

Riparian vegetation extent monitoring methods

Reef Water Quality Report Card 2023–2025

Reef 2050 Water Quality Improvement Plan



Australian Government



Queensland Government

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Citation

Australian and Queensland governments. 2026. Riparian vegetation extent monitoring methods, Reef Water Quality Report Card 2023–2025, State of Queensland, Brisbane

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Riparian vegetation extent monitoring

This report summarises the data and methods used for reporting progress towards the Reef 2050 Water Quality Improvement Plan (WQIP) 2025 catchment management target for riparian vegetation extent. The target is:

- The extent of riparian vegetation is increased (Australian and Queensland governments, 2017).

Riparian woody vegetation and ground cover are the vegetation adjacent to waterways which can help reduce pollutant flow to the waterways and stabilise the streambank (Lyons et al., 2000). Riparian areas that are non-woody and have very low ground cover levels may be areas of concern for soil and nutrient loss to the stream (Lyons et al., 2000). Maintaining and enhancing riparian woody vegetation and ground cover in riparian areas is, therefore, important to minimise impacts on water quality in Great Barrier Reef catchments.

Monitoring of riparian vegetation extent is based on analysis of satellite imagery to map woody vegetation and ground cover in riparian areas. The program leverages monitoring of woody vegetation from the Statewide Landcover and Trees Study (SLATS) (Queensland Department of the Environment, Tourism, Science and Innovation, 2026), and monitoring of fractional cover as part of the Queensland Ground Cover Monitoring Program.

Methods

Monitoring and reporting of riparian vegetation extent (and cover) is made up of three key components:

- defining and mapping riparian areas
- mapping riparian woody vegetation extent and measuring changes to this extent over time
- estimating riparian ground cover and analysing how it changes over time within riparian areas.

Defining and mapping riparian areas

Riparian areas range from small headwater creeks to major rivers. Many studies have shown the benefits of using geographic information systems (GIS) and remote sensing to analyse vegetation within a range of specified distances to a stream (Goetz, 2006; Yang, 2007, Apan et al., 2002). For the purposes of meeting the range of objectives for this component of the Paddock to Reef Integrated Monitoring, Modelling and Reporting program (Paddock to Reef program), riparian areas were defined by a 50m buffer zone applied to a combination of topographic drainage line data and riverine wetlands, as mapped by the Queensland Wetlands Program. Estuarine areas were excluded from the analysis. The same drainage data that is used for defining Category R areas for the *Vegetation Management Act 1999* was used to ensure consistency. This is the same riparian area dataset used previously in the 2017 era mapping (reported in 2019), converted to a 10m resolution raster dataset, aligned to the underlying Sentinel-2 datasets. There may be slight differences between this dataset and more recent mapping of drainage lines, and the riparian extent may be updated for future reporting periods.

Mapping riparian woody vegetation extent

For this report, the extent of riparian woody vegetation was mapped using the Statewide Landcover and Trees Study (SLATS) Sentinel-2 woody vegetation extent layers for 2018 to 2023 (Queensland Department of the Environment, Tourism, Science and Innovation, 2026). The 2019 to 2023 layers are updates of the SLATS 2018 baseline woody extent layer.

Features were categorised as either woody or non-woody, where woody vegetation is defined as stands of woody vegetation greater than 0.5 ha with a crown cover greater than 10% (Queensland Department of Environment and Science, 2022). A minimum width of 20m was applied to linear features. Both woody and non-woody features smaller than these sizes have been filtered out of the data set. No distinction is made between

native and non-native vegetation; woody vegetation, such as woody weeds and horticultural crops, is included as woody in the final classification.

It is important to note that this reporting focusses solely on presence or absence of riparian vegetation, given its overall significance for streambank stability, slowing overland flows, and maintaining and improving water quality. The analysis does not examine vegetation type, structure, cover, age or the policy settings that protect vegetation in the landscape. No distinction is made between remnant and non-remnant woody vegetation, and no analysis is made regarding potential non-compliance of riparian vegetation losses (i.e. clearing) under Queensland's Vegetation Management framework.

It is important to note direct comparisons cannot be made with reporting periods prior to 2018, due to the change in methodology in determining woody extent and clearing.

Measuring changes to riparian woody vegetation over time

Recent losses of riparian woody vegetation are analysed using change data from SLATS 2018–2023. The recent losses discussed in this report only use the 'full clearing' category, not the 'partial clearing' category. Full clearing is defined as clearing that results in the conversion of a woody area to non-woody (i.e. to less than 10% crown cover). The recent losses relate only to anthropogenic clearing, and do not include vegetation loss from natural events such as cyclones and drought stress, which typically have a faster recovery time than regrowth after clearing. This distinction is determined through the SLATS classification process.

While measuring regrowth is not part of the current riparian analysis, future reporting will include additional accounting analysis of the losses and gains (i.e. regrowth) in woody extent, including vegetation loss from natural events. However, note that regrowth gains in woody extent may not have the same water quality or ecological values as older, more structurally complex woody vegetation.

