

Resource title	Forests of Australia (2023) dataset
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Abstract	<p><i>Forests of Australia (2023)</i> is a continental spatial dataset of forest extent, by national forest categories and types, assembled for Australia's State of the Forests Report - 2023 update. It was developed from multiple forest, vegetation and land cover data inputs, including contributions from Australian, state and territory government agencies and external sources.</p> <p>A forest is defined in this dataset as "An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding two metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20 per cent. This includes Australia's diverse native forests and plantations, regardless of age. It is also sufficiently broad to encompass areas of trees that are sometimes described as woodlands".</p> <p>The dataset was compiled by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) for the National Forest Inventory (NFI), a collaborative partnership between the Australian and state and territory governments. The role of the NFI is to collate, integrate and communicate information on Australia's forests. State and territory government agencies collect forest data using independent methods and at varying scales or resolutions. The NFI applies a national classification to state and territory data to allow seamless integration of these datasets. Multiple independent sources of external data are used to fill data gaps and improve the quality of the final dataset.</p> <p>The NFI classifies forests into three national forest categories (Native forest, Commercial plantation, and Other forest) and then into various forest types. Commercial plantations presented in this dataset were sourced from the National Plantation Inventory (NPI) spatial dataset (2021) (unpublished), also produced by ABARES. Another dataset produced by ABARES, the Catchment scale land use of Australia (CLUM) dataset (2020), was used to identify and mask out land uses that are inappropriate to map as forest.</p>

	<p>The <i>Forests of Australia (2023)</i> dataset is produced to fulfil requirements of Australia's <i>National Forest Policy Statement</i> and the <i>Regional Forests Agreement Act 2002</i> (Cwth), and is used by the Australian Government for domestic and international reporting.</p> <p>Previous versions of this dataset are available on the Forests Australia website spatial data page and the Australian Government open government data portal data.gov.au.</p>
Purpose	For describing Australia's forest extent, as reported in the Australia's State of the Forests Report -2023 update .
ANZLIC search words	<p>FORESTS FORESTS Natural FORESTS Plantation AGRICULTURE VEGETATION VEGETATION Floristic VEGETATION Structural</p>
Keyword(s)	<p>Forest Forest cover Land cover Forest type Plantation Vegetation Vegetation cover Tree cover Woody cover Australia</p>
Sources used to generate this dataset and/or resource	See Table 1 and Table 2 (Appendix 1) below.
Publication date	December 2023
Latest date of information/currency	30 June 2021
Data file name	Aus_For23
Stored data format	GIS files created using Esri ArcGIS 10.6 software: ESRI Grid (raster) and Layer file formats – zipped. TIFF raster format is also available.
Compressed file size	150 MB (zipped ESRI GRID), 77 MB (zipped GeoTiff)
Geographic extent	<p>Australia excluding external territories</p> <p>North bounding Latitude: -8.2° South bounding Latitude: -44.4° East bounding Longitude: 157.2° West bounding Longitude: 109.5°</p>
Spatial resolution/cell size	1 hectare/100 x 100 metre
Spatial reference	ESPG:3577 GDA94 Australian Albers

	Coordinate system: GDA_1994_Albers False Easting: 0 False Northing: 0 Central meridian: 132° Standard parallels: -18°, -36° Latitude of origin: 0° Datum: D_GDA_1994
Positional accuracy	Horizontal: ±100 metres Vertical: not applicable
Attribute accuracy	Attributes are compiled exercising due care and skill. However, accuracy of attributes is in part dependent on accuracy of data supplied to ABARES and therefore cannot be guaranteed.
Completeness	Coverage: Dataset provides coverage of 100% of Australia excluding external territories. Attributes: Forest Category and Forest Type information is present for over 99.0% of Australia.
Update frequency	5 years
Licencing	Creative Commons by Attribution 4.0 International (CC BY 4.0)
Access constraints	No restriction, nil cost.
Use constraints	CC BY 4.0 permits: Share – users may copy and redistribute the material in any medium or format. Adapt – users may remix, transform, and build upon the material for any purpose, even commercially. Attribution – users must give appropriate credit using the citation listed, provide a link to the licence, and indicate if changes were made. Users may do so in any reasonable manner, but not in any way that suggests the licensor endorses the use.
Security constraints	Classification: Unclassified
Legal constraints	The Australian Government acting through the Department of Agriculture, Fisheries and Forestry, represented by the Australian Bureau of Agricultural and Resource Economics and Sciences, has exercised due care and skill in preparing and compiling the information and data in this publication. Notwithstanding, the Department of Agriculture, Fisheries and Forestry, ABARES, its employees and advisers disclaim all liability, including liability for negligence and for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying on any of the information or data in this publication to the maximum extent permitted by law.
Metadata date	30 November 2023
Additional metadata	Documentation on dataset lineage, and attribute data descriptions and lookup tables for the <i>Forests of Australia (2023)</i> dataset, are available from the Forests Australia spatial data webpage.

