

Queensland
**REEF WATER
QUALITY**
Program



Reef protection regulations
Farming in Reef catchments

Grazing guide

Version 2

(Agricultural environmentally relevant activity standard
for beef cattle grazing)

Prepared by:

Office of the Great Barrier Reef, Environmental Policy and Programs, Department of Environment and Science

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Updated April 2022

STANDARD CONDITIONS

Under the Reef protection regulations, the following standard conditions apply to beef cattle grazing carried out on a commercial basis as part of the Agricultural Environmentally Relevant Activity (ERA) standard for beef cattle grazing – version 2.

Standard condition 1

For land in **good or fair condition**, continue using measures to maintain the land in good or fair condition.

Standard condition 2a

For land in **poor condition**, measures must be implemented to improve **land condition** towards achieving good or fair condition.

Standard condition 2b

For land in **degraded condition**, measures must be implemented to improve land condition towards achieving good or fair condition OR preventing areas of degraded land condition from further degrading or expanding.

Standard condition 3

From 1 December 2019, for beef cattle grazing in the Wet Tropics, Burdekin, Fitzroy, Mackay Whitsunday and Burnett Mary regions within the Great Barrier Reef catchment, records must be kept in accordance with **Appendix 1** of the ERA standard.

Standard condition 4

- From 1 December 2020, for beef cattle grazing in the Burdekin region within the Great Barrier Reef catchment, records must be kept in accordance with **Appendix 1 and 2** of the ERA standard.
- From 1 December 2021, for beef cattle grazing in the Fitzroy region within the Great Barrier Reef catchment, records must be kept in accordance with **Appendix 1 and 2** of the ERA standard.
- From 1 December 2022, for beef cattle grazing in the Wet Tropics, Mackay Whitsunday and Burnett Mary regions within the Great Barrier Reef catchment, records must be kept in accordance with **Appendix 1 and 2** of the ERA standard.

Standard condition 5

The person carrying out the agricultural ERA must keep all **relevant primary documents** related to the agricultural ERA records.

Standard condition 6

Records required in standard conditions **3-5** must be kept for at least six (6) years and made available to the administering authority when requested within the requested timeframe.

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Glossary

Activity: The environmentally relevant activity (ERA) to which this Agricultural ERA standard applies.

Agricultural Environmentally Relevant Activity (agricultural ERA): Has the same meaning as the *Environmental Protection Act 1994*:

- (1) An activity is an agricultural ERA if it is—
 - (a) carrying on any of the following on a commercial basis—
 - (i) cattle grazing
 - (ii) horticulture
 - (iii) cultivation of another crop.
 - (b) carried out on a lot that is in the Great Barrier Reef catchment.
- (2) However, if only part of the lot is in the Great Barrier Reef catchment, the activity is an agricultural ERA if the part of the lot that is in the catchment is –
 - (a) More than 75 percent of the lot or
 - (b) More than 20,000 hectares.

Agricultural property: Agricultural property, in relation to a relevant activity, means the parcel or parcels of land on which the activity is carried out.

Appropriate person: A person who has professional qualifications, training or skills or experience relevant to providing grazing land condition advice. This must include the ability to give an authoritative assessment, advice and analysis relevant to the property, using protocols, standards, methods or literature, where relevant.

A beef cattle grazier can be considered an appropriate person if they demonstrate they have the appropriate skills, qualifications, and experience relevant to grazing land condition.

Commercial: For the purposes of this guide, commercial is defined as undertaking the activity (beef cattle grazing) for a fee or reward.

Degraded condition: Means land that has less than 20 percent ground cover at 30 September each calendar year and is associated with severe erosion or scalding, resulting in a hostile environment for plant growth.

Diversion banks: Means a structure to divert run-off away from areas where it could cause problems (such as cultivated paddocks or buildings) into stable waterways, natural depressions or water storages.

Dry season: For the purposes of this standard, the dry season is between 1 May and 31 October each calendar year.

Fertiliser: Means a product that contains a quantified amount, obtained by analysis, of nitrogen and/or phosphorus.

Frontage country: Means the area of land adjacent to a watercourse, including the riparian zone and floodplain and extending to the start of the upland area.

Good or fair condition: Means land with greater than 50 percent ground cover at 30 September each calendar year.

Grazing land: Means anywhere on the property where beef cattle grazing is carried out.

Grazing pressure: Means the ratio between the amount of forage eaten relative to the amount of forage grown over a growing season or year.

Great Barrier Reef catchment: Has the same meaning in the *Environmental Protection Act 1994*. The Great Barrier Reef catchment is the area shown on a map prescribed by regulation as the Great Barrier Reef catchment.

Ground cover: Means plants, plant litter, tree leaf litter, twigs and woody debris that protect the soil surface from erosion.

Land condition: Means the capacity of grazing land to respond to rain and produce useful forage. Indicators of land condition include the proportion of organic ground cover, density of desirable perennial pasture species (i.e. grasses that are perennial, productive and palatable (3P) for cattle), extent of erosion and presence of weeds.

Land type: Means a manageable unit of land readily recognised by graziers as having distinct soil, vegetation, landform and productive capacity.

Linear infrastructure: Means man-made features, such as roads, tracks, fences or drainage channels.

Long-term carrying capacity: Means the average number of animals that a paddock can be expected to support over a period of 10 years or more while maintaining or improving land condition.

Measure: Means an action, or procedure, which is planned and implemented to maintain good or fair condition land, improve poor or degraded condition land, or prevent areas of degraded condition land from further degrading or expanding.

Paddock: An area of land that is typically used for beef cattle grazing.

Poor condition: Means land with less than 50 percent ground cover at 30 September each calendar year; unless:

It can be demonstrated to the satisfaction of the Department of Environment and Science (through verifiable ground cover records or other reasonable evidence) that for a land type on the **agricultural property** it is not possible (taking all reasonable steps) to achieve 50 percent ground cover at 30 September each year.

Preferential grazing: Means where cattle selectively graze certain areas in a paddock over others (for example on certain land types or areas around a watering point) that can result in overgrazed patches of land.

Relevant primary document: Means a document relating to the carrying out of the activity that is the subject of the record from which information in the record was obtained; and can include:

- receipts and invoices for the purchase of a fertiliser product
- a summary of tailored advice about carrying out the agricultural ERA (e.g. measures to improve groundcover and land condition).

Short-term carrying capacity: Means the number of animals that a paddock can support for a short period (e.g. a week, a season, or a year). It is different from long-term carrying capacity because it varies according to the amount of rainfall received for that period.

Stocking rate: Means the number of livestock per unit area of a paddock or whole grazing property, at a particular time. Classes of stock can be standardised using Adult Equivalents (AE) or equivalent standardised livestock units.

Wet season: For the purpose of this standard, the wet season is between 1 November and 30 April of the following year.

Introduction

The *Environmental Protection Act 1994* requires **commercial** beef cattle graziers, sugarcane growers, banana growers and horticulture and grain growers in the Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary regions of the **Great Barrier Reef catchment** to comply with commodity-specific minimum practice agricultural standards under the Reef protection regulations.

The purpose of the Reef protection regulations is to protect the health of the Great Barrier Reef by reducing pollutant run-off (nutrients, sediment and pesticides) in waterways that flow to the Reef.

The regulated minimum practice agricultural standards are based on the best available science and agricultural industry expertise to deliver significant water quality benefits for the Reef while driving better land management practices for profitable and productive farming.

In grazing, areas with little or no **ground cover** are susceptible to soil erosion following run-off from rainfall. This can result in the loss of valuable topsoil containing nutrients and organic matter to waterways. Areas that have high ground cover are less prone to erosion and run-off. Rainfall infiltration rates also increase with increased ground cover, resulting in less run-off and more water available to support productive pastures.

The Great Barrier Reef catchment consists of Cape York, Wet Tropics, Burdekin, Mackay Whitsunday, Fitzroy and Burnett Mary natural resource management regions (Figure 1).

Producers in Cape York are not currently required to meet minimum practice agricultural standards as the region has met its Reef water quality targets (under the Reef 2050 Water Quality Improvement Plan 2017-2022).

You can find out if your property is in one of these regions by completing this [online form](#) which is available at www.qld.gov.au/ReefRegulations.

The online form gives you the number of hectares of your Lot/s in each Reef catchment. If a Lot on plan (i.e. the boundaries of your property) crosses the outer boundary of the Great Barrier Reef catchment, the Lot is considered within the Reef catchment if more than 75 percent of the Lot, or more than 20,000 hectares of the Lot, is within the Reef catchment boundary. If a Lot is located across the boundary of two Reef regions, the Lot is taken to be in the region where more than 50 percent of the Lot is located.

Note: Properties and areas that are drought declared or affected by a natural disaster will be given special consideration during the delivery of compliance programs.