Estimating riparian ground cover

For non-woody riparian areas, ground cover is estimated for the current reporting year. Ground cover monitoring is included to recognise the importance of having some level of vegetation cover in riparian areas to help minimise erosion, particularly where woody vegetation is not present to stabilise the soil. Ground cover reporting in riparian areas is based on Sentinel-2 seasonal fractional cover data (Joint Remote Sensing Research Program, 2022). The Sentinel-2 fractional cover product is not specifically a ground cover product and does contain woody vegetation. However, as its use is restricted to non-woody areas in this analysis, it is suitable for the purposes of assessing ground cover. Ground cover levels are assessed in the late dry season (i.e. the spring seasonal image) for the reporting year of interest.

Three classes of ground cover were used for reporting: 0–30%; 30–70%; and greater than 70% ground cover. Very low ground cover can indicate degraded areas, such as gullies. It may also be present naturally in areas containing sandbars, sand dunes and rocky streams. Dams and waterbodies were classified as 'no data'. The different cover types were then combined into a raster layer for the riparian area within each catchment, coded as follows:

- high ground cover, i.e. non-woody, 70% and greater cover
- medium ground cover, i.e. non-woody, between 30% and 70% cover
- low ground cover, i.e. non-woody, less than 30% cover
- woody vegetation
- no/missing data

Although not part of the riparian target, this additional dataset is available on request.

Assessing progress towards the target

The Reef 2050 Water Quality Improvement Plan 2025 target that '*the extent of riparian vegetation is increased*', is reported based on data from 2021–2023. Specifically, the extent of riparian woody vegetation in 2023 will be compared to the extent in 2021 with progress measured by the change between those two dates. A positive change in extent indicates progress. A negative change (greater than 0.01% annual loss) indicates that no progress has been made. As this reporting period is only two years compared to the previous three-year period, the change has been converted to an annual rate.

Assessment against the target as per the below criteria:

Progress	Criteria
Improving (target met)	Increase of riparian vegetation
No change	Less than or equal to 0.01% annual loss of riparian vegetation
Declining	More than 0.01% annual loss of riparian vegetation.

Semiquantitative confidence ranking

Data confidence ●●●○○

A multi-criteria analysis was used to score the confidence in each indicator used in the report card from low to high. The approach combined the use of expert opinion and direct measures of error for program components where available. Riparian vegetation extent received a three dot confidence ranking.

Maturity of methodology (weighting 0.5)	Validation	Representativeness	Directness	Measured error
New or experimental methodology	Remote sensed data with no or limited ground truthing	1:1,000,000	Measurement of data that have conceptual relationship to reported indicator	Error not measured or >25% error
Peer reviewed method	Remote sensed data with regular ground truthing (not comprehensive)	1:100,000	Measurement of data that have a quantifiable relationship to reported indicators	10–25% error
Established methodology in published paper	Remote sensed data with comprehensive validation program supporting (statistical error measured)	1:10,000	Direct measurement of reported indicator with error	Less than 10% error
2 x 0.5 = 1	2	2	2	2

Bolded cells indicate assessment ranking

Total score = 9, equates to **three dots**.

References

- Apan, A.A., Raine, S.R. and Paterson, M.S., 2002. Mapping and analysis of changes in the riparian landscape structure of the Lockyer Valley catchment, Queensland, Australia. *Landscape and Urban Planning* 59:43-57.
- Goetz, S.J., 2006 Remote Sensing of riparian buffers: past progress and future prospects. *Journal of the American Water Resources Association*. 42:133-143.
- Joint Remote Sensing Research Program & Queensland Department of Environment and Science. 2022. Seasonal Fractional Cover - Sentinel-2, JRSRP Algorithm Version 3.0, Eastern and Central Australia Coverage. Version 3.0. Terrestrial Ecosystem Research Network. Dataset. <https://portal.tern.org.au/metadata/13810293-c6b5-442b-bfcd-817700738e0d>
- Lyons, J., Trimble, S. W., and Paine, L. K., 2000. Grasses vs trees: Managing riparian areas to benefit streams of central North America. *Journal of the American Water Resources Association*. 36:919-930.
- Queensland Department of Environment and Science. 2022. Statewide Landcover and Trees Study – Methodology Overview v1.1. Queensland Government, Brisbane.
- Queensland Department of the Environment, Tourism, Science and Innovation. 2025. Statewide Landcover and Trees Study – 2022-2023 Report. Queensland Government, Brisbane.
<https://www.data.qld.gov.au/dataset/2022-23-slats-report>
- Queensland Department of the Environment, Tourism, Science and Innovation. 2026. Statewide Landcover and Trees Study – Sentinel-2 series. Queensland Government, Brisbane.
<https://www.data.qld.gov.au/dataset/statewide-landcover-and-trees-study-queensland-sentinel-2-series>
- Yang, X. 2007. Integrated use of remote sensing and geographic information systems in riparian vegetation delineation and mapping. *International Journal of Remote Sensing*. 28:353-370.