Australian Government

Department of Agriculture

ABARES

Development of a national tenure dataset for reporting the tenure of Australia's forests

Rohan Jacobsen, Martin Mutendeudzi, Claire Howell and Steve Read

Cataloguing data

Contents

Tables

Figures

Summary

Land tenure is the mechanism that declares the legal relationship between people and land. It describes who owns which land, and underpins the rights that exist and the activities that are permitted on that land. ABARES holds the authoritative national dataset on the tenure of Australia's forests, and the principles employed in generating this dataset can be applied to other areas of tenure reporting.

Tenure is important when describing forest land. Tenure is a key attribute that has a major bearing on the management intent of forests. It also underpins the identification of who has access to, and rights of use over, forests and forest resources. Forest tenure is reported in the *Australia's State of the Forests Report* (SOFR) series from data in Australia's National Forest Inventory (NFI).

The method for assembling and determining a national forest tenure dataset for the NFI has varied over time, mainly due to changes in the availability and accuracy of source tenure data. An investigation of the tenure information reported in *Australia's State of the Forests Report 2013* assessed the accuracy of available national datasets against authoritative jurisdictional datasets to be between 79% and 99.5%, including identification of specific anomalies. The investigation recommended that the best approach for determining land tenure for the NFI, would be to use state and territory datasets as primary sources, with national datasets only as secondary sources.

ABARES therefore developed the following principles for determining and reporting national land tenure for national forest reporting:

1) recognition of jurisdictional title registers as the formal legal source of tenure information
2) selection and assembly of the most accurate of the available spatial compilations of land tenure
3) transparent translation of jurisdictional and other tenure classes into NFI tenure classes.

These principles underpin the approach that was used to assemble a national forest tenure dataset for the NFI and for reporting in *Australia's State of the Forests Report 2018*.

Spatial tenure datasets were obtained from state, territory and national sources, as spatial representations of the information in jurisdictional title registers. State and territory sources covered all jurisdictions except for South Australia, and part of Western Australia. National sources were the Department of Defence, PSMA Australia, and the NFI forest tenure dataset assembled for *Australia's State of the Forests Report 2013*. Each of these jurisdictional and national datasets was subject to a process to determine suitability of the spatial information of individual areas or tenure classes therein for reporting forest land tenure. Suitable source datasets were assembled into a national land tenure dataset, and the various jurisdictional tenure classes were translated into the standard set of six tenure classes developed for national forest tenure reporting through the NFI.

By land area, 59% of the final spatial tenure dataset used jurisdictional sources of spatial tenure data. Where there was limited or no coverage from jurisdictional data, including for all of South Australia and part of Western Australia, the PSMA Australia and the NFI forest tenure datasets were used as sources. Data on Defence land were taken from the Department of Defence dataset, rather than the jurisdictional datasets, to ensure correct

classification of the Defence estate. By land area, only 0.4% of the jurisdictional datasets were overwritten by Defence data.

The final spatial land tenure dataset, allocated to the six NFI tenure classes, was combined with the forest cover spatial dataset developed for *Australia's State of the Forests Report 2018*, to produce a national NFI forest tenure dataset named *Tenure of Australia's forests (2018)*. By total forest area, two thirds (67%) of Australia's forests are in Leasehold forest (35%) or Private forest (32%), with one sixth of Australia's forests in Nature conservation reserves (16%).

Comparison of this dataset against historic NFI forest tenure datasets showed a reduction in anomalous tenure classification, compared to the previous NFI forest tenure dataset *Tenure of Australia's forests (2013)*. The final *Tenure of Australia's forests (2018)* dataset provides the most complete and accurate representation of the tenure of Australia's forests, and was used to report the area of forest by tenure in *Australia's State of the Forests Report 2018*.

The approach employed to develop the *Tenure of Australia's forests (2018)* dataset may have direct application in the compilation of other national tenure datasets, such as for all land. Adherence to the principles of tenure determination outlined in this report will guide the best approach for assembling and reporting tenure for any future purpose. The methods for translation of the various jurisdictional tenure classification schemas can also be adapted to suit wider land tenure and land ownership applications.

