woody thickening will also decrease land condition while maintaining some of the "good" condition characteristics such as ground cover. However weeds and woody thickening can have a large impact on land condition because they require more intensive and expensive management techniques to rectify.

Weeds, trees and shrubs in large numbers affect land condition by competing with pastures for nutrients, water and sunlight. Minor weed infestations or woody thickening can quickly spread to dominate the landscape, inhibiting pasture growth and making them less viable for cattle production.

Studies conducted in the VRD and Katherine region show that trees can reduce pasture growth by up to 50%. However, total clearing of trees is not recommended in extensive grazing systems due to the costs of controlling tree regrowth. The most effective way to maintain good tree basal area is with appropriate fire and grazing management.

Burning conditions required for various weed and woody management objectives.

Management Objective	Fire intensity	Fuel Load (kg (dry matter)/ha)	Season of burn
Maintaining woody vegetation structure	Moderate-High	2000-3000	April-October
Change woody vegetation structure, control exotic weeds	High-very high	2500-4500	August-October
Hazard reduction – reducing risk of wildfire	Low-moderate	>1500-2000	March-June

Hyptis suaveolens **is a common weed on red earths in the region**

The ABCD Land Condition Framework

The ABCD land condition framework provides land managers with a standardised approach for assessing the capacity of their land to respond to rainfall.

Figure 1
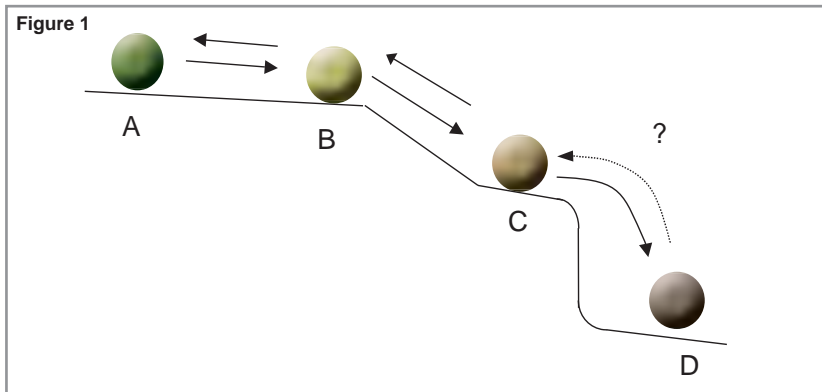
In the ABCD framework, land condition can be represented by a ball sitting on a slope. The further the ball travels down the slope, the poorer the land condition. The slope of the line represents the relative management effort required to reverse the change in land condition. As land condition declines, the slope becomes steeper which makes improving land condition more labour intensive, expensive and time consuming the further it declines.

Land in 'A' condition is relatively stable. Land that is trending towards 'B' condition can be fairly quickly reverted to 'A' by small changes in management.

However, land in 'B' condition is susceptible to a quick decline to 'C' condition. Reversing this change may require more significant changes in management and will take some time to occur.

Land in 'C' condition is very susceptible to falling rapidly to 'D' condition. Land in 'D' condition will not revert to 'C' condition by simply changing management, at least not in any time frame of practical interest to grazing land management. Improving land in 'D' condition to 'C' condition requires a large input of external energy (mechanical and/or chemical), and even this may be insufficient if soil condition has been severely damaged.