Appendix 1

Table 1: Key input datasets used to develop *Forests of Australia 2023* dataset using Multiple Lines of Evidence approach

Dataset	Description
<i>Forests of Australia (2018)</i>	<i>Forests of Australia (2018)</i> is the forest extent dataset that was used in the State of the Forest Report (SOFR) 2018. It is a continental dataset of forest extent by national forest categories and types. The dataset was developed by a Multiple Lines of Evidence process from multiple forest, vegetation and land cover spatial data inputs, including contributions from relevant Australian, state and territory government agencies and external sources.
State-wide Land and Tree Study (SLATS) Woody Extent (2018) - Queensland. Also known as Queensland Foliage Projective Cover (FPC) (2018).	The Queensland government SLATS method calculates Foliage Projective Cover (FPC) values from Sentinel-2 satellite images (and before 2018 used Landsat satellite Thematic Mapper™ and Enhanced Thematic Mapper Plus (ETM+) images). ABARES used an empirically derived relationship between FPC and crown-cover values (Scarath et al. 2008) to delineate the landscape into forest and non-forest areas (an FPC of 11% is approximately equivalent to a crown cover of 20%). The Sentinel-2 dataset is produced at 10 m × 10 m resolution, and is supported by on-ground validation. The dataset covers the whole of Queensland, was developed to support land-clearance legislation and monitoring of change.
National Greenhouse Gas Inventory (2016 – 2020)	The National Greenhouse Gas Inventory (NGGI) dataset is produced from Landsat satellite Thematic Mapper™, Enhanced Thematic Mapper Plus (ETM+) and Operational Land Image (OLI) images for the Australian Government Department of the Climate Change, Energy, the Environment and Water (DCCEEW), and identifies woody vegetation of height or potential height greater than 2 metres, crown cover greater than 20%, and with a minimum patch size of 0.2 hectares (DISER 2021a). The dataset is compiled using time-series data since 1972, and is produced at a 25 m × 25 m resolution. The NGGI dataset used was developed from the five annual layers (2016-2020, inclusive) from the National forest and sparse woody vegetation data (Version 5.0) spatial dataset produced using the algorithms for land-use change allocation developed for the <i>National Inventory Reports</i> (DISER 2021b). Each layer of the original 25 m resolution, three-class (forest, sparse woody and non-forest) dataset was resampled to a binary (forest and non-forest) 100 m raster by classifying as forest the 100 m pixels that had more than half their area as forest; the sparse woody and non-forest classes were combined into a non-forest class. The five annual layers were then combined and every pixel in the combination that had been classified as forest in any year during 2016-2020 period was allocated as forest (and the balance non-forest). This approach was taken to prevent areas where the crown cover had reduced temporarily below 20%, through events such as fire, harvesting, drought or disease, from being incorrectly classified as non-forest.
NSW H_Woody_Fuzzy_2_Class	This dataset was developed to support New South Wales Natural Resources Commission's (NRC) Monitoring, Evaluation and Reporting Program and is based on the NGGI dataset produced by DCCEEW from Landsat data. NRC applied Fuzzy Logic and Probability modelling to the NGGI dataset to derive annual layers distinguishing between forest and non-forest at 25 m raster resolution. Each of five annual layers, 2015 to 2019, was resampled to a 100 m raster by classifying as forest the 100 m pixels that had more than half their area as forest as determined from 25 m pixels. The five annual layers were combined and every pixel in the combination that had been classified as forest in any year during 2015-2019 period was allocated as forest (and the balance non-forest). This approach was taken to prevent areas where the crown cover had reduced temporarily below