1 Introduction

1.1 Purpose

This ABARES Technical Report has been produced to:

- Define land tenure with regard to forests, and describe how it has been reported historically in the *Australia's State of the Forest Report* series.
- Provide an account of the past methods of assembling national forest tenure datasets.
- List the issues identified in the forest tenure information reported in *Australia's State of the Forests Report 2013* with recommendations to address the issues.
- Define the guiding principles of determining tenure for reporting on forests.
- Document the method used to determine the national forest tenure dataset for *Australia's State of the Forests Report 2018*, including technical information on how individual tenure datasets were combined, and how the various jurisdictional tenure classes were translated to the six national tenure classes.
- Describe the potential applicability of this approach to developing other national tenure datasets.

1.2 What is land tenure, and where is land tenure information held?

In the simplest terms, land tenure is the mechanism that declares the legal relationship between people and land. Tenure of land describes land ownership, occupancy, and rights that exist and activities that are permitted. In modern societies, tenure is fundamental to city planning, housing, economic development, and natural resource and environment management (Donnelly and ICSM 2012). For forests and forest land, tenure is a determinant of the level of access and rights of use of forests, including for forest resources such as timber, and therefore has a major bearing on the management intent for forests.

Each jurisdiction (state or territory) in Australia controls its own system of tenure and is the authoritative source of land tenure. In Australia, land ownership operates under the Torrens Title system of registration of title which is administered at the state and territory level. The Torrens system was adopted by all Australian colonies in the mid-19th century, and today each state and territory maintain their own Torrens Title systems and registries.

For each jurisdiction, the Torrens system certifies and catalogues the ownership of all land parcels, through certificates of title, in a single register commonly referred to as a land title registry. Each land parcel's certificate of title documents the proprietor (owner) of the title and information about any leases, easements or interests. A certificate of title is the indefeasible[1] record of ownership and a legally binding document.

The information held within the registry is the foundation on which land tenure is determined and, for the purposes of this report, is considered the true source of tenure.

---

[1] indefeasible: not subject to being lost, annulled, or overturned

The boundary lines of a land parcel are legally defined by a 'survey plan' (DNRM 2009) that may accompany a certificate of title. This information is collated in jurisdiction-wide databases of all land parcels and property boundaries in that jurisdiction, called a cadastre. Cadastre maps and corresponding modernised digital cadastre databases (DCDB) are the commonly used geographic representation of property boundaries for a variety of administrative purposes such as surveying, public land management, and land and land use information.

There is no national level register of certificates of title. However, in 2001 a national cadastral dataset of land parcels and property boundaries of Australia was first released and licenced by PSMA Australia (PSMA Australia 2002; formerly Public Sector Mapping Agencies Australia).

1.3 Overarching types of land tenure

Land tenure can generally be grouped into two overarching types: freehold land, and non-freehold land.

Freehold land is land alienated from the Crown, where title and ownership are granted (usually via purchase) to a private individual or entity. Freehold land is often referred to as 'private land'. Freehold titles are generally held in perpetuity, and offer the most complete form of land ownership. However, they remain subject to applicable jurisdictional laws: for example, some jurisdictions retain rights relating to extraction of minerals and other resources such as timber from freehold land[2].

Some jurisdictions also have specific legislation that enables Aboriginal freehold land titles to be granted to Aboriginal communities or Torres Strait Island communities (in this report, referred to collectively as Indigenous communities), allowing the associated rights and interests be held in trust by Indigenous communities for the benefit of the respective Indigenous peoples and traditional owners. Indigenous communities also have traditional rights and interests in land recognised in *The Native Title Act 1993 (Cth)*. Native title rights are based on Indigenous traditional law and custom and generally must give way to existing land rights, whether freehold or non-freehold, but may co-exist with some forms of Crown land tenure[3]. ABARES has developed a national Indigenous ownership, management and access spatial dataset separate from the national forest tenure spatial dataset, for the purposes of reporting on Australia's Indigenous forest estate (Dillon et al. 2013).

Non-freehold land is land held by the Crown, either by the Commonwealth government or by a state or territory government. It includes a range of tenures that exist for a variety of purposes. Non-freehold land may be formally designated through legislation for purposes in the public interest such as environmental protection, production forestry, heritage protection, recreation, infrastructure, defence, and various community uses[4]. National parks and state forests are types of land commonly held by the Crown.