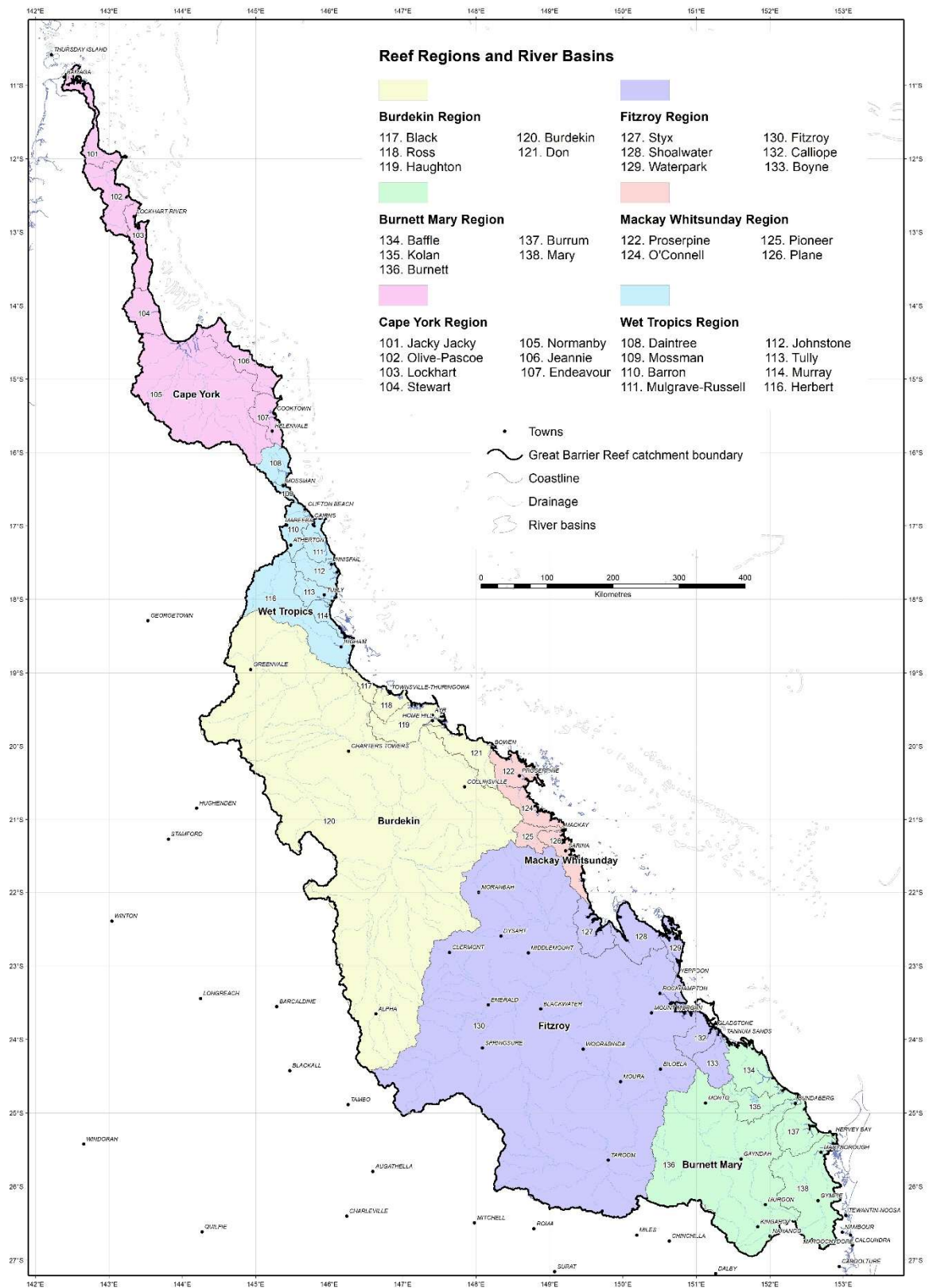


Figure 1: The Great Barrier Reef stretches more than 2,300 kilometres along Queensland's coastline. It receives run-off from 35 catchments which are spread over six natural resource management regions.

Purpose of this document

The purpose of this document is to provide practical information to support graziers to meet requirements in accordance with the Agricultural Environmentally Relevant Activity (ERA) standard for beef cattle grazing – version 2, under the *Environmental Protection Act 1994*.

This guide:

- will help you to
 - determine **land condition** by assessing your ground cover
 - determine the **measures** for improving land condition
 - meet record keeping requirements, and
- provides information on where to find help and further information.

When will the regulations apply for commercial beef cattle grazing?

The Reef protection regulations apply to different regions at different times. Please refer to Table 1 below for the commencement dates for the various Reef catchments.

Table 1: Beef cattle grazing timeframes for regulations.

| Region | General record keeping | Minimum standards |
|---|------------------------|-------------------|
| Burdekin | 1 December 2019 | 1 December 2020 |
| Fitzroy | 1 December 2019 | 1 December 2021 |
| Wet Tropics, Mackay Whitsunday, Burnett Mary | 1 December 2019 | 1 December 2022 |

Part 1: What do I need to do?

Under the minimum practice agricultural standards, commercial beef cattle graziers are required to continue using measures that maintain land in **good or fair condition**. Where land is in **poor** or **degraded condition** graziers must use measures to improve land condition towards achieving good or fair condition.

It is recognised that it may be impractical and too costly to improve some areas of degraded condition land (for example severe gullying or scalded areas). If so, it is expected that you take measures to prevent these areas from further degrading or expanding.

This guide outlines steps that you could take to help support you in meeting the minimum practice agricultural standards under the regulation.

These steps are summarised in Figure 2.

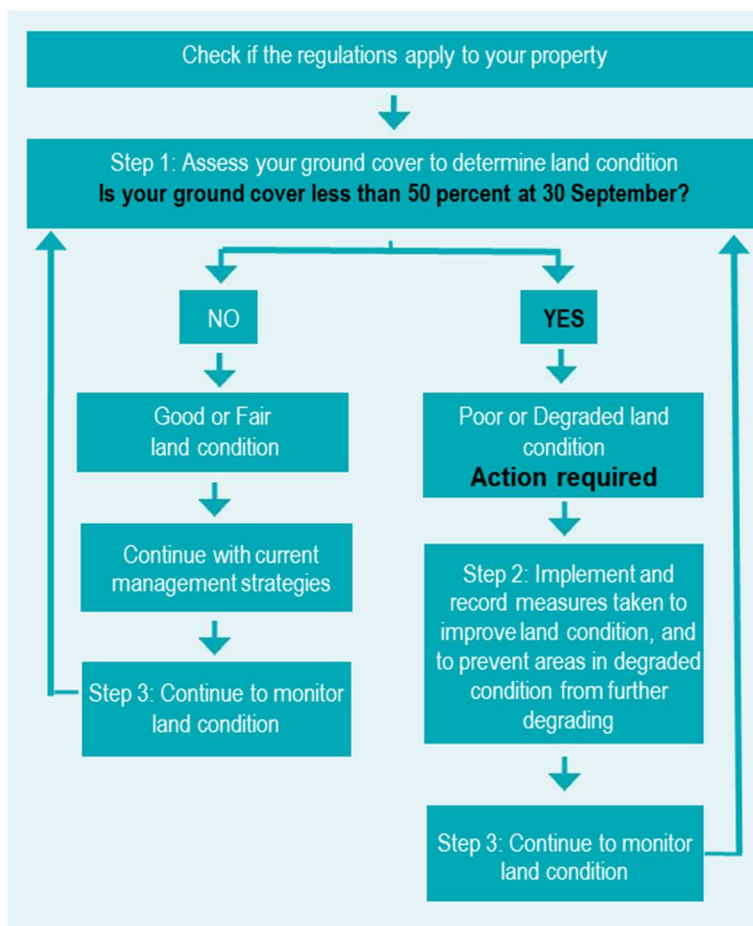


Figure 2: Flow chart showing a process that can help you to meet the minimum practice agricultural standards for beef cattle grazing in the Reef catchments.

Step 1: Assess your ground cover to determine your land condition annually

Land condition is an indicator of the health of **grazing lands** and is the capacity of land to produce useful forage (McIvor 2012). It has also been classified into four broad categories under the ABCD Land Condition Framework (Department of Employment, Economic Development and Innovation (2011)) based on a number of indicators (refer to Figure 3).

Ground cover is a key indicator of land condition and refers to pasture plants, plant litter, tree leaf litter, twigs and woody debris that can protect the soil surface from erosion. High rates of erosion are likely where **ground cover** is less than 50 percent (Roth et al 2004).

Under the minimum practice agricultural standards, land condition is determined by your ground cover in each paddock at 30 September each year. You are not required to address other aspects of land condition.

You can assess ground cover by using the methods in this guide (refer to [More detail on Step 1. Assessing your ground cover](#)), using your own method or seeking specialist advice from an appropriate person.



If there is greater than 50 percent ground cover at 30 September each year –

Land is considered to be in good or fair land condition

Continue current management

No action required. However, it is recommended that you monitor land in good and fair condition to detect any early signs of declining land condition. You can find examples on how to monitor land condition under [More detail on Step 3. Continue to monitor land condition.](#)



If there is less than 50 percent ground cover at 30 September each year –

Land is considered to be in poor or degraded land condition

Action required

You are required to take measures to improve areas of poor land condition.

AND

You are required to take measures to improve areas of degraded land condition OR prevent areas of degraded land condition from further degrading or expanding.

The measures you implement are up to you, but you can find information on measures designed to achieve the standards that you may wish to use in this guide.

These measures are not exhaustive and you may wish to implement other measures.

Record the measure(s) taken, date taken and location on the property where measures have been taken to improve land in poor or degraded condition.