	20%, through events such as fire, harvesting, drought or disease, from being incorrectly classified as non-forest.
NPI 2021 spatial dataset	NPI 2021 spatial dataset was used to identify the area of Commercial plantations (Legg et al. 2021). The spatial vector dataset (from ABARES) was converted to a raster format before being integrated with the MLE forest cover raster dataset.
Qld 2016–17, 2017-18, and 2018-19 Land Clearing datasets	These annual datasets are produced by the Queensland government for the purposes of tracking vegetation clearing in the state, and were used by the NFI to identify and classify as non-forest cleared areas that would otherwise have been incorrectly mapped as forest in <i>Forests of Australia (2023)</i> .
NSW 2017-18, 2018-19 and 2019-20 Woody vegetation clearing datasets	These annual datasets are produced by the New South Wales government for the purposes of tracking vegetation clearing in the state, and were used by the NFI to identify and classify as non-forest cleared areas that would otherwise have been incorrectly mapped as forest in <i>Forests of Australia (2023)</i> .
Tasmania Forest Communities with NVIS Groups 2020 dataset	This statewide forest cover dataset was provided by the Tasmanian government for use in SOFR 2023. The vector (shapefile) dataset distinguishes between forest and non-forest polygons, with the forest polygons further attributed with relevant forest communities, including the dominant tree species. The dataset also includes attributes of vegetation community codes, source data and a National Vegetation Information System (NVIS) attribute that describes high-level forest structure.
Victorian Land Cover (2015-19)	The Victorian Department of Environment, Land, Water and Planning ¹ (DELWP) recommended allocating as forest the following cover types from the Victorian Land Cover (2015-19) dataset: <ul style="list-style-type: none"> - Treed native vegetation - Conifer plantation - Hardwood plantation - Mangrove vegetation - Perennial wetland
Global Mangrove Watch (2018)	The Global Mangrove Watch (GMW) dataset is based on ALOS PALSAR and Landsat imagery, and provides geospatial information about mangrove extent and changes. Geoscience Australia is a collaborator of the GMW project through the Digital Earth Australia (DEA) project (Bunting et al. 2018; Thomas et al. 2017).
Land Use Mapping Project ² (LUMP) of the Northern Territory (2016 – 2022)	The LUMP dataset maps land use in the Northern Territory using the national classification scheme developed by the Australian Collaborative Land Use and Management Program (ACLUMP). The dataset was used to identify and map sandalwood plantations in <i>Forests of Australia (2023)</i> .
National Vegetation Information System (NVIS) 6.0	The NVIS dataset contains detailed vegetation descriptions in 6 hierarchal classes, Level 1-6, based on structural and floristic information including dominant genus, growth form, height and cover. Level 6 (VI) Sub-Association (sub-stratum) growth form, height and cover information was used to identify mapped areas that fulfilled the definition of forest (growth form = tree, potential height >= 2 m and potential crown cover = 20%).
Catchment scale land use of Australia – Update December 2020 (CLUM) land-use mask	The CLUM land-use mask was used to exclude from the MLE forest cover dataset land uses deemed to be not suitable to carry forests, for example urban residential, industrial, mining, horticulture and intensive agriculture. The CLUM dataset is produced by ABARES (2021).
Google Earth Pro, Bing Maps and World Imagery by ESRI	The most recent high-resolution imagery from Google Earth Pro, Bing Maps and World Imagery by ESRI were used for validation of forest and non-forest allocation in areas where confidence in other datasets was low.

¹ Now called Department of Energy, Environment and Climate Action

² [Land Use Mapping Project of the Northern Territory, 2016 - 2022 \(LUMP\) - Dataset - NTG Open Data Portal](#)

CRA, Comprehensive Regional Assessment; CRAFTI, Comprehensive Regional Assessment Aerial Photographic Interpretation; FPC, Foliage Projective Cover; MLE, Multiple Lines of Evidence; NFI, National Forest Inventory; NGGI, National Greenhouse Gas Inventory; NPI, National Plantation Inventory; NIR, National Inventory Report; SPOT, Satellite Pour l'Observation de la Terre. Note: Forest area, cover and extent are used interchangeably in this work.

























