

# Ground cover methods



## Great Barrier Reef Report Card 2015



Australian Government



Queensland Government

## **Ground cover methods**

The following provides a brief overview of the data and methods used for reporting regional ground cover in the Great Barrier Reef Report Card 2015 (reef report card). Further detail about data processing and differences compared to previous report cards can be found in the ground cover technical report (DSITI 2016 in prep).

## **Background**

### **Why measure ground cover?**

Ground cover is defined as the vegetation (living and dead), biological crusts and stone that are in contact with the soil surface. Ground cover is a key component of many soil processes including infiltration, runoff and surface erosion. In the Great Barrier Reef regions, low ground cover can lead to soil erosion which contributes to increased sediment loads reaching the reef lagoon and loss of productivity for grazing enterprises.

It is particularly important to maintain ground cover during dry periods or periods of unreliable rainfall to minimise loss of water, soil and nutrients when rainfall eventually occurs. This will also maximise the pasture response to rainfall. Implementation of appropriate and sustainable land management practices, particularly careful management of grazing pressure, can help to maintain or improve ground cover, reducing erosion and improving the stability and resilience of the grazing system.

### **Factors that influence ground cover**

Ground cover levels are the result of complex interactions between landscape function (soil type, topography and vegetation dynamics), climate and land management. Some areas maintain naturally higher levels of ground cover due to factors such as high soil fertility and consistently high annual rainfall. The impacts of grazing land management practices on ground cover levels in these areas may be minimal due to the resilience of the land to respond to pressures. In areas where rainfall is less reliable and soils are less fertile, ground cover levels can vary greatly and the influence of grazing land management practices on ground cover levels and the species composition of the ground cover can be more pronounced.

A number of initiatives are in place or are planned in Great Barrier Reef regions aimed at improving grazing land management, including programs which are improving management of ground cover levels appropriate to the regional conditions. These include the industry-led Grazing Best Management Practice; a number of infrastructure projects such as fencing key areas and better distribution of watering points for stock; trialling different grazing strategies; and, a range of extension and education activities including development of online, interactive and reporting tools for accessing and viewing ground cover information.

## Reporting ground cover levels for Reef Water Quality Protection Plan 2013

Reporting for the ground cover target is provided by the Queensland Ground Cover Monitoring Program and is based on ground cover monitoring data derived from Landsat satellite imagery, calibrated by field data. While it is acknowledged that a range of factors influence ground cover levels, reporting is presently focused only on information which describes regional ground cover levels in the current and historical context. Rainfall data is provided in this report for context only as it is the primary driver of ground cover levels at a regional scale.

A range of products have been, or are being developed by the Queensland Ground Cover Monitoring Program which account for the influence of climate, land management and soil type. These are more appropriate for monitoring local scale variability and differences in ground cover levels, but are of limited use for the regional scale reporting required here. Products which prove useful for describing ground cover levels at the regional scale will help to revise future ecologically-relevant and regionally-focused targets, and will be incorporated into future reporting.

## Methods

The following provides a brief overview of the data and methods used for regional reporting in this report. For further detail about data processing refer to the ground cover technical report (DSITI 2016 in prep).

### Ground cover data

#### *Fractional ground cover*

Reporting is based on data derived using the fractional cover method described by Scarth *et al.* (2010) and Guerschmann *et al.* (2015). The method measures the proportion of green cover, non-green cover and bare ground using reflectance information from late dry season Landsat 5 Thematic Mapper (TM), Landsat 7 Enhanced Thematic Mapper (ETM+) and Landsat 8 Operational Land Imager (OLI) satellite imagery. The spatial resolution of Landsat imagery is approximately 30 metres. The return interval of a Landsat satellite is 16 days and the archive of Landsat data used here dates from 1987 to 2015.

The fractional cover data is calibrated using over 1500 field observations from a range of cover levels and environments. Using the field observations, a further adjustment is applied to the fractional cover data to account for the influence of trees, shrubs and ground cover fractions measured by the satellite. This results in a data product, named fractional ground cover, which aims to effectively remove the influence of trees and shrubs and provides estimates of the level of green ground cover, non-green ground cover and bare ground at ground level. Importantly, this data product enables reporting in areas of higher tree cover: up to 60 per cent persistent green (i.e. woody vegetation) cover. As a final step, the green and the non-green ground cover fractions are summed to produce a total ground cover estimate, as erosion and runoff are influenced by all ground cover. This estimate of total ground cover is what is used for reporting here and is hereafter referred to simply as '*ground cover*'.