Understanding land systems

The term 'land system' describes areas of similar soil and vegetation patterns. Land systems are widely used and referred to because they have been quantified by field surveys and mapping. 'Land units' are a more detailed measure of land systems and describe unique areas of specific soils and vegetation. Each land system usually contains a number of land units.
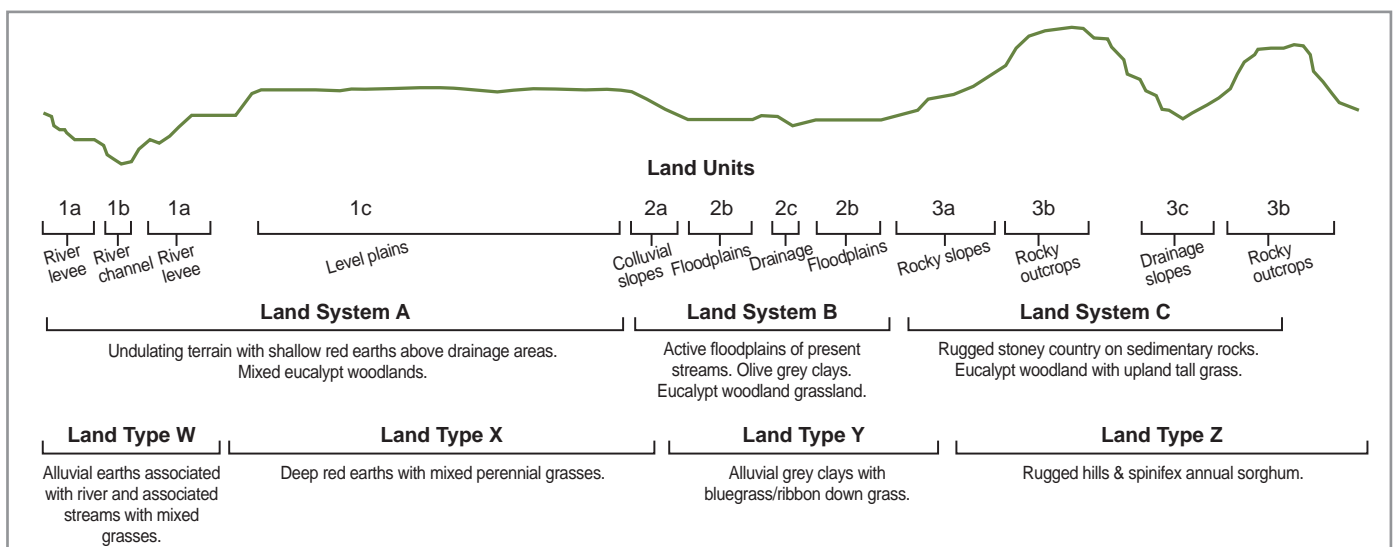
'Land type' is another term commonly used and it refers to specific soil and vegetation features. These are more commonly 'layman's' terms and often are described by the dominant soil, tree or pasture species, for example Relic floodplains or Perennial grasses on northern red soils. They are generally broad and can occur over a number of land systems. For example, Banjo and Brolga are different land systems due to the nature of their geology, but are both the same land type; Perennial grasses on northern red soils.

Using this guide

This guide includes information on pasture growth and carrying capacity for a selection of land systems in the region. Above the land system name is a general land type description. This will help you identify which pages are most suitable to land systems not mentioned in the booklet.

Use the land system photos in conjunction with the land condition assessment table on page 2 to help you identify your pastures and what condition they are in.

A Condition

| Recommended utilisation rate |
| 20% |
| Pasture growth expected in 50% of years |
| 850 - 2200 kg/ha |
| Desirable species % |
| >80% |
| Carrying Capacity (AE's/km²) |
| 4.5 - 12 |

Utilisation rate is the proportion of pasture growth that can be consumed while maintaining good land condition.

Pasture growth values are based on median annual rainfall (the expected annual rainfall in 50% of years). Annual rainfall can vary within a region, and this will affect how much pasture grows. Where this is the case a range of expected pasture growth values have been given that represent the lowest to the highest across the region that the land system occurs in.

Carrying capacity is the average long term stocking rate that can be carried safely. Because of differences in average rainfall across geographical areas a range of expected pasture growths have been used in the calculations.

$$Carrying\ capacity = \frac{Pasture\ growth * Utilisation\ rate * 100}{Forage\ demand}$$

(times by 100 is conversion from ha to km²)

Forage demand = annual animal intake per AE (3650kg/year)
AE = Adult equivalent (One AE = One 450kg dry cow)
Carrying capacity is expressed as AE's /km²

Carrying capacity assumptions and notes

Long term carrying capacity is the average number of animals that a paddock can be expected to support over a planning horizon (5-10 years) without affecting land condition.

Pasture growth estimates have been calculated using models created from data collected from monitoring sites across the NT.

Carrying capacity figures assume all land is within 3-5km of water (depending on terrain).