Non-freehold land also includes land under a leasehold title where the government (as lessor) and an individual or entity (as lessee) enter into a contract. For this tenure, the government remains the proprietor (legal owner) of the land but the lessee is granted, for a fee, an interest in the land for a fixed term or in perpetuity. Generally, a leasehold title permits the lessee to exclusive occupancy of land and rights of use, however, those rights are subject to applicable

---

[2] austrade.gov.au/land-tenure
[3] austrade.gov.au/land-tenure/native-title/native-title/native-title
[4] austrade.gov.au/land-tenure

jurisdictional laws such as statutory obligations of duty of care for the land, or restrictions on the extraction of minerals and resources such as timber (DNRM 2013).

In some jurisdictions, non-freehold land may be referred to as Crown land or state land. Non-freehold land that is not leasehold land is often referred to as 'public land'.

1.4 Tenure classes in Australia's National Forest Inventory

Australia's National Forest Inventory (NFI) collects, curates and communicates information on Australia's forests for national and international monitoring and reporting, and for enabling national policy decision-making, and is the authoritative source of information on Australia's forests. The NFI is guided by the National Forest Inventory Steering Committee (NFISC), which comprises representatives from national, state and territory government agencies involved in forest information management. The NFI is housed in, and managed by, the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), the science and economics research agency of the Australian Government Department of Agriculture.

Forest land tenure data collated and held in the NFI is classified into one of six national NFI tenure classes. These classes are amalgamations of the wide range of jurisdictional tenure classes used by each state and territory. The six NFI tenure classes are (in alphabetical order):

- **Leasehold forest**: Crown land held under leasehold title, and generally privately managed, although state and territory governments may retain various rights over the land, including over forests or timber on the land. This class includes land held under leasehold title with special conditions attached for designated Indigenous communities.

- **Multiple-use public forest**: publicly owned state forest, timber reserves and other land, managed by state and territory government agencies for a range of forest values, including wood harvesting, water supply, biodiversity conservation, recreation and environmental protection.

- **Nature conservation reserve**: publicly owned lands managed by state and territory government agencies that are formally reserved for environmental, conservation and recreational purposes, including national parks, nature reserves, state and territory recreation and conservation areas, and some categories of formal reserves within state forests. This class does not include informal reserves (areas protected by administrative instruments), areas protected by management prescription, or forest areas pending gazettal to this tenure. The harvesting of wood and non-wood forest products generally is not permitted in nature conservation reserves.

- **Other Crown land**: Crown land set aside for a variety of purposes, including utilities, scientific research, education, stock routes, mining, use by the defence forces, and to protect water-supply catchments, with some areas used by Indigenous communities.

- **Private forest**: land held under freehold title and private ownership, and usually privately managed. This class includes land with special conditions attached for designated Indigenous communities.

- **Unresolved tenure**: land where data are insufficient to determine land ownership status.

While these NFI classes have been developed specifically for reporting on forest tenure nationally, they could also apply to all land with minimal change in names. To achieve this, the NFI tenure classes 'Leasehold forest' and 'Private forest' would be renamed 'Leasehold land' and

'Private land' respectively; the NFI tenure class 'Multiple-use public forest' would not be renamed.

1.5 Reporting forest tenure in the *Australia's State of the Forests Report* series

Australia's State of the Forests Report (SOFR) is a comprehensive five-yearly national synthesis report on the status of Australia's forests, covering the environmental, economic, and social benefits and services provided by forests (MIG and NFISC 2018). The SOFR series satisfies a mandated commitment to report on Australia's forests in the *National Forest Policy Statement* (Commonwealth of Australia 1992) – a joint statement between the Commonwealth and state and territory governments on the vision, policy goals and objectives for Australia's forests. The Commonwealth *Regional Forest Agreement Act 2002* also commits the Commonwealth to creating a publicly available source of information on Australia's forests.

Australia is one of 12 member countries of the Montreal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. The working group has developed a framework of criteria and indicators to help assess the essential components of sustainable forest management (Montreal Process Working Group 2015). Australia developed an adapted version of the framework with seven criteria and 44 indicators that suit the unique characteristics of Australia's forests (Commonwealth of Australia 2008), and these indicators underpin the reporting format of the SOFR series.

Within these seven criteria and 44 indicators, the area of forest by tenure is reported in *Indicator 1.1a – Area of forest by type and tenure* but also informs other indicators. Reporting of tenure uses the six NFI tenure classes. Data are presented spatially (as a map) and in tabular form (showing the area of forest by tenure nationally and for each jurisdiction)[5]. The underpinning spatial dataset is also published by ABARES[6]. Each of the five reports in the SOFR series provides a snapshot of tenure in regards to forests. Employing a consistent approach of assembling and reporting tenure across the series would enable the ability to determine actual change in forest tenure over time.