Records must be kept in accordance with standard conditions 3-6, however records can be kept in any form.

Note: It is acknowledged that some **land types** have low expected pasture densities (e.g. in the Desert Uplands), and may not achieve 50 percent ground cover even when the land is in **good or fair condition**. Refer to Table 2 in the [Note on some land types](#) section for the list of land types where it may not be possible (taking all reasonable steps) to achieve 50 percent ground cover at 30 September each year.

If your property contains land types that are unable to reach 50 percent ground cover, you must be able to demonstrate this to the satisfaction of the Department of Environment and Science through verifiable ground cover records or other reasonable evidence (for example a land type report).

Land in degraded condition is land that has less than 20 percent ground cover at 30 September each calendar year and is associated with severe erosion or scalding, resulting in a hostile environment for plant growth.

GOOD CONDITION – A

A condition land has all of the following features:

- **most land types in good condition will typically have at least 50% and often above 70% ground cover at the end of the dry season**
- good density of perennial grasses dominated by those species considered to be perennial, productive and palatable (3P grasses) for that land type, little bare ground (less than 30 % in most years)
- few weeds and no significant infestations
- good soil condition: no erosion, good surface condition



FAIR CONDITION - B

B condition land has at least one or more of the following features, but otherwise is similar to A condition land:

- **land types will typically have at least 50% ground cover and less than 70% in most years at the end of the dry season**
- some decline of grasses that are perennial, productive and palatable (3P grasses), increase in other species (less favoured grasses, weeds) and/or bare ground (more than 30% but less than 50% in most years)
- some decline in soil condition, some signs of previous erosion and current susceptibility to erosion



POOR CONDITION - C

C condition land has one or more of the following features, but otherwise is similar to B condition land:

- **land with poor or degraded condition will typically have less than 50% ground cover at the end of the dry season**
- general decline of grasses that are perennial, productive and palatable (3P grasses), large amounts of less favoured species and/or bare ground (greater than 50% in most years)
- obvious signs of past erosion and/or current susceptibility to erosion is high



DEGRADED CONDITION - D

D condition land has one or more of the following features:

- **generally less than 20% ground cover**
- general lack of any perennial grasses or forbs
- severe erosion or scalding, resulting in hostile environment for plant growth
- often no long-term ability to carry stock



Figure 3: The ABCD land condition framework. Content and photos adapted from Department of Employment, Economic Development and Innovation (2011) and Alexander et al (2018).

Step 2: Implement and record measures you are taking to improve land condition

You must take measures to improve ground cover in areas assessed to be in poor or degraded condition based on your ground cover at 30 September each calendar year.

As previously stated, it may be impractical and cost prohibitive to improve some areas of degraded condition land (for example, severe gullying or scalded areas). If so, it is expected that you take measures to prevent these areas from further degrading or expanding.

A measure is defined as an action, or procedure, which is planned and implemented to maintain good or fair condition land, improve poor or degraded condition land, or prevent areas of degraded condition land from further degrading or expanding. Measures to improve condition refer to ways that increase ground cover. Increasing ground cover reduces the risk of soil being washed away and lost to waterways following rainfall.

While the ABCD land condition framework (refer to Fig. 3) includes other indicators for land condition e.g. desirable pasture species (3P grasses) and weed density, ground cover (greater than 50%) is the indicator that will be used for meeting the minimum standards. Increasing ground cover with 3P grasses is highly desirable but not a requirement for meeting the minimum standards.

You are required to record annually the date and measure(s) taken, and the location on the property where measures have been taken. You must record the measure within three days, keep the record for six years and be able to produce the record on request.

Records must be kept in accordance with standard conditions 3-6, however records can be kept in any form.

This guide focuses on a few examples of measures you may take to improve land condition:

- adjusting **grazing pressure**
- **wet season** spelling
- managing **preferential grazing**
- managing land around gullies and early signs of gullying
- managing **linear infrastructure**
- establishing **diversion banks**
- sown pastures and forage crops
- managing weeds.

You can find more information on each measure and monitoring land condition in [More detail on Step 2. Measures to improve land condition](#) and [More detail on Step 3. Continue to monitor land condition](#).

Important

The Minimum Standards do not mandate measures that must be implemented. This guide does not promote the use of one measure above others, and may not list others that are better suited to your property. You should choose the best measures to improve land condition on your property, and seek expert advice where necessary (see the [Contacts](#) section for more information). Depending on your situation, you may need to use one or more measures to improve land condition.

If there are several areas in poor or degraded condition it is recommended you work out which are most likely to lose soil in rainfall run-off to waterways and focus on the most significant of these first. Often frontage country, areas around gullies and watering points can have low ground cover and have a higher risk of soil being lost to waterways.

Step 3: Continue to monitor land condition

You should continue to monitor land condition across your property at least annually in September, to track and detect changes in ground cover (improvement or decline) over time.

You can find examples on how to monitor ground cover in the section [More detail on Step 3. Continue to monitor land condition](#).

Part 2: Further Information

More detail on Step 1. Assessing your ground cover

How do I assess ground cover?

You should assess the ground cover in your paddocks each September before the onset of summer rainfall. This provides a good indication of land condition and whether management strategies have been successful in maintaining perennial pastures.

You can use either of the tools described below, or your own method, to help you estimate your ground cover.

Estimating ground cover in the paddock

You can estimate ground cover in a paddock by:

- standing with your feet, about 50 cm apart
- looking at your feet, imagine a square 50 cm x 50 cm and estimate the percentage of ground cover within that square. You can use Figure 4 as a guide.
- repeat this several times across the paddock and estimate the average ground cover for the paddock.

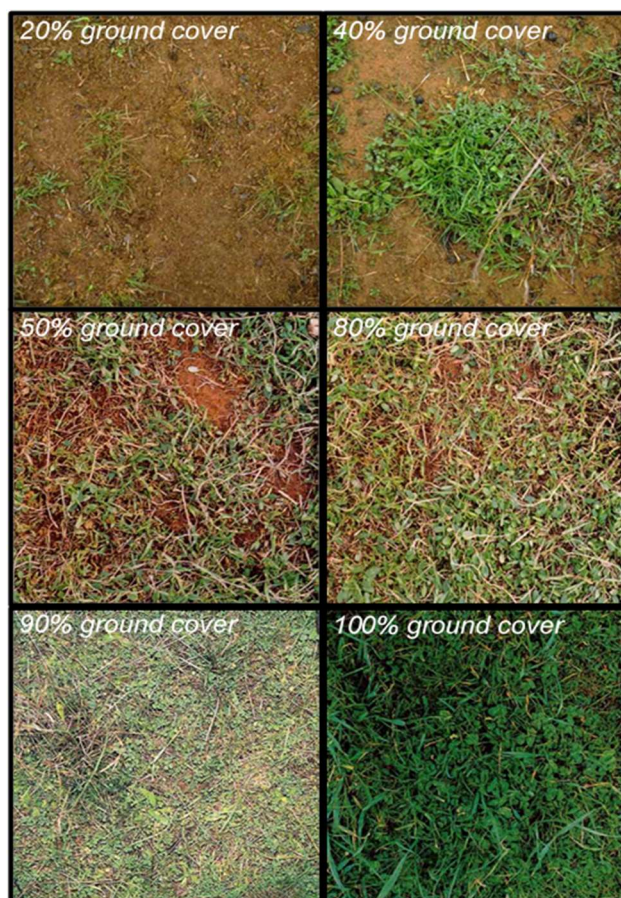


Figure 4: Pasture photos showing different percentages of ground cover (adapted from Meat & Livestock Australia, 2013).

Figure 5 shows various patterns of ground cover you may have in each square. Patterns can range from clumped and patchy to being evenly distributed. Each square is an aerial view where black represents ground cover and white is bare ground. For a land type with 50 percent ground cover (outlined in red in Figure 5), the cover may appear in various patterns.



Figure 5: Patterns and corresponding percentage of ground cover.

The video [Why you need ground cover - maximise rainfall infiltration](http://www.futurebeef.com.au) demonstrates the substantial loss of soil and water by rainfall run-off when ground cover is low. The video is available at www.futurebeef.com.au.

For the Burdekin region, photo standards for land condition are also available for land types. These photos show land in good condition through to degraded condition and indicate the level of ground cover as a percentage. You can access these photo standards at www.futurebeef.com.au (Karfs et al 2009).

Using ground cover reports for your property

Online tools such as FORAGE and VegMachine use climate data, pasture-related information and satellite imagery to generate property reports that you can use to assess and monitor changes in ground cover.

FORAGE produces reports for land types for a whole property and VegMachine produces reports for land types in a selected area of a property, such as a paddock. These reports are free to access.

FORAGE ground cover reports

Two types of reports are available online that you can use to monitor ground cover on your property (figures for both can be seen on the following pages):

1. Ground cover report: This report provides maps of seasonal and minimum ground cover (Figure 6) for a selected Lot on Plan or adjoining Lots on Plan for a selected year, season or individual month. The colour coding on this report shows ground cover percentage, which will allow you to identify areas of less than 50 percent ground cover. By requesting reports on a regular basis, you can monitor and record changes in ground cover across your property. This report could be used to help identify suitable locations for monitoring sites.