### ***Late dry season ground cover***

Late dry season ground cover is estimated using a seasonal composite of fractional ground cover data. The seasonal composite is derived from each 16 day Landsat satellite image acquired throughout the season. It is produced by selecting the most representative per pixel estimate (i.e. 30 metre x 30 metre area) of fractional ground cover for the season; then, compositing these to generate a comprehensive regional data set. This approach has the advantage of removing errors and outliers in the data, providing the most spatially comprehensive coverage as there is generally very little missing data due to cloud, cloud shadow or satellite sensor issues. For reporting here, spring (September-November) seasonal composites (for the period 1987 to 2015) are used as this best approximates the late dry season.

### **Reporting regions and grazing lands**

Reporting is based on the six natural resource management regions which incorporate the Great Barrier Reef region:

- Cape York region
- Wet Tropics region
- Burdekin region
- Mackay Whitsunday region
- Fitzroy region
- Burnett Mary region

Grazing lands in the reporting regions were spatially-defined based on the most recent version of land use data provided by the Queensland Land Use Mapping Program (QLUMP) (DSITI, 2012). The most recent version of the mapping is current to 2009 for all reported regions, except for Cape York and the Wet Tropics, which are current to 2013 and 2015, respectively.

A reporting region is therefore defined as that part of a natural resource management region which is grazing land and has less than 60 per cent persistent green cover.

### **Reporting ground cover**

This report provides a regional overview of late dry season ground cover levels in the Great Barrier Reef region based on analysis of seasonal (spring) total ground cover data. The statistics are calculated for each pixel (i.e. 30 metre x 30 metre area) and then summarised (i.e. averaged) for each of the regions.

Statistics reported include:

- 2015 mean late dry season ground cover
- 28 year mean late dry season ground cover (1987 to 2015)
- percentage of the region's reporting area with late dry season ground cover less than 70 per cent in 2015
- percentage of the region's reporting area with mean late dry season ground cover less than 70 per cent for the 28 year period, 1987 to 2015.

Graphs showing the distribution of ground cover for each region across the range of ground cover levels and a map of ground cover percentages have been provided for the Great Barrier Reef region, and each reporting region, as a visual representation of the statistics listed above. A map of ground cover decile rankings has also been produced to provide information on the ground cover levels for the reporting year (2015) compared to long-term mean ground cover levels.

It is important to note that averaging ground cover across whole regions can mask localised areas of lower cover, particularly in large catchments with a strong rainfall gradient (e.g. Burdekin or Fitzroy). The mean ground cover reported here is therefore indicative of general levels of ground cover within the reporting region. Note that the reporting regions are further divided into catchments (and sub-catchments for larger catchments) for additional level of reporting in the ground cover technical report (DSITI 2016 in prep).

### Rainfall data

Rainfall data is provided for current and historical context as rainfall is the primary driver of ground cover levels at the regional scale. In general, high rainfall in the preceding seasons results in higher ground cover levels and low rainfall in preceding seasons results in lower ground cover levels. Rainfall data was obtained from Scientific Information for Land Owners (SILO) as a five kilometre grid (<https://www.longpaddock.qld.gov.au/silo/>). The mean annual rainfall was then calculated from September to September for each year from 1986, to align the mean annual rainfall with the late dry season reporting period, for each reporting region.

### Scoring system

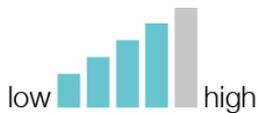
A standardised scoring system is used for each of the key indicators in the reef report card. The scoring system is used to assess and communicate the status of the indicator against the Reef Water Quality Protection Plan target.

### Ground cover target

*Minimum 70 per cent late dry season ground cover on grazing lands by 2018.*

Grade	Status	Criteria for June 2015	Colour
A	Very good	Greater than 70% average groundcover	Dark green
B	Good	Between 50-69% average groundcover	Light green
C	Moderate	Between 40-49% average groundcover	Yellow
D	Poor	Between 30-39% average groundcover	Orange
E	Very poor	Less than 30% groundcover	Red

## Qualitative confidence ranking



A multi-criteria analysis was used to qualitatively score the confidence in each indicator used in the Great Barrier Report Card from low to high. The approach combined the use of expert opinion and direct measures of error for program components where available. Ground cover received a four bar confidence ranking.

## References

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