Discounts for pasture growth for land condition changes have been calculated using GLM principles

Table 2

Land Condition	Discount applied to pasture growth	Land Condition	Discount applied to pasture growth
A	100% of A condition pasture growth	C	45% of A condition pasture growth
B	75% of A condition pasture growth	D	20% of A condition pasture growth

Pasture growth may vary outside of the given ranges depending on the type of land condition decline you have. Where high yielding weeds and undesirable plants invade, pasture growth values may actually be higher but the overall productivity of useful forage or carrying capacity would be reduced.

Utilisation rates are based on research work conducted across northern Australia. As a general rule, recommended utilisation rates are 20% for robust black soils, 15% for productive red soils with perennial grasses, 10% for poorer red soils with a mix of less palatable perennial and annual grasses and 5% for spinifex dominated land types.

Utilisation rate recommendations and carrying capacity figures have been excluded for land in D condition. While pastures in this condition can grow limited grass, it is not recommended that these areas be grazed until land condition can be improved..

Perennial grasses on northern red soils

Banjo land system

Dominant Pastures
Plume sorghum (*Sorghum plumosum*)
Ribbon grass (*Chrysopogon fallax*)
Kangaroo grass (*Themeda triandra*)

Other Pastures
Spinifex (*Triodia pungens*)
White grass (*Sehima nervosum*)

Other Shrubs
Quinine bush (*Petalostigma pubescens*)

Dominant Trees
Grey box (*Eucalyptus patellaris*)
Inland bloodwood (*Corymbia terminalis*)
Rusty bloodwood (*Corymbia ferruginea*)

Other Trees
Variable bark bloodwood (*Corymbia dichromophloia*)

Description
Gently undulating to almost level plains; predominantly loamy red earths with gravelly red and yellow earths and lithosols.

Pastoral Value
Moderate pastoral value. Suitable for pasture improvement on almost level plains with minor limitations. Low forage quality in the dry season.

Management Implications
Benefits from strategic burning to manage woody thickening.

A Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
2600 kg/ha
Desirable species %
>80%
Carrying Capacity (AE's/km²)
10.5

B Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
1950 kg/ha
Desirable species %
50 – 80%
Carrying Capacity (AE's/km²)
8

C Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
1200 kg/ha
Desirable species %
25 – 50%
Carrying Capacity (AE's/km²)
5

D Condition

Recommended utilisation rate
0%
Pasture growth expected in 50% of years
500 kg/ha
Desirable species %
0 – 25%
Carrying Capacity (AE's/km²)
0

Bulwaddy country

Bulwaddy land system

Dominant Pastures
White grass (*Sehima nervosum*)
Plume sorghum (*Sorghum plumosum*)
Ribbon grass (*Chrysopogon fallax*)

Other Pastures
Kangaroo grass (*Themeda triandra*)
Soft spinifex (*Triodia pungens*)
Feathertop wiregrass (*Aristida latifolia*)

Other Shrubs
Quinine bush (*Petalostigma pubescens*)
Yellowjack *(Terminalia canescens)*
White plum *(Fluggea virosa)*

Dominant Trees
Bulwaddy (*Macropteranthes kekwickii*)
Variable bark bloodwood *(Corymbia dichromophloia)*
Ironwood *(Erythrophleum chlorostachys)*

Other Trees
Lancewood (*Acacia shirleyi*)
Snappy gum (*Eucalyptus leucophloia*)
Glossy-leaf Box *(Eucalyptus chloropylla)*
Grey Box *(Eucalyptus patellaris)*

Description

Gently undulating terrain comprising frequent rises and associated slopes; lithosols, gravelly earths and deep loamy red earths; dense Bulwaddy shrublands to Eucalypt woodlands.

Pastoral Value

Moderate pastoral value, low forage value in dry season.

Management Implications

Benefits from strategic burning to manage woody thickening.

A Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
2150 – 2350 kg/ha	
Desirable species %	
>80%	
Carrying Capacity (AE's/km²)	
9.5	

B Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
1600 – 1750 kg/ha	
Desirable species %	
50 – 80%	
Carrying Capacity (AE's/km²)	
6.5 – 7	

C Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
950 – 1050 kg/ha	
Desirable species %	
25 – 50%	
Carrying Capacity (AE's/km²)	
4 – 4.5	

D Condition

Recommended utilisation rate	
0%	
Pasture growth expected in 50% of years	
450 kg/ha	
Desirable species %	
0 – 25%	
Carrying Capacity (AE's/km²)	
0	

Variable sandy and loamy red soils

Elsey land system
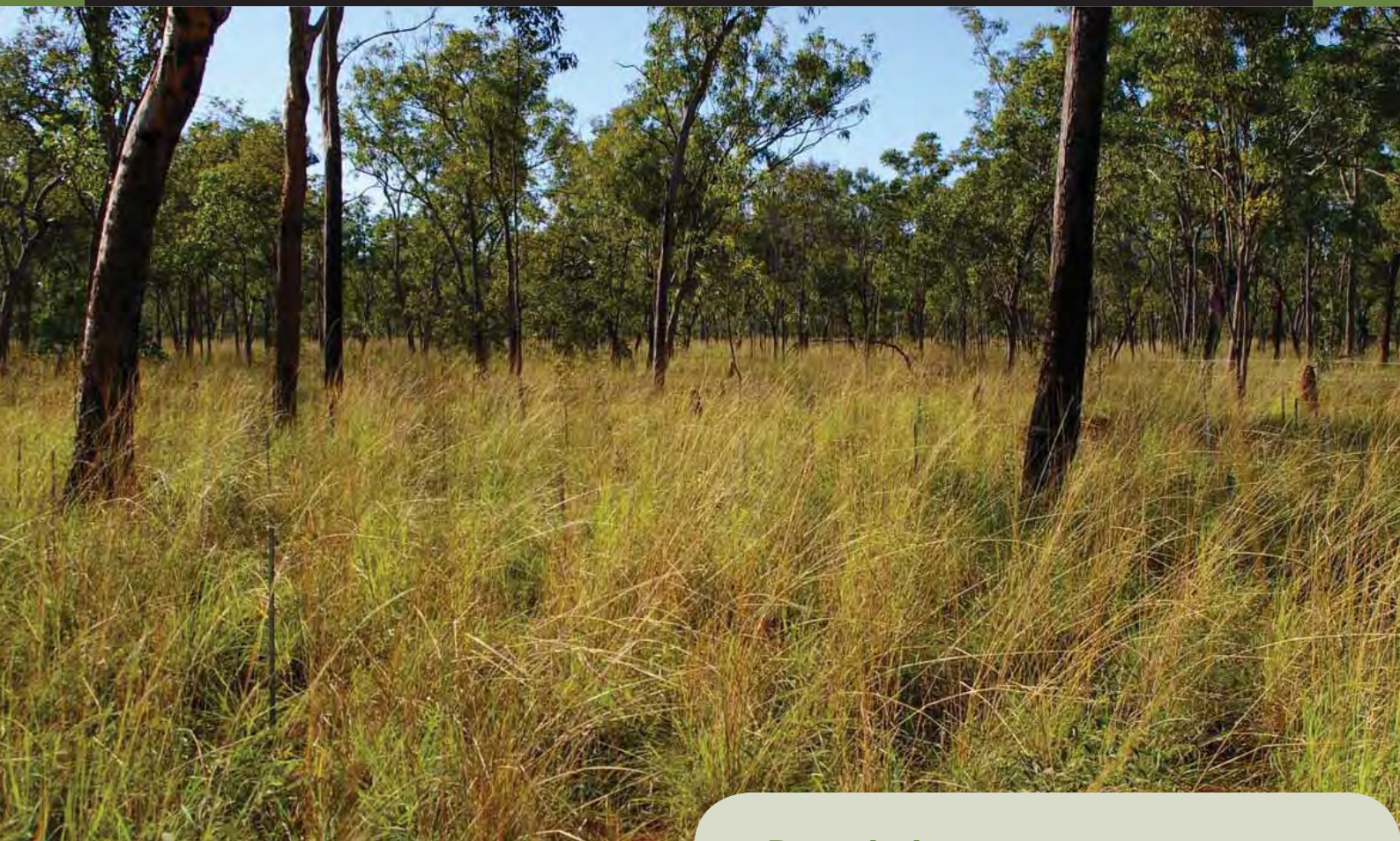
Description

Gently undulating to almost level plains, slightly lower than surrounding land systems, characterised by a considerable proportion of large closed depressions. Variable depth, sand and loamy red earths.