2. Regional comparison ground cover report: This report tracks ground cover percentage over time for each dominant land type on your property. It compares and ranks the ground cover of each land type on your property against the same land type within a 25 km or 50 km radius around your property (Figure 7). The report indicates whether ground cover on your property is higher or lower than the surrounding region for each land type, and hence helps to identify areas to improve.

How can I get my FORAGE reports?

You can request these free reports, as well as a user guide and videos on how you can use FORAGE on your property, from the [Long Paddock](http://www.longpaddock.qld.gov.au) website, at www.longpaddock.qld.gov.au. You should verify the reports through on-ground field inspection.

FORAGE REPORT: GROUND COVER

<http://www.longpaddock.qld.gov.au/forage> July 11, 2019 Lot on Plan: 1OC57 Label: test



Introduction

This report presents three ground cover information products: (i) a ground cover map for the chosen month; (ii) a minimum ground cover map for the period 1990 to 2016; and, (iii) a graph showing the historical time series of seasonal ground cover. The maps and historical time series graph are generated from the ground cover products which are produced by the Queensland Government's Remote Sensing Centre using Landsat satellite image data from the United States Geological Survey.

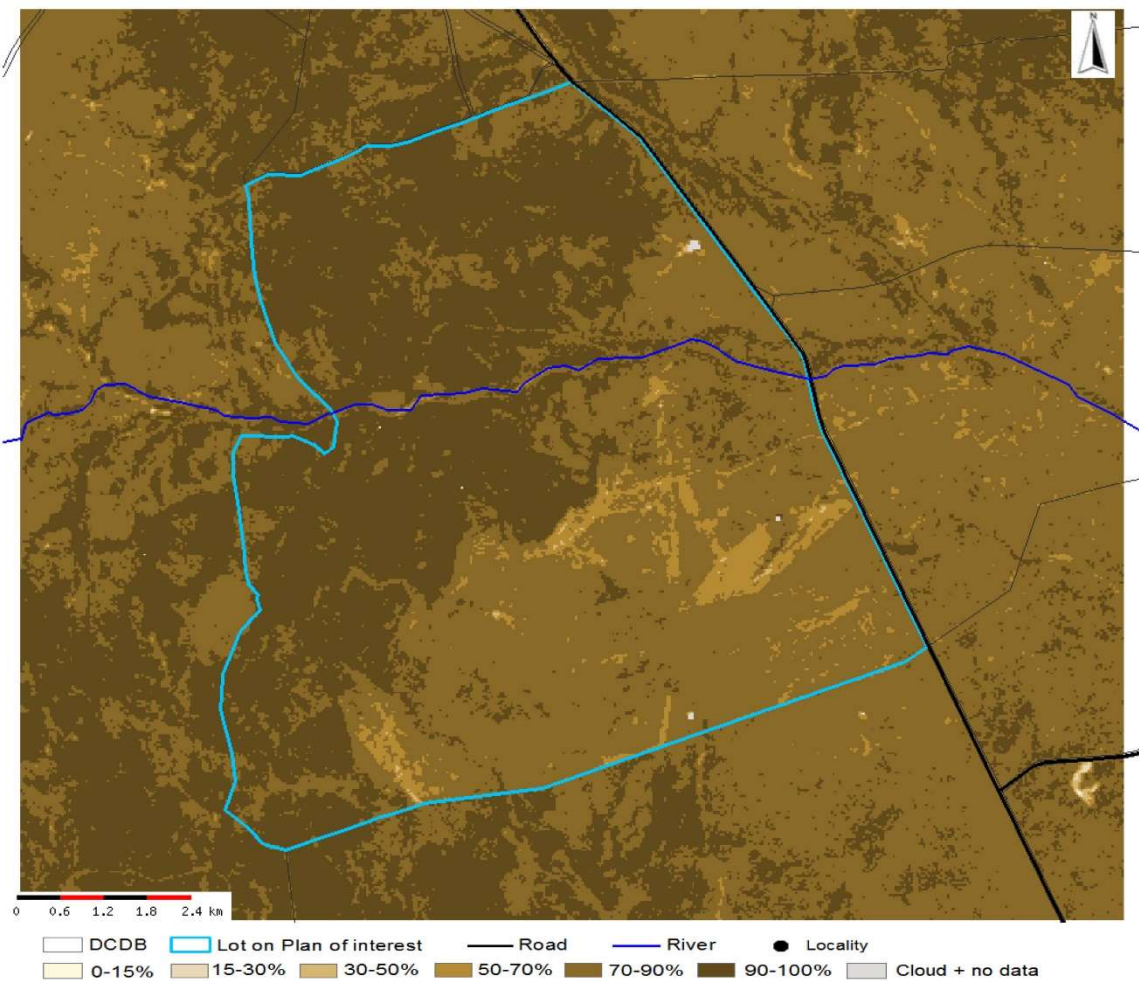
Background information of the Lot on Plan

| | |
|---|---|
| Latitude/longitude: -19.49/145.68 | Local government: Charters Towers Regional |
| Total land area: 6920 ha | Average woody vegetation cover: 17.5% |
| Long-term annual mean temperature: 23.4 °C | Long-term annual mean rainfall: 595.6 mm |
| Last 12-month rainfall: 929.9 mm | Last month rainfall: 39.5 mm |

Location map



Ground cover map (The image is for September 2018)



Ground cover map summary

The monthly ground cover map shows the level of ground cover for areas on the Lot on Plan with less than 60% tree cover. The image is for September 2018. The percentage of the total area of the Lot on Plan for 6 ranges of ground cover levels are summarised below:

| Cover levels | <15% | 15 - 30% | 30 - 50% | 50 - 70% | 70 - 90% | >90% |
|----------------------------------|------|----------|----------|----------|----------|------|
| Percentage out of the total area | 0.0 | 0.0 | 0.1 | 4.2 | 45.5 | 50.2 |

Figure 6: An example of a FORAGE Ground cover report (source: The Long Paddock, Queensland Government).

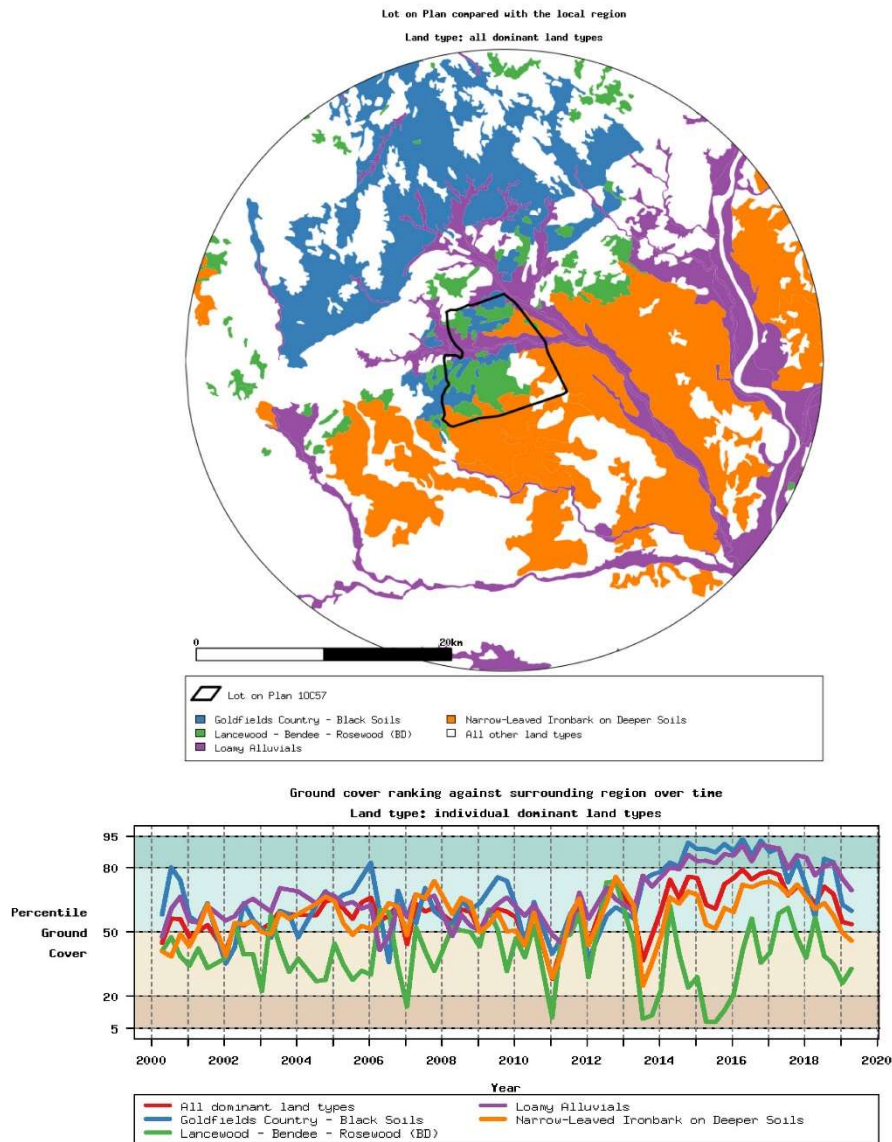
FORAGE REPORT: GROUND COVER - REGIONAL COMPARISON

<http://www.longpaddock.qld.gov.au/forage> July 11, 2019 Lot on Plan: 10C57 Label: test

Introduction

This report presents a regional comparison of the ground cover levels for the dominant Grazing Land Management (GLM) land types on the selected Lot on Plan. The information about cover levels is generated from seasonal ground cover data derived from satellite imagery and calibrated by field measurements. If there are limited satellite data available for periods when there is too much cloud, ground cover is estimated based on the long term pattern of cover compared with the surrounding area. These estimates are indicated by the dotted line on the cover plot.

