Australian Government
Department of Climate Change, Energy, the Environment and Water

National Forest and Sparse Woody Vegetation Data

Version 8.0 (2023 Release)

Custodian

Department of Climate Change, Energy, the Environment and Water

Publication Date

August 2024

Abstract

Landsat satellite imagery is used to derive woody vegetation extent products that discriminate between forest, sparse woody and non-woody land cover across a time series from 1988 to 2023. A forest is defined as woody vegetation with a minimum 20 per cent canopy cover, at least 2 metres high and a minimum area of 0.2 hectares. Note that this product is not filtered to the 0.2ha criteria for forest to allow for flexibility in different use cases. Filtering to remove areas less than 0.2ha is undertaken in downstream processing for the purposes of Australia's National Inventory Reports. Sparse woody is defined as woody vegetation with a canopy cover between 5-19 per cent.

The three-class classification (forest, sparse woody and non-woody) superseded the two class classification (forest and non-forest) from 2016. This classification is produced using the same approach in terms of time series processing (conditional probability networks) as the two-class method, to detect woody vegetation cover. The three-class algorithm better encompasses the different types of woody vegetation across the Australian landscape.

It is not advisable to compare previous two-class forest and non-forest product with the latest three-class product for multi-year change. For land cover change studies, it is highly recommended to use three-class time series data from a single year of supply. Note that satellite sensor changes and calibration base changes can result in pixel shift in Landsat imagery between supply years for the same epoch at a given location.

Forest and sparse woody vegetation data is derived from satellite imagery sourced from Landsat TM, ETM+ and OLI sensors for the following epochs:

1988, 1989, 1991, 1992, 1995, 1998, 2000, 2002, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022 and 2023.

For further technical information, please refer to Australia's National Inventory Report 2022.

Satellite image acquisition dates vary between northern and southern tiles, to ensure the best possible forest discrimination. Data for remaining rangeland tiles (sf53 and sg53) is available for 1989-2006 in the version 4, 2019 release. Please refer to National Forest and Sparse Woody Vegetation Data (Version 4,2019 Release) on www.data.gov.au.

Unlike previous versions of the National Forest and Sparse Woody Vegetation data releases where 35 tiles have been released as part of the product, only the 25 southern tiles have been supplied in this release. The 10 northern tiles will be released as a separate product release, expected later in the financial year, as these are subject to a methodological change associated with the adoption of the Sentinel sensor and will be supplied at a different resolution.

Defined region

Australia excluding external territories.

Maintenance and update frequency

Each update of the National Inventory results in a new suite of products across the entire time series, as part of a continuous improvement and verification program. Since 2004, woody cover and change products are updated annually.

Date Range

3 January 1988 – 14 March 2023

Conditions of use

The data are designed for the purpose of providing a nationally consistent land cover product. Users should always consider the appropriateness of the data before using for other purposes.

Lineage

Woody vegetation cover across Australia is derived from Landsat imagery, at a 25-metre resolution from 1988 to 2023. Since 2020, a Random Forests classifier is applied to terrain corrected, surface reflectance data extracted from the Digital Earth Australia platform, to produce the annual woody vegetation product. This is followed by Conditional Probability Network (CPN) analysis to strengthen confidence in the classification, as each image is compared to the previous and subsequent images to resolve uncertainty.

The two-class algorithm in use prior to 2016 classified land cover into forest and non-forest.
In 2016 a new three-class algorithm was introduced to assess both the extent, and changes in extent, of sub-forest forms of woody vegetation using the Landsat TM, ETM+ and OLI data. This method builds on the previous two-class CPN classification technique, by incorporating an additional spatial measure to distinguish between sparse woody vegetation (5-19% canopy cover) and forest (≥ 20% canopy cover). See figure 1 for a comparison between the two classification methods.

During each National Inventory cycle the entire product suite is revised as the time series expands and more images are available for previous and subsequent image comparisons. Therefore identification of forest and sparse woody extent is continually improving, particularly in more recent years.

It is highly recommended that the revised three-class data for the entire time series be used for land cover change studies as there are known changes to forest area between the two-class and three-class

algorithms and changes related to sensor change. This does not necessarily indicate that forest has regrown or been cleared. Rather, it is related to the reclassification of areas that were classified as non-forest in the two-class system, but were near to the thresholding boundary and have now been captured using the three-class technique.