---

[5] See for example agriculture.gov.au/abares/forestsaustralia/Pages/SOFR2018/Criterion1.aspx
[6] agriculture.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/forest-tenure

2 Background

The extent of forest by type and tenure has been reported in each *Australia's State of the Forests Report* (SOFR 1998, SOFR 2003, SOFR 2008, SOFR 2013 and SOFR 2018). The approaches used for determining tenure information for the National Forest Inventory (NFI), and the sources of that tenure information have varied over time.

2.1 Past methods of tenure determination

For the first three reports in the *Australia's State of the Forests Report* series (SOFR 1998, SOFR 2003 and SOFR 2008), tenure information for the NFI was sourced primarily from state and territory governments. For SOFR 1998, tenure information was also sourced from the Australian Surveying and Land Information Group (now Geoscience Australia). The spatial datasets provided to the NFI for these three reports were of varying format, scale, currency, and completeness of coverage and attribution. The accuracy of these datasets is unknown.

In 2012, PSMA Australia released its first spatial Land Tenure dataset that covered all jurisdictions (PSMA Australia 2011, 2012)[7]. The PSMA Land Tenure dataset assembles land tenure information from relevant land agencies from each state and territory, and classifies each jurisdiction's tenure schema into its own national land tenure schema. The PSMA's tenure classification schema is hierarchical, comprising four tiers, with the fourth and most detailed tier containing 22 individual classes of land tenure across freehold and non-freehold land. Obtained under licence, the PSMA Land Tenure dataset is a coded look-up table of tenure attributes that is linked to corresponding codes that are applied to land parcel records in PSMA's national spatial cadastre dataset, CadLite. The PSMA CadLite dataset provides a spatial representation of legal land parcels and property boundaries across Australia[8]: these are the land parcels for which tenure information is provided in the PSMA Land Tenure dataset.

The NFI opted to use the PSMA 2012 Land Tenure dataset as the primary dataset for determining forest tenure for SOFR 2013, given the benefits of consistency of tenure classification, and the reduced time and effort resulting from utilising an already assembled national land tenure dataset. An additional dataset was sourced from Forestry Corporation NSW (FCNSW), then Forests NSW, as tenure data were not available for much of NSW in the PSMA Land Tenure dataset.

The tenure information in the PSMA Land Tenure and FCNSW datasets were then translated into the NFI's six national tenure classes, and applied to all land (whether forest or non-forest). The resultant national dataset of land tenure was then combined with forest cover information. The resulting spatial dataset, *Tenure of Australia's forests (2013)*[9], was used to report on the area of forest by tenure in SOFR 2013. A subsequent dataset with updated forest type data, *Tenure of Australia's forests (2013) v2.0*[10], was published in 2015.

---

[7] PSMA Australia Limited is an unlisted company owned by all Australian governments and responsible for the commercial provision of fundamental geospatial infrastructure.
[8] psma.com.au/products/cadlite
[9] agriculture.gov.au/abares/forestsaustralia/Pages/spatial-data.aspx#superseded-datasets
[10] agriculture.gov.au/abares/forestsaustralia/Pages/spatial-data.aspx

2.2 Investigation of the reliability of forest tenure reported in *Australia's State of the Forests Report 2013*

Following the publication of SOFR 2013, a potentially anomalous tenure classification was identified in the *Tenure of Australia's Forests (2013)* dataset for an area of forest in southern Victoria. Approximately half the forest area of Wilsons Promontory National Park, Victoria, was classified as 'Other Crown land' tenure, with the remaining extent classified as 'Nature conservation reserve' tenure. In all previous SOFRs, this national park was entirely classified as 'Nature conservation reserve'. Wilsons Promontory National Park was reserved as a national park in 1908[11], and no evidence could be identified supporting a change of land tenure of the park or part of the park. The allocation of part of the park as 'Other Crown land' in SOFR 2013 was derived from data in the PSMA 2012 Land Tenure dataset.

Other similar anomalies were identified on inspection of other areas in Australia.

Subsequently, a broader investigation into the reliability of the *Tenure of Australia's Forests (2013)* dataset and its source data was undertaken, to determine the most suitable spatial representation of land tenure for reporting forest tenure in SOFR 2018 (Jacobsen 2017). Suitability was informed by assessments of the available sources of land tenure data, and a judgement on the resourcing benefit of using a single source tenure dataset, such as that from the PSMA, against the accuracy benefit of assembling a mosaic of multiple jurisdictional and national sources of tenure.