Cover rankings per dominant land type



Disclaimer

Limitation of liability: the State of Queensland, as represented by the Department of Environment and Science (DES) gives no warranty in relation to the data (including without limitation, accuracy, reliability, completeness or fitness for a particular purpose). To the maximum extent permitted by applicable law, in no event shall DES be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits or confidential or other information, for business interruption, for personal injury, for loss of privacy, for failure to meet any duty including of good faith or of reasonable care, for negligence, and for any other pecuniary or other loss whatsoever including, without limitation, legal costs on a solicitor own client basis) arising out of, or in any way related to, the use of or inability to use the data. ©The State of Queensland, 2019.

Figure 7: An example of a FORAGE Regional comparison ground cover report showing ground cover over time. Source: The Long Paddock, Queensland Government.

VegMachine ground cover reports

VegMachine uses the same information as the FORAGE reports and also tracks ground cover for land types in a paddock, a patch within a paddock, as well as a whole property. You can select an area of interest using the polygon tool and see how ground cover has changed over time.

VegMachine also gives you the option of looking at different time periods.

The VegMachine report for assessing ground cover is the **Regional comparison ground cover report** which includes a map of land types, and graphs for each land type that show:

- percentage ground cover and how this has changed over time within the selected area, such as a paddock
- how the ground cover for these land types compares to the same land types in the surrounding region.

Figure 8 shows an extract from a VegMachine report. You can use the ground cover percentages shown on the graphs to determine the ground cover of your paddocks.

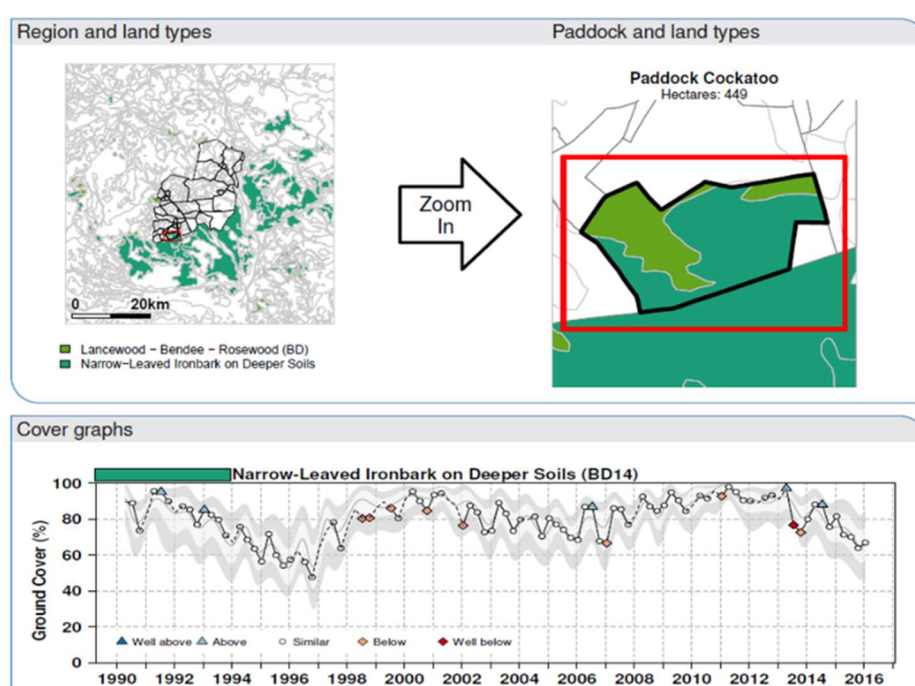


Figure 8: Example of a graph from a VegMachine Regional comparison ground cover report (Source Beutel et al 2017).

How can I get my VegMachine reports?

You can request a free VegMachine report online, as well as a user guide with frequently asked questions online at <https://vegmachine.net>.

You can also view short videos about how to create and interpret the report on VegMachine's [YouTube channel](#).

Note on some land types

Some land types have low expected pasture densities for perennial pastures and may not achieve 50 percent ground cover even when the land is in good or fair condition. These land types tend to have ground cover less than 50 percent in most years, for example in seven or eight out of ten years. Table 2 lists the land types that have low expected densities.

Land type information sheets are available online for most Reef catchments at www.futurebeef.com.au.

If your property contains land types that are unable to reach 50 percent ground cover, you must be able to demonstrate this to the satisfaction of the Department of Environment and Science through a land type report, verifiable ground cover records or other reasonable evidence.

Table 2: Land types in the Reef catchments with expected low plant densities and hence low ground cover. (Adapted from State of Queensland (Department of Natural Resources and Mines) 2013).

| Reef catchment | Land type |
|----------------------------------|---|
| Burdekin | Lancewood-bendee-rosewood |
| | Soft wood scrub |
| | Blackwood scrubs on massive soils |
| | Jump-ups |
| | Lakebeds |
| | Box and napunyah |
| | Ranges |
| | Softwood scrub (low in natural state, medium/high cover in cleared state) |
| Burdekin (Desert Uplands) | Frontal dunes |
| | Hard ironbark country |
| | Ironbark country |
| | Jump-ups |
| | Lakebeds |
| | Yellowjacket country +/- wattles |
| Fitzroy | Lancewood – bendee – rosewood |
| | Narrow-leaved ironbark with rosewood |
| | Softwood scrub (low in natural state, m/h cover in cleared state) |
| | Bullock country |
| | Coastal sand dunes |
| | Cypress pine country |
| | Serpentine ironbark |
| | Spotted gum ridges |
| | Brigalow with blackbutt (Dawson gum) (low in natural state, m/h cover in cleared state) |
| | Brigalow with melonholes (low in natural state, m/h cover in cleared state) |
| | Brigalow softwood scrub (low in natural state, m/h cover in cleared state) |
| Inland Burnett | Softwood scrub (low in natural state, m/h cover in cleared state) |
| | Narrow-leaved ironbark and wattles |
| | Spotted gum ridges |
| | Brigalow and brigalow belah (low in natural state, m/h cover in cleared state) |
| | Brigalow melonholes (low in natural state, m/h cover in cleared state) |
| Coastal Burnett | Hoop pine scrub |
| | Softwood scrub |
| Wet Tropics | Range soils |
| | Sandy red earths |
| | White sandy soil |
| | Yellow earths |

More detail on Step 2. Measures to improve land condition

Where you have assessed paddocks to be in poor or degraded condition based on ground cover, you must take action to improve land condition and reduce the risk of valuable soil being lost to waterways following run-off from rainfall.

Land in good condition has the greatest capacity to respond to rainfall and produce useful forage. It supports long-term productivity by maximising the infiltration of rainfall for pasture growth and keeping soil and nutrients in the paddock (McIvor 2012, Alexander et al 2018).

This section provides detail on how to improve land condition, based on the indicators described in the ABCD land condition framework (Figure 3).

Important indicators of land condition, besides ground cover, include: density of perennial grasses; presence of weeds; and extent of soil erosion (McIvor 2012, Alexander et al 2018).

The most desirable pasture grasses are the preferred 3P grasses, i.e. those that are:

- perennial – live for more than one year
- productive – produce the most forage
- palatable – well grazed by stock

For more information on preferred, intermediate and non-preferred pasture species for your individual land types, visit the Future Beef website at www.futurebeef.com.au.

Perennial grasses are better at protecting the soil from erosion because they tend to survive through the **dry season**. In contrast, annual grasses tend not to survive into the dry season and leave bare soil exposed to erosion (Figure 9). In addition, perennial grasses have deeper root systems that help water to infiltrate into the soil. 3P grasses are favoured as they are more productive and palatable for cattle.

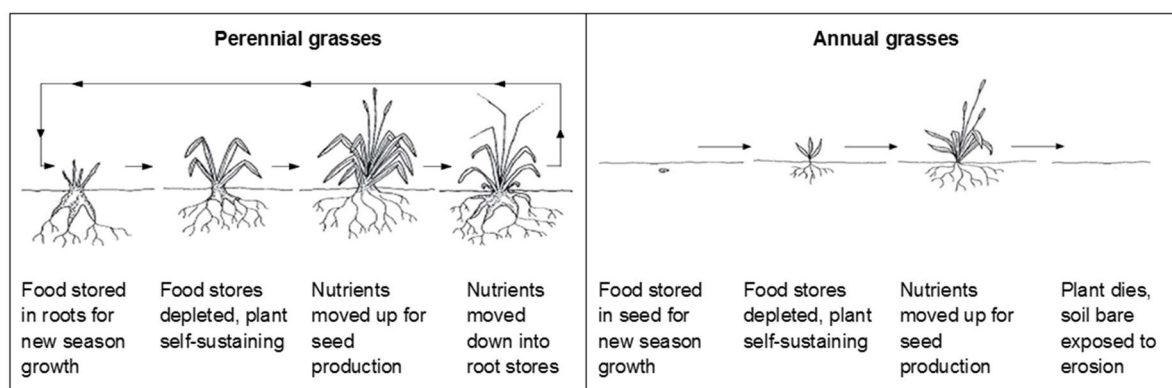


Figure 9: The life cycle of perennial vs annual grasses (Adapted from Rolfe et al 1997 and Quirk and McIvor 2007).