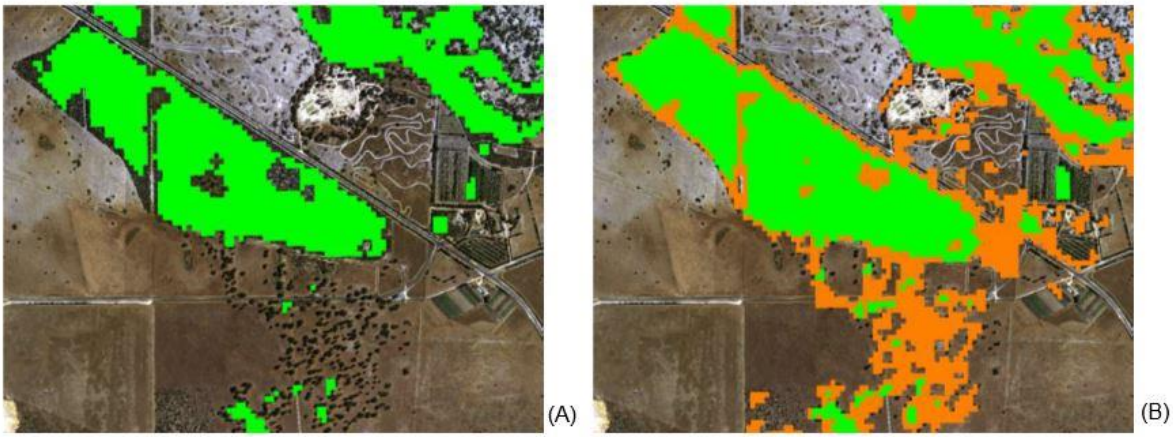

Figure 1: Woody vegetation extent. (A) shows forest (green) in the two-class classification. (B) shows forest (green) and sparse woody vegetation (orange) in the three-class classification (image source: CSIRO)

References

Furby, S., 2002. Land Cover Change: Specifications for Remote Sensing Analysis. *National Carbon Accounting System Technical Report No. 9*, Australian Greenhouse Office, Canberra.

Furby, S., 2016. General Guidelines for Thresholding Images Using Image Matching, Version 13, Unpublished Report, CSIRO Data61.

Furby, S., 2019. Methodology for the Forest Extent and Change Mapping for the National Inventory: 2019 Update, Unpublished Report, CSIRO Data61.

Cell Size

0.00025 degrees (~25m)

Coordinate System

Geographic; Datum: GDA 1994

Positional accuracy

The positional accuracy of these data is assumed to be the same as the Surface Reflectance products obtained from Digital Earth Australia.

Dataset units

Table 1: Three-class woody vegetation classification pixel values

Pixel value	Description
0	Non-woody
1	Sparse woody vegetation
2	Woody vegetation (forest)

Attribute Completeness

Woody vegetation extent is classified through the CPN analysis only where certainty levels are high, thus minimizing false change over time. The statistical probability of woody vegetation being confidently attributed as present requires two subsequent epochs to be present in the analysis.

Geographic Completeness

Southern tiles, Mainland Australia and most nearby islands.

Geographic completeness is defined by the available Landsat images for each epoch from 1988.

Data format and delivery

Tiff files delivered on a per-tile basis (see figure 2)

Dataset citation

Department of Climate Change, Energy, the Environment and Water (2023). National forest and sparse woody vegetation data. Version 8.0. Commonwealth of Australia, Canberra.

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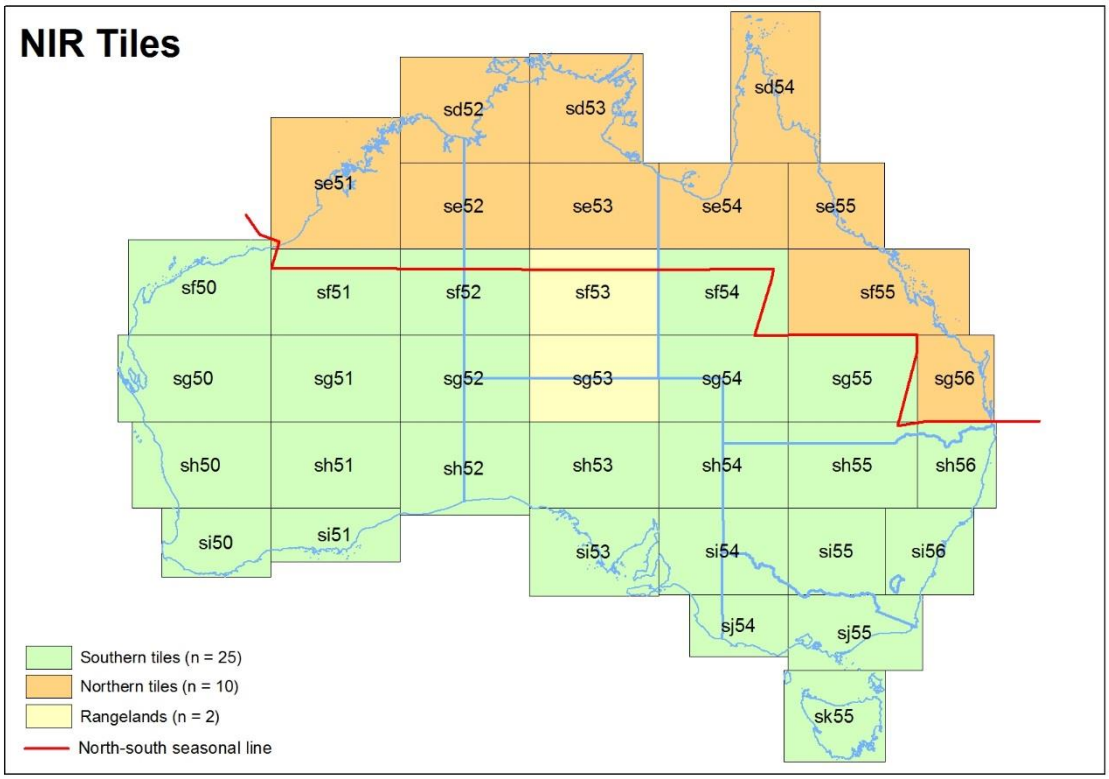

Figure 2: Woody extent data is currently available from 1988-2022 for northern (v7.1 release) and from 1988-2023 for southern tiles (v8.0 release). For rangeland tiles (yellow), data is available from 1989 to 2006.