The investigation conducted a series of accuracy assessments of test tenure from various methods ('user' datasets) against true tenure from key source jurisdictional datasets ('producer' datasets) for each jurisdiction.

- The 'producer' datasets obtained for these assessments were the closest cadastral or spatial representations of the true source of tenure in land title registry records. For some jurisdictions this was a publicly available land tenure spatial dataset or a digital cadastre database (DCDB) where tenure information was included in the land parcel attributes. Where such a data source was not available, examination of relevant legislation and tenure documentation informed the selection of the spatial dataset(s) that best represented the true tenure. For example, this included using jurisdictional datasets representing Crown lands, public lands and private lands.

- The 'user' datasets tested mainly included the PSMA 2012 Land Tenure dataset, historical NFI tenure datasets and some jurisdictional datasets.

For each 'user' dataset, the accuracy assessments identified an overall error (the degree to which the 'user' data was different to the 'producer' data), and an overall accuracy (the degree to which the 'user' data agreed with the 'producer' data). These results were confirmed by visual analysis of the data for individual land parcels.

Overall accuracy of tenure information varied across the user datasets tested for different jurisdictions. Overall accuracy varied from a high of 99.5% (overall error of 0.5%) for the PSMA 2012 Land Tenure dataset for the Northern Territory (tested against the Northern Territory DCDB), to a low of 79% (overall error of 21%) for the PSMA 2012 Land Tenure dataset for Tasmania (tested against the Tasmania Land Tenure dataset provided by Tasmania).

---

[11] parkweb.vic.gov.au/explore/parks/wilsons-promontory-national-park/culture-and-heritage

Visual analysis also identified instances of inconsistent tenure classification between the 'producer' datasets and the 'user' datasets. For example:

- in Victoria, the Puckapunyal Military Base, designated as Commonwealth Crown land in Victorian Crown/public land spatial datasets, was listed in the PSMA 2012 Land Tenure as a combination of 'private tenure' and 'no data'

- in Queensland, the Great Sandy National Park on K'Gari (Fraser Island), designated as national park in the Queensland DCDB, was listed in the PSMA 2012 Land Tenure as 'no data'

- in Tasmania, the Southwest National Park, designated as national park in the Tasmania Land Tenure spatial dataset, was listed in the PSMA 2012 Land Tenure in part as a timber reserve.

The results from these accuracy assessments indicated that using a single national land tenure dataset, compared to a mosaic of authoritative jurisdictional datasets, will result in a degree of tenure classification error, with the degree of error varying by jurisdiction. The investigation concluded that, notwithstanding the increased effort required, the best approach for determining land tenure for the NFI, for reporting in SOFR 2018, would be primarily to use state and territory data sources for land tenure, with the PSMA 2016 Land Tenure dataset (and other national datasets as needed) to be used as secondary sources of land tenure.

However, the investigation also identified variation across jurisdictional spatial datasets of the tenure classification for a number of Department of Defence facilities and establishments, and gaps in spatial data coverage of others. The NFI classifies land under control of the Department of Defence as 'Other Crown land' tenure. The investigation thus identified that Department of Defence information on the Defence estate should be obtained and used for tenure determination for the NFI for reporting in SOFR 2018. The Defence spatial land dataset was the only national dataset used in preference to jurisdictional datasets for tenure determination.

3 Developing an updated forest tenure dataset

3.1 Supply of data

In preparation for the supply of data and information for reporting in SOFR 2018, in 2016 the NFI sent data requests for tenure information for *Indicator 1.1a – Area of forest by type and tenure* to relevant agencies in each state and territory. In response:

- the Australian Capital Territory (ACT) supplied a dataset with complete spatial coverage of the territory including tenure attributes translated to the NFI's six national tenure classes.

- New South Wales (NSW) and the Northern Territory (NT) both supplied their respective digital cadastre databases (DCDBs), with original tenure attributes included. NSW also provided instructions for extracting particular land tenure attributes.

- Queensland indicated that the Queensland DCDB could be obtained from the Queensland open data portal QSpatial[12]; this dataset included original tenure attributes.

- Tasmania and Victoria both supplied land tenure datasets that had been prepared by each state for inclusion in respective state-based forest status reports, *State of the forests Tasmania 2017* (FPA 2017) and *Victoria's State of the Forests Report 2013* (DEPI 2014). Both datasets included tenure attributes translated to tenure classes reported in each respective report.