The density of perennial pastures is influenced by land type, grazing pressure and seasonal conditions. Some land types naturally have plant communities with a higher density of perennial grasses than others. Figure 10 shows examples of patterns of density.

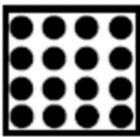





| | | | | | |
|--|--|---|--|---|---|
|  |  |  |  |  |  |
| Closed or dense High density: touching or overlapping canopies, bases of plants are slightly separated | Mid-dense Touching or slightly separated canopies, bases of plants are clearly separated | Sparse or open Clearly separated canopies, bases of plants are well separated | Very sparse Well separated canopies, bases of plants are very well separated | Isolated Isolated canopies, bases of plants are isolated | None No perennial plants |

Figure 10: Patterns of perennial grass density. The dots represent different grass densities. The dots in each box can be used to reflect the average density of perennial plants to help with monitoring areas and recording changes. (Adapted from Department of Environment and Resource Management 2010).

Weeds compete with pasture plants for sunlight, water and nutrients. This leads to a decline in land condition, reduced pasture for cattle and less ability for that land to carry stock and be productive. Areas of low ground cover and density of perennial grasses are at risk of soil erosion and invasion by weeds. See [8: Managing weeds](#) for more information.

Good ground cover and density of perennial grasses help to stabilise soil, including those with a higher risk of erosion. In addition, they help to improve soil condition by increasing capacity to absorb and store rainfall for plant growth.

Examples of measures you may take to improve land condition:

- adjusting grazing pressure
- wet season spelling
- managing preferential grazing
- managing land around gullies and early signs of gullying
- managing linear infrastructure
- establishing diversion banks
- sown pastures and forage crops
- managing weeds.

Important

The Minimum Standards do not mandate measures that must be implemented. This guide does not promote the use of one measure above others, and may not list others that are better suited to your property. You should choose the best measures to improve land condition on your property, and seek expert advice where necessary (see the [Contacts](#) section for more information). Depending on your situation, you may need to use one or more measures to improve land condition.

If there are several areas in poor or degraded condition it is recommended you work out which are most likely to lose soil in rainfall run-off to waterways and focus on the most significant of these first. Often frontage country, areas around gullies and watering points can have low ground cover and have a higher risk of soil being lost to waterways.

How to prioritise and plan implementation of measures

You are required to undertake and record measures on any paddocks that are identified as being in poor or degraded condition at 30 September each year. However, you are likely to be continually assessing and undertaking different actions on your property to maintain and improve land condition, so where should you start your efforts and how?

Prioritising

The aim of the minimum standards is to reduce soil loss from properties to waterways. So if you have assessed your property condition and are considering what measures to use and where to start - you should start on those areas of the property that are most likely to reduce the amount of soil ending up in waterways.

High priority areas include (for example):

- paddocks with consistently low ground cover in September (i.e. below 50%) compared to similar types of land surrounding your property
- paddocks with large areas of bare ground between patches of ground cover
- areas with steep slopes, actively eroding soils, or highly erodible or dispersive soils
- paddocks in poor or degraded condition including those closely connected to a gully, river, creek or other watercourse
- large and actively eroding gullies – but remember, you are not expected to fully remediate large gullies where it is not practical or prohibitively costly to do so, but rather take measures designed to stop them from further expanding (for example - stock exclusion).

Low priority areas for water quality would be considered:

- small and/or isolated areas with low ground cover that aren't actively eroding (for example holding yards) and areas with poor connectivity to watercourses
- paddocks with consistently good ground cover (i.e. above 50%) and fair/good land condition.

Planning

- High priority areas (like those outlined above) should be the first areas of focus and depending on your property and other conditions, may take the longest time and most significant measures to see improvement in ground cover and land condition.
- **Remember, the regulation requires that a measure is something that will begin the transition of the poor or degraded area back towards fair/good condition. Not that the measure will have changed the condition of the land by a certain date.**
- Low priority areas may not require any specific actions to be undertaken other than those you take regularly to manage pasture within and between seasons.

Below is a list of possible actions which can be taken to address poor or degraded land.

1: Adjusting grazing pressure

Managing grazing pressure so that the amount of forage eaten compared to the amount of forage grown over a period of time without overgrazing is vital for keeping land healthy and productive over the long-term. The effects of different grazing pressures on adjacent paddocks can be seen in Figure 11.



Figure 11: The effect on ground cover of adjacent paddocks subjected to different grazing pressures.

Overgrazing can:

- limit a plant's ability to grow and produce useful forage
- reduce the ground cover and density of perennial grasses, especially those most productive and palatable to cattle
- expose soil to erosion and weed invasion
- reduce the amount of water that filters down into the soil
- increase the loss of valuable soil and water from the property
- reduce the carrying capacity of the land.

Managing grazing pressure on land in poor or degraded condition can give pastures a chance to recover. In the case of degraded condition land, reducing the grazing pressure around these degraded areas can help prevent these areas from degrading or expanding further.

Matching stocking rate to long-term carrying capacity

Matching stocking rates to the long-term carrying capacity of your property helps to ensure that there is enough pasture left at the end of the driest time of year and before the summer rains, to reduce soil loss and keep land in good condition.

Case study

Long-running field trials in the Burdekin showed that heavy stocking (constant stocking at about twice the long-term carrying capacity) adversely affected ground cover, pasture and soil condition (Figure 12). The loss of rainfall in runoff was also far greater compared to paddocks that were moderately stocked.

After 20 years, the density of 3P grasses was three to four times higher in the moderately stocked and rotationally spelled paddocks compared to the paddocks with a high stocking rate (O'Reagain et al 2018).

In dry years, overstocking degraded pasture and reduced production. Animals also had to be drought fed, which increased financial loss. During the 20 years of the trial, the heavy stocking strategy was the least profitable of all strategies.



Figure 12: Sites of the Wambiana grazing trial in the Burdekin after 20 years in May 2018. Although just emerging from severe drought, including the fourth driest year on record, 3P grasses were still present in the moderately stocked paddock (left) compared to the heavily stocked paddock where there was only sparse Indian couch and bare ground (right) (O'Reagain et al 2018).

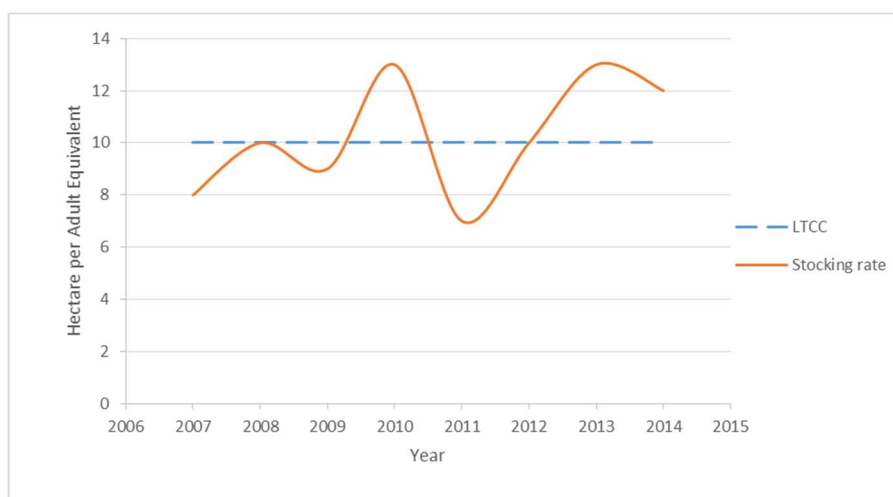


Figure 13: An example of how long-term carrying capacity differs from stocking rate (Source Moravek et al 2017).

Long-term carrying capacity is the average number of animals that a paddock can be expected to support over a period of 10 years or more, while maintaining or improving land condition. It depends on climate, the mix of land types as well as the evenness of grazing. It gives a benchmark number at which to set the stocking rate (Figure 13).

Long-term carrying capacity will also vary depending on the land condition across the property. For example, a property in North Queensland can have a long-term carrying capacity of 145 adult equivalents for a paddock in fair land condition. However, for the same paddock in poor condition, this falls down to 44 adult equivalents. This shows how land managed in good condition has the potential to be more profitable than land in poorer condition.

Long-term carrying capacity can be calculated using the following equation:

| | |
|--|---|
| Long-term carrying capacity (hectares per Adult Equivalent) = | $\frac{\text{Intake of an Adult Equivalent set at 3,650 kg per Adult Equivalent per year}}{\text{Pasture growth in kilograms of dry matter per hectare x utilisation rate (\%)}}$ |
|--|---|

Where:

An **adult equivalent (AE)** is based on the forage intake for a 450 kg steer at maintenance. Table 3 shows adult equivalents for different classes of cattle, as well as native and feral animals likely to compete with cattle for pasture.