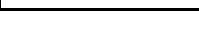
Table 2: Data sources for forest area attribution

Parameter	Data sources (ordered by priority)	Notes
Forest type	<ul style="list-style-type: none"> • NPI 2020, then • Land Use Mapping Project of the Northern Territory (LUMP), 2016 – 2022, then • Tasmania Forest Communities with NVIS Groups 2020, then • NVIS 6.0, then • Forests of Australia (2018) 	<p>A hierarchical approach was used to derive and allocate NFI forest types to the NFI 2021 forest cover dataset in the following order:</p> <ol style="list-style-type: none"> 1. the NPI 2021 spatial dataset was used to allocate types to Commercial plantations. 2. the NT LUMP 2016-22 dataset was used to allocate sandalwood plantations in the Northern Territory to “Other forest”. 3. native forest types were then allocated: <ul style="list-style-type: none"> – Tasmania, from <i>Tasmania Forest Communities with NVIS Groups 2020</i> – ACT, from Forests of Australia 2018 – for all other states and territories, from Major Vegetation Subgroup (MVS), Major Vegetation Group (MVG), Level V and Level VI categories of the NVIS 6.0 dataset. 4. where forest types could not be allocated from the above sources, forest types used in the SOFR 2018 forest cover dataset were allocated. 5. any remaining native forest areas not allocated a forest type were allocated as “Other native forest”. Planted forest areas not allocated a type were allocated as “Other forest”.
Forest tenure	<ul style="list-style-type: none"> • Jurisdictional land tenure datasets from relevant land titles registries and spatial data agencies, then • National land tenure data from PSMA Australia Limited³ (2019), then • Tenure of Australia’s Forests (2018), as used for SOFR 2018. 	<p>The process to allocate tenure categories to the NFI 2021 forest cover dataset used a combination of national tenure information from PSMA, and data from all jurisdictions. Data sources used for each jurisdiction were prioritised based on the assessed accuracy of each dataset.</p>
Forest height and cover	<ul style="list-style-type: none"> • NVIS 6.0, then • Tasmania Forest Communities with NVIS Groups 2020, then • SOFR 2018. 	

NFI, National Forest Inventory; NPI, National Plantation Inventory; NVIS, National Vegetation Information System; PSMA, PSMA Australia Ltd; TASVEG, Tasmanian Vegetation Monitoring and Mapping Program.

³ PSMA Australia Limited has traded under the name [Geoscapes Australia](#) since April 2020.

Table 3: RGB and Hexadecimal values look-up table - for forest type (For_type) colours used to display the Forests of Australia dataset series.

For_Type	RGB value			Hexadecimal value	Colour
	R	G	B		
Acacia	204	173	0	#ccad00	
Callitris	20	130	255	#1482ff	
Casuarina	115	38	0	#732600	
Eucalypt	47	141	0	#2f8d00	
Eucalypt Low Closed	152	251	152	#98fb98	
Eucalypt Low Open	84	106	47	#546a2f	
Eucalypt Low Woodland	122	196	205	#7ac4cd	
Eucalypt Mallee Open	205	102	102	#cd6666	
Eucalypt Mallee Woodland	255	160	122	#ffa07a	
Eucalypt Medium Closed	189	183	107	#bdb76b	
Eucalypt Medium Open	126	207	126	#7ecf7e	
Eucalypt Medium Woodland	128	255	0	#80ff00	
Eucalypt Tall Closed	27	68	0	#1b4400	
Eucalypt Tall Open	69	138	0	#458a00	
Eucalypt Tall Woodland	189	255	255	#bdffff	
Mangrove	255	0	255	#ff00ff	
Melaleuca	255	255	0	#ffff00	
Rainforest	25	25	113	#191971	
Other native forest	255	158	15	#ff9e0f	
Hardwood plantation	240	0	0	#f00000	
Softwood plantation	240	0	0	#f00000	
Mixed species plantation	240	0	0	#f00000	
Unknown species plantation	240	0	0	#f00000	
Other forest - unallocated type	238	224	205	#eee0cd	
Non Forest	255	255	255	#ffffff	

References:

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⁴ Now Department of Climate Change, Energy, the Environment and Water.