Pastoral Value

Low-moderate pastoral value. Soils have reduced water holding capacity which limits growth of pasture during the late wet and early dry. Highly variable with some closed depressions with heavier soils and high pasture growth with increased pastoral value.

Management Implications

Sandy soils may be prone to erosion when ground cover decreases under heavy grazing. High variability in soil and pasture types may lead to patchy grazing. Benefits from strategic burning to manage woody thickening and grazing distribution.

Dominant Pastures
Plume sorghum *(Sorghum plumosum)*
Ribbon grass *(Chrysopogon fallax)*
Spinifex *(Triodia pungens)*
Wanderrie grass *(Eriachne* species*)*

Other Pastures
White grass *(Sehima nervosum)*
Perennial sorghum *(Sorghum interjectum)*

Dominant Trees
Rusty bloodwood *(Corymbia ferruginea)*
Ironwood *(Erythrophleum chlorostachys)*
Grey box *(Eucalyptus patellaris)*
Darwin box *(Eucalyptus tectifica)*
Woollybutt *(Eucalyptus tetrodonta)*
Inland bloodwood *(Corymbia terminalis)*

A Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
2400 – 2600 kg/ha
Desirable species %
>80%
Carrying Capacity (AE's/km²)
10 – 10.5

B Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
1800 – 1950 kg/ha
Desirable species %
50 – 80%
Carrying Capacity (AE's/km²)
7.5 – 8

C Condition

Recommended utilisation rate
15%
Pasture growth expected in 50% of years
1100 – 1200 kg/ha
Desirable species %
25 – 50%
Carrying Capacity (AE's/km²)
4.5 – 5

D Condition

Recommended utilisation rate
0%
Pasture growth expected in 50% of years
500 kg/ha
Desirable species %
0 – 25%
Carrying Capacity (AE's/km²)
0

Relic floodplains

Larrimah land system

Dominant Pastures
Plume sorghum (*Sorghum plumosum*)
Ribbon grass (*Chrysopogon fallax*)
Silky browntop (*Eulalia aurea*)
Feathertop wiregrass (*Aristida latifolia*)

Other Pastures
Mitchell grasses (*Astrebla* species)
Annual sorghum (*Sorghum timorense*)
Kangaroo grass (*Themeda triandra*)
Cockatoo grass (*Alloteropsis semialata*)
Bluegrasses (*Dicanthium* species)

Other Shrubs
Conkerberry (*Carissa lanceolata*)
Supplejack (*Ventilago viminalis*)
Rosewood (*Terminalia volucris*)

Dominant Trees
Coolibah (*Eucalyptus microtheca*)
Bauhinia *(Bauhinia cunninghamii)*

Other Trees
Nutwood (*Terminalia arostrata*)
Inland bloodwood *(Corymbia terminalis)*

Description

Floodplains not associated with present streams; olive brown, brown and grey clays, some yellow earths.

Pastoral Value

Moderate to high pastoral value.

Management Implications

Susceptible to overgrazing if occurring in small pockets surrounded by less fertile red soils. Benefits from wet season spelling.

A Condition

Recommended utilisation rate	
20%	
Pasture growth expected in 50% of years	
2750 – 3900 kg/ha	
Desirable species %	
>80%	
Carrying Capacity (AE's/km^2)	
15 – 21	

B Condition

Recommended utilisation rate	
20%	
Pasture growth expected in 50% of years	
2000 – 2900 kg/ha	
Desirable species %	
50 – 80%	
Carrying Capacity (AE's/km^2)	
11 – 16	

C Condition

Recommended utilisation rate	
20%	
Pasture growth expected in 50% of years	
1250 – 1800 kg/ha	
Desirable species %	
25 – 50%	
Carrying Capacity (AE's/km^2)	
7 – 10	

D Condition

Recommended utilisation rate	
0%	
Pasture growth expected in 50% of years	
550 – 800 kg/ha	
Desirable species %	
0 – 25%	
Carrying Capacity (AE's/km^2)	
0	

Perennial grasses on southern red soils

Sturt land system

Description

Almost level to gently undulating plains on the plateau surface; lacking drainage lines; variable depth red earth soils with or without gravel; mixed eucalypt woodlands and perennial grasses.