Table 3: Adult equivalents for different classes of animals. Adult equivalent ratings are based on the pasture intake for a 450 kg steer at maintenance (adapted from Alexander et al 2017).

| Animal and classes of cattle | Adult Equivalent |
|---------------------------------|------------------|
| Adult equivalent (450 kg steer) | 1.0 |
| Weaner | 0.5 |
| One-year-old heifer/steer | 0.68 |
| Two-year-old heifer | 0.87 |
| Two-year-old steer | 0.93 |
| Wet cow | 1.35 |
| Bull | 1.5 |
| Kangaroo | 0.10 |
| Goat | 0.11 |
| Horse | 1.2 |

Pasture growth is the average forage production for a paddock in kilograms of dry matter per hectare (kg/ha). You can use photo standards showing pasture yields for various land types to help estimate your pasture growth. [Pasture photo standards](#) can be found at www.futurebeef.com.au. The example in Figure 14 shows photo standards for the Narrow leaved ironbark land type.

Utilisation rate is the proportion of pasture grown that is eaten by cattle within a grazing period, expressed as a percentage. The safe utilisation rate is the maximum rate of average annual pasture consumption consistent with maintaining or encouraging good land condition (Alexander et al 2017).

The utilisation rate of land types can vary from 10 to 35 percent depending on the land type (refer to [land type fact sheets](#) available at www.futurebeef.com.au). For example, the utilisation rate for Blue gum flat in the Burnett Mary is 35 percent compared to 10 percent for Ranges in the Burdekin.

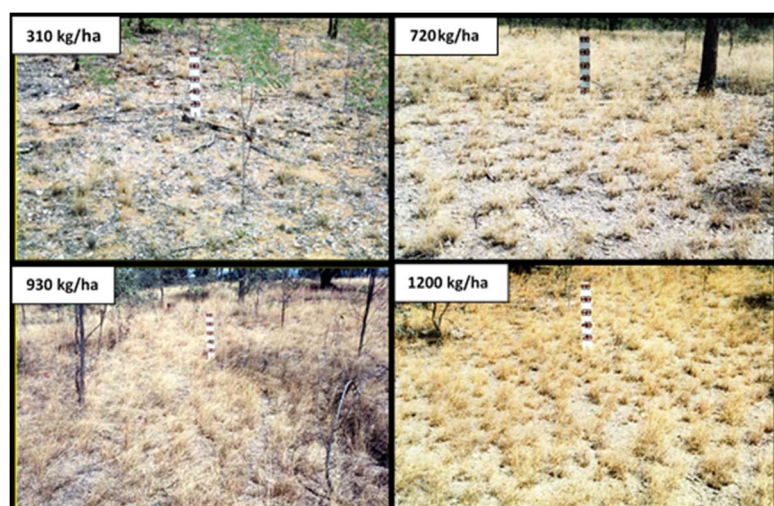


Figure 14: An example of photo standards showing different pasture yields.

Further resources

You can request Pasture growth alert, Rainfall and Pasture and/or Rainfall and Pasture by Land Type reports for your Lot on Plan and adjoining Lots on Plan, samples of reports and answers to common questions from www.longpaddock.qld.gov.au/forage.

A [FORAGE Quick User Guide](#) is also available.

Determining short-term carrying capacity using forage budgets

Stocking rate can be adjusted up or down depending on seasonal conditions. A good time to determine the amount of pasture in the paddock and adjust rates is at the end of the summer rain. You may choose to adjust stocking rates at other times during the year where land condition is declining. A forage budget will help you match stock numbers in a paddock with current pasture supply and keep land in good or fair condition, or improve land in poor or degraded condition by reducing grazing pressure.

Under the minimum practice agricultural standards for beef cattle grazing, you can choose any method of calculating a forage budget, as long as it aims to achieve at least 50 percent ground cover in the paddock at 30 September each year before the summer rain. Read the Toolbox for calculating forage budgets section, for more information.

Toolbox for calculating forage budgets

Available from the Future Beef website, at www.futurebeef.com.au

- [Forage budgeting videos](#)
- [Balancing supply and demand video](#)
- [Stocktake](#) and [stocktake plus app](#)
- [Dry season pasture budget: a guide for stocking rates](#)
- [Break of season rules for forage budgets](#)
- Grazing Land management workshops – find available workshops near you by searching the [Events](#) page on the Future Beef website.

Available from the Meat & Livestock Australia website, at www.mla.com.au

- [Stocking rate calculator](#)
- [Feed budget and rotation planner](#)
- [Pasture improvement calculator](#)

Available from the Resources Consulting Services Australia website, at www.rcsaustralia.com.au

- [Grazing charts](#)

Further resources

- Nicol, L. (2019) Pasture budgeting in Central Queensland. Fitzroy Basin Association (available from Fitzroy Basin Association office, Rockhampton).

2: Wet season spelling

Wet season spelling reduces grazing pressure on paddocks and helps to regenerate productive perennial grasses and replenish seed reserves. This involves destocking one or more paddocks for all or part of the wet season. Where the outcome is to improve land condition, you should ideally spell for the entire wet season or longer (McIvor 2012). Spelling for more than one wet season is needed when the wet season is poor. Spelling land after a fire helps pastures to recover.

Once you bring cattle back onto spelled land, you should make sure that the stocking rate is based on a forage budget. If your stocking rate is too high, this may undermine the beneficial effects of wet season spelling and result in a decline in land condition.

Small holding paddocks, round yards and laneways etc. should be managed appropriately. If located in a high risk erosion area (for example frontage country), these should be managed to keep a high level of ground cover, or moved to a low risk area if traffic is too high.

Further resources

You can find more information on wet season spelling in the [Grazing distribution](#) resource or by searching the Department of Agriculture and Fisheries website at www.daf.qld.gov.au.

3: Managing preferential grazing

Cattle prefer grazing certain areas over others, such as:

- frontage country next to streams and rivers (Figure 15)
- certain land types and plant species
- areas close to watering points.

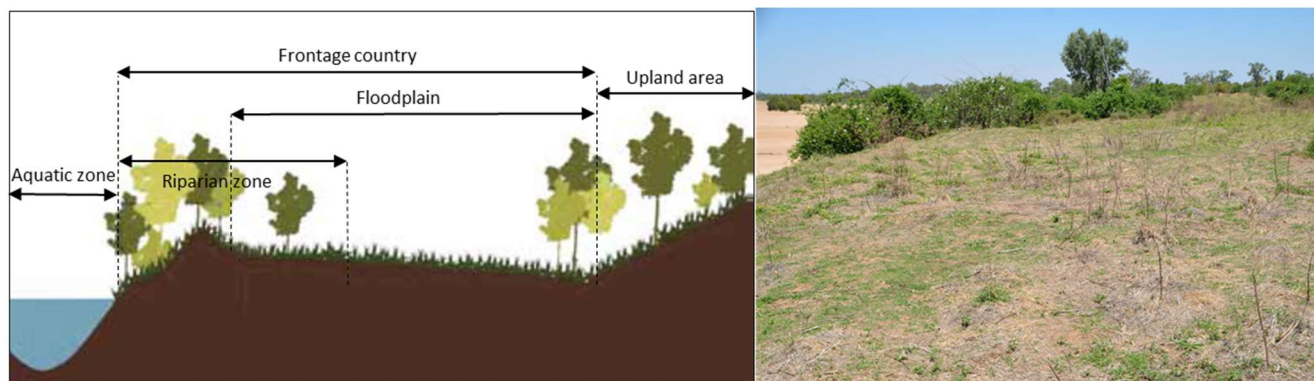


Figure 15: Left: alluvial frontage country, which includes the riparian zone and floodplain (Adapted from Coughlin et al 2008, Abernathy and Rutherford 1999). Right: example of frontage country on a grazing property.

Studies have found that cattle spend most of their time within three kilometres of a watering point (Department of Agriculture and Fisheries and Forestry; Alexander et al 2018). Adding or relocating watering points and strategically placing licks (or other forms of supplementary feed) can help to even out grazing pressure. Establishing more off-stream watering points will also help reduce the need for cattle to access streams and reduce pressure on frontage country.

Permanent or temporary fences can help control cattle access to sensitive areas such as frontage country and streambanks where the condition of land may be poor or degraded. Fencing allows these sensitive areas to be destocked for a wet season, for example, or lightly grazed to reduce the likelihood of them degrading further. It also allows the pasture in these areas to recover.

4: Managing land around gullies and early signs of gully

Gully erosion is a highly visible form of soil erosion that may form anywhere on a property. However, areas at particular risk of gully formation include, but are not limited to, areas where there is:

- poor or degraded land condition
- loss of topsoil or vegetation
- concentration of run-off along drainage lines, furrows, roads, tracks or fence lines
- unstable soil or walls of pre-existing gullies
- existing erosion (Carey et al 2015b, Wilkinson et al 2015).

Gully erosion affects soil productivity, resulting in degradation of land condition and a decline in pasture productivity and downstream water quality (Carey et al 2015b).

Under the minimum practice agricultural standards, you are not required to remediate all gullies back to good or fair condition land, but rather focus on managing grazing pressure in and around gullies, including the catchment above the gully. This will help slow the gully's advancement, and any early signs of gully erosion such as rills, from getting worse. Managing grazing pressure can include either destocking the area, or stocking appropriately based on forage production and seasonal conditions.