- Western Australia (WA) provided a dataset of land tenure information that covered parts of the state (areas managed by Department of Parks and Wildlife, now Department of Biodiversity, Conservation and Attractions), and advised the NFI to use the PSMA Land Tenure dataset for the remaining areas.

- South Australia was unable to provide a land tenure dataset, and advised the NFI to use the PSMA Land Tenure dataset for the entire state. The NFI identified that the PSMA 2016 Land Tenure dataset contained insufficient attributes for translation to NFI tenure classes for an area of non-freehold land in South Australia. A supplementary state dataset of conservation reserves under government control was therefore sourced from the South Australia Department of Environment and Natural Resources (now Department for Environment and Water), and used to assemble a near-complete coverage of South Australia.

The NFI also obtained basic spatial information on the Defence estate from the Department of Defence. The data supply included advice that the entire Defence estate be translated to the NFI tenure class 'Other Crown land'.

The 2016 PSMA CadLite and Land Tenure datasets for all jurisdictions were purchased and used to fill gaps in coverage and land tenure attributes for South Australia and Western Australia. The PSMA Land Tenure dataset was also used to fill coverage gaps present in land tenure datasets supplied by other jurisdictions. For example, the Jervis Bay Territory was not covered by either the ACT-supplied or the NSW-supplied land tenure datasets, and therefore tenure information for this area was sourced from the PSMA Land Tenure dataset. Similarly, the ACT-supplied tenure dataset contained no data for road reserves in the ACT and therefore tenure information for these areas was sourced from the PSMA Land Tenure dataset.

3.2 Assembling the updated national forest tenure dataset

All tenure datasets obtained for SOFR 2018 were evaluated and assessed for reporting tenure of forest land. This process included:

- review of associated dataset metadata and documentation

- identification of relevant tenure attribute field(s)

- review of documentation and legislation describing tenure classes, to identify their utility and to formulate translations to NFI forest tenure classes

- filtering and selection of the attribute information of value

---

[12] qldspatial.information.qld.gov.au/catalogue/custom/index.page

- geoprocessing to NFI standards of resolution and spatial reference. The NFI publishes spatial information in a raster format with a cell size (resolution) of one hectare (100 by 100 metres).

To be deemed suitable and fit for purpose for a particular area, each dataset was required to have a spatial extent and tenure attributes that could be translated into NFI tenure classes. A spatial extent alone, such as a land parcel or property boundary with no tenure attributes, was considered to be a data gap, as were areas with no spatial information.

Each dataset was converted from the supplied format and resolution to the NFI standard format and resolution.

Tenure classification schemas used in each of the state and territory datasets were interpreted and translated into the NFI's six national tenure classes. The proposed translations for each jurisdiction were endorsed by NFISC representatives. Tables A1–A6 in Appendix A show how the tenure classification schemas used by NSW, the NT, Queensland, Tasmania, Victoria and WA were translated to the NFI national tenure classes, respectively. Tenure data for the ACT were provided in NFI tenure classes.

The PSMA Land Tenure dataset and tenure classification schema was also translated into the NFI national tenure classes. Table A7 in Appendix A shows the four-layer hierarchical tenure classification schema used in the PSMA Land Tenure dataset, and its translation to the NFI national tenure classes.

The spatial dataset of the Defence estate supplied by the Department of Defence was translated in its entirety to the NFI tenure class 'Other Crown land'.

The tenure classes used in the previous NFI dataset *Tenure of Australia's forests (2013) v2.0* were the same as those used currently in the NFI, so needed no translation.

For each state and territory, the dataset used to allocate tenure information to a land parcel was selected based on the recommendations from the investigation of reliability of forest tenure data. The Defence estate was given first priority, with all the Defence estate being classified to the 'Other Crown land' tenure class; this eliminated any tenure data anomalies or gaps present for this land in other data sources. The jurisdictional sources of data were given second priority, on the basis of recommendations from the tenure investigation report (Jacobsen 2017). The PSMA Land Tenure data was given third priority, and was used predominantly for SA and areas of WA but also for areas of gap-filling in other jurisdictions. Where data coverage was incomplete in all of these three datasets, gaps were filled using land tenure data from the *Tenure of Australia's forests (2013) v2.0* dataset. The dataset priority to assign land tenure classes, from highest to lowest, was therefore:

1) Department of Defence estate data

2) Jurisdictional land tenure data

3) PSMA Land Tenure data

4) NFI *Tenure of Australia's forests (2013) v2.0*

Data sources that specifically stated the tenure of a parcel of land as unallocated were treated as data of value, and were translated to the NFI tenure class 'Unresolved tenure'. However, areas with no spatial information, no tenure information, or 'no data' were treated as having an absence of data, and were filled by subsequent data sources, using datasets in the order above.