Pastoral Value

Suitable for pasture improvement, moderate to high grazing potential, but low forage quality in the dry season.

Management Implications

Benefits from strategic burning to manage woody thickening.

Dominant Pastures
Kangaroo grass (*Themeda triandra*)
Plume sorghum (*Sorghum plumosum*)
Ribbon grass (*Chrysopogon fallax*)

Other Pastures
Soft spinifex (*Triodia pungens*)
White grass (*Sehima nervosum*)

Dominant Trees
Grey box (*Eucalyptus patellaris*)
Southern box (*Eucalyptus argillacea*)
Ironwood (*Erythrophleum chlorostachys*)

A Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
3100 – 3250 kg/ha	
Desirable species %	
>80%	
Carrying Capacity (AE's/km²)	
13	

B Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
2350 – 2450 kg/ha	
Desirable species %	
50 – 80%	
Carrying Capacity (AE's/km²)	
10	

C Condition

Recommended utilisation rate	
15%	
Pasture growth expected in 50% of years	
1450 kg/ha	
Desirable species %	
25 – 50%	
Carrying Capacity (AE's/km²)	
6	

D Condition

Recommended utilisation rate	
0%	
Pasture growth expected in 50% of years	
650 kg/ha	
Desirable species %	
0 – 25%	
Carrying Capacity (AE's/km²)	
0	

Species list

Sturt Plateau

Desirable perennial grasses

Plume sorghum	*Sorghum plumosum*
Perennial sorghum	*Sorghum interjectum*
Ribbon grass	*Chrysopogon fallax*
Kangaroo grass	*Themeda triandra*
Flinders grasses	*Iseilema* species
Bluegrasses	*Dicanthium* species
Silky browntop	*Eulalia aurea*
Mitchell grasses	*Astrebla* species
Cockatoo grass	*Alloteropsis semialata*
Desert bluegrass	*Bothriochloa ewartiana*
Broad-leaf ribbon grass	*Chrysopogon latifolius*

Intermediate value grasses (perennials and annuals)

Soft spinifex	*Triodia pungens*
White grass	*Sehima nervosum*
Wanderrie grass	*Eriachne* species
Annual sorghum	*Sorghum timorense*
Black speargrass	*Heteropogon contortus*
Native couch	*Brachyachne convergens*

Less desirable grasses (perennial and annual)

Feathertop wiregrass	*Aristida latifolia*
Northern kerosene grass	*Aristida hygrometrica*

Less desirable forbs

Spurges	*Euphorbia* species
Rattlepod	*Crotalaria* species
Tick weed	*Cleome viscosa*
Chaff flower	*Achyranthes aspera*
Sidas	*Sida* species