Research in the Upper Burdekin showed that where stock was excluded over the long-term there was 77 percent less sediment run-off from soil erosion than that from grazed gullies. This shows that reducing grazing pressure (refer to [1: Adjusting grazing pressure](#)) within and around gullies can be an important strategy for controlling gully erosion (Wilkinson et al 2018, 2019).

If you choose to remediate gullies, there are many options available including re-vegetation of the gully floor, porous check dams (Figure 16) and management of grazing pressure (refer to [1: Adjusting grazing pressure](#)).



Figure 16: Using a Porous Check Dam to assist in remediating a gully.

Further resources

You can find more information on gully erosion and its control in:

- Chapter 13 of the [Soil conversation guidelines for Queensland](#) (Carey et al 2015a), available by searching for Soil conservation guidelines at www.qld.gov.au.
- [Gully erosion manual – options for prevention and rehabilitation](#) (Day and Shepherd 2019), available from the Burnett Mary Regional Group website at www.bmrg.org.au.

However, you should seek specialist advice from an appropriate person before starting a gully control project. Please refer to the [Contacts](#) section for more information.

5: Managing linear infrastructure

Linear infrastructure includes structures such as fences, roads and tracks. If these structures are poorly located, they can cause land condition to decline. You should construct these features where they are least likely to cause erosion (Carey et al 2015c).

Further resources

You can find more information in Chapter 14 of the [Soil conversation guidelines for Queensland](#) (Carey et al 2015a), available by searching for Soil conservation guidelines at www.qld.gov.au.

However, it is recommended that you seek specialist advice from an appropriate person. Please refer to the [Contacts](#) section for more information.

6: Establishing diversion banks

Diversion banks are used to direct run-off around and away from areas where it could cause problems, such as paddocks with a slope, to suitable disposal areas (Carey et al 2015d).

Suitable disposal areas may include stable waterways, water storages, or areas of the landscape where run-off can be absorbed into the soil, for example, where land has good ground cover and high infiltration rates (Carey et al 2015d).

Further resources

You can find more information on diversion banks in Chapter 8 of the [Soil conservation guidelines for Queensland](#) (Carey et al 2015a), available at www.qld.gov.au.

However, it is recommended that you seek specialist advice from an appropriate person before establishing diversion banks. Please refer to the [Contacts](#) section for more information.

7: Sown pastures and forage crops

Sown pastures and forage crops have been shown to be a valuable way to improve the productivity of a grazing enterprise, and have the ability to assist in restoring land condition. Both have high input costs and depending on your specific property and situation, may not be economically viable. They also require suitable arable land and have a risk of pasture establishment failures.

Further resources

More information can be found at the [Business Queensland](#) website at www.business.qld.gov.au.

It is recommended that you seek specialist advice from an appropriate person to help you assess the viability of establishing sown pastures and forage crops on your property. Please refer to the contact list for more information.

8: Managing weeds

Weed infestations are often related to a decline in land condition. Weeds can also appear after drought. Weeds establish where there is bare ground, taking advantage of less competition from pasture plants.

Taking a proactive approach to preventing and controlling weeds is generally better than waiting for problems to occur. Prevention of weeds includes washing down facilities for vehicles and machinery and good stock hygiene practices. However, this will not prevent weeds from spreading by wind, water or animals - this requires early intervention.

Monitoring your property helps to detect new weeds and enables early intervention, reducing the risk of seeds spreading further onto the property. Monitoring can also be done alongside land condition monitoring (see [More detail on Step 3. Continue to monitor land condition](#)). Having a weed management plan also assists in the management of weeds.

You may need to obtain approvals under other legislation or regulations in relation to management of native vegetation to meet the requirements under the [Vegetation Management Act](#) and other legislation. However, non-native vegetation (including lantana or prickly acacia) or declared weeds can be controlled without approval. Refer to the [Toolbox on managing weeds](#) section for more information.

It is recommended that you seek specialist advice from an appropriate person for more details, if you are unsure. Please refer to the [Contacts](#) section for more information.

Toolbox on managing weeds

- The [Weeds of Australia identification tool](#), available from the Business Queensland website at www.business.qld.gov.au
- [Managing weeds](#), available from the Department of Agriculture, Water and the Environment website at www.environment.gov.au
- Vegetation management resources
 - [Vegetation management](#) available from www.qld.gov.au
 - [Vegetation management laws](#), available from the Department of Natural Resources, Mines and Energy website at www.dnrme.qld.gov.au.

More detail on Step 3. Continue to monitor land condition

Regardless of the measures you use or if your land is in good, fair, poor or degraded condition, it is important to continue to monitor your land condition to assess how effective measures have been. Observing ground cover at least annually in the same way at the same time each year in September helps to:

- detect changes in the condition of pastures and soil
- identify any early decline in land condition
- guide management decisions accordingly.

Some appropriate methods such as photo monitoring, which is described below, can be used to monitor changes in ground cover. You can also use tools such as FORAGE reports and VegMachine FORAGE reports described in [More detail on Step 1. Assessing your ground cover](#) to detect changes in ground cover. You are not restricted to the monitoring methods outlined in this guide, and may choose another technique that achieves the same outcome.

Photo monitoring

Photo monitoring uses photos of a site taken at the same place and time each year to monitor the land condition of that site. Comparing the photos from year to year helps to:

- detect any changes
- make informed management decisions
- adjust stocking rates based on changes in ground cover and density of desirable perennial grasses
- record the effectiveness of your management practices.

Taking photos in September each calendar year gives a good indication of pasture condition before the start of summer rains, and shows whether management strategies have been successful.

You can use the following step-by-step guide and refer to Figure 17 to carry out photo monitoring:

1. Select areas to monitor, representative of where you are taking measures to improve land condition. Areas of poor or degraded land condition where measures are being taken must be monitored. The sites you choose should be accessible at the end of the growing season and in September and their location must be recorded. You could mark the photo monitoring sites and areas of restoration on a property map.
2. Mark the site by using a clearly visible marker (for example, a capped steel picket), GPS location or a landmark (for example a fence line, tree or shed). This will ensure that you can take the photo at the same position each year.
3. Using Figure 17 as a guide, place your first marker in the area you wish to photograph. Walk 10 metres north – this is your second marker point. Turn to face the first marker. The 10 metres distance between markers helps to align the photograph and ensures the ideal ratio of land to sky, which is four-parts land to one-part sky.

Photograph the site from the second marker showing mostly landscape and include the first marker in the photo. As shown in Figure 17, it is recommended that you take one photo from an elevated position and one photo from ground level.

Photos can also be taken looking straight down to indicate pasture density and ground cover percentage. The best time to take your photograph is between 9am and 4pm, which ensures the ideal lighting (McIvor 2012).

4. It is essential to use a time stamp on photos, or record the date and attach it to the photo to ensure that the date is recorded. You should make sure that the photo represents the same view of the landscape as taken in previous years.

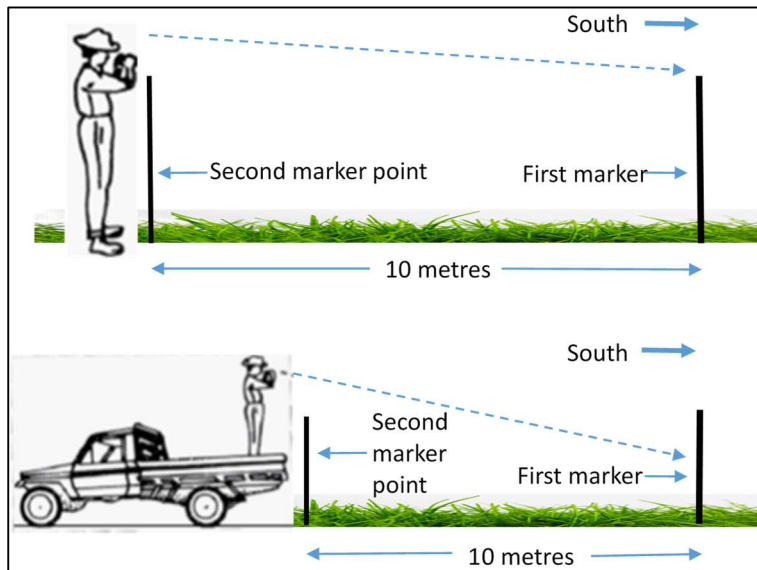


Figure 17: Example of how to set up a photo-monitoring site (Source: adapted from Mclvor 2012).

Contacts

For professional advice on the measures described in this guide you can contact the following organisations:

Department of Environment and Science (DES)

☎ 13 QGOV (13 74 68)

✉ officeoftheGBR@des.qld.gov.au

www www.qld.gov.au/ReefRegulations

Department of Agriculture and Fisheries (DAF) extension officers can be contacted on:

☎ 13 25 23

✉ callweb@daf.qld.gov.au

www www.daf.qld.gov.au/about-us/contact-us

Contact details for regional offices can be found here:

www www.daf.qld.gov.au/contact/offices

Natural Resource Management (NRM) groups

www www.nrmr.org.au/find-your-regional-group/

Vegetation management, Department of Natural Resources, Mines and Energy (DNRME) can be contacted on:

☎ 135 VEG (135 834)

✉ vegetation@dnrme.qld.gov.au

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