NOTES

NOTES

Sturt Plateau Land Systems
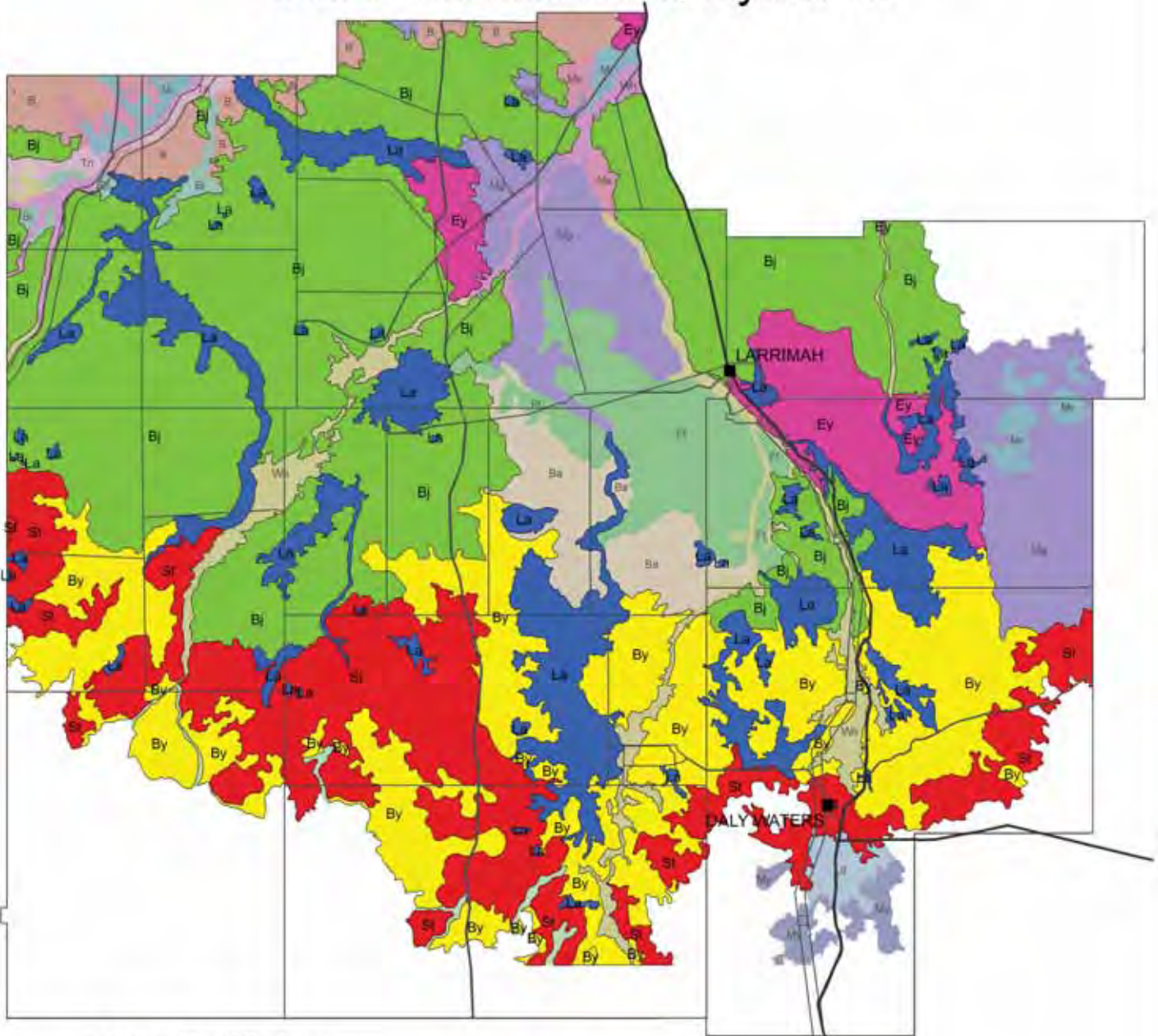
Featured Land Systems

- 🟩 Banjo (Bj)
- 🟨 Bulwaddy (By)
- 🟪 Elsey (Ey)
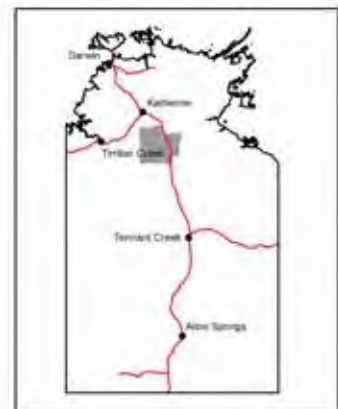- 🟦 Larrimah (La)
- 🟥 Sturt (St)

Other Land Systems

Birdum (Bi)	McGorrey (My)
Birrimbah (B)	Mering (Mg)
Brolga (Ba)	Mueller (Mr)
Forrest (Ft)	Tagoman (Tn)
Jundee (Je)	Warloch (Wh)
Lancewood (Ld)	Western (Wn)
Mais (Ms)	

N

0 5 10 20 30 40
Kilometres

Legend

—— Major Road

—— Secondary Road

Infrastructure and Cadastre data supplied by the NT Department of Planning and Infrastructure.
Land System data supplied by the NT Department of Natural Resources, Environment, The Arts and Sport.

Map produced by Desert Wildlife Services.Technical Enquiries: 08 89521696

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