Any remaining areas, being areas for which no data were allocated in any of the above datasets, were classified as 'Unresolved tenure'.

The output national land tenure dataset was compared with *Tenure of Australia's forests (2013) v2.0* dataset, to identify areas with a change of reported tenure. For large areas where a change in reported tenure had occurred, either the change of reported tenure was confirmed as correct or the tenure was further reviewed to determine and allocate the correct tenure. For example, national parks in North Queensland were classified in the NFI tenure class 'Private forest' in the output national dataset. The validation process showed that these areas were national parks on Cape York Peninsula Aboriginal Land where land ownership was granted as Aboriginal Freehold tenure. Therefore, the 'Private forest' tenure of these national parks was validated as correct.

The validated national land tenure dataset was then combined (intersected) with the spatial forest cover and type dataset *Forests of Australia (2018)*[13] developed for SOFR 2018. The output dataset, *Tenure of Australia's forests (2018)*[14], shows the extent of Australia's forest, by forest type and forest tenure classes. Information derived from the datasets was used to report in tabular form forest tenure extents by jurisdiction in *Australia's State of the Forests Report 2018*.

The final output spatial dataset, *Tenure of Australia's forests (2018)*, is available in an Esri grid raster format from the Forests Australia website[15] and from the Australian Government open data portal[16]. The area of forest by forest type and forest tenure is reported in Indicator 1.1a of *Australia's State of the Forests Report 2018*, and is available as an accessible PDF on the Forests Australia website[17].

4 Tenure of Australia's forests 2018

4.1 Land tenure, by data source

The complete national tenure dataset classified all land in Australia into the six NFI tenure classes, whether forest or non-forest. Although developed for forest tenure reporting, the NFI tenure classes can be used to describe all land with minimal change in name (for example, 'Private forest' to 'Private land').

Of the total land area, the tenure of 0.5% (3.5 million hectares) was derived from the Department of Defence estate data, the tenure of 59% (456 million hectares) was derived from jurisdictional data, the tenure of 25% (189 million hectares) was derived from the PSMA Land tenure dataset, and the tenure of 16% (120 million hectares) was derived from the *Tenure of Australia's forests (2013) v2.0* (Table 1).

---

[13] agriculture.gov.au/abares/forestsaustralia/Pages/spatial-data.aspx
[14] Ibid.
[15] doi.org/10.25814/5c592792c780e; agriculture.gov.au/abares/forestsaustralia/forest-data-maps-and-tools/spatial-data/forest-tenure
[16] data.gov.au/dataset/ds-dga-a923c977-8db4-4451-9740-8ff24b94742c/details?q=forest%20tenure
[17] doi.org/10.25814/5be1205b3aa33; agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2018

Table 1 Total land and forest area in NFI tenure dataset, by data source

Data source	Land area ('000 hectares)	Proportion of total land area	Forest area ('000 hectares)	Proportion of total forest area
Department of Defence estate data	3,534	0.5%	1,331	1.0%
Jurisdictional land tenure data	456,099	59%	113,389	85%
PSMA Land Tenure data	188,834	25%	11,774	8.8%
NFI *Tenure of Australia's forests (2013) v2.0*	120,442	16%	7,544	5.6%
None	6	0.0%	0	0.0%
Total	**768,915**	**100%**	**134,037**	**100%**

Note: Totals may not tally due to rounding.

Of the total forest area, the tenure of 1.0% (1.3 million hectares) was derived from the Department of Defence estate data, the tenure of 85% (113 million hectares) was derived from jurisdictional data, the tenure of 8.8% (12 million hectares) was derived from the PSMA Land tenure dataset, and the tenure of 5.6% (7.5 million hectares) was derived from the *Tenure of Australia's forests (2013) v2.0* (Table 1).

The complete national land tenure dataset comprised 100% (3.53 million hectares) of the Defence estate dataset (resulting from this dataset being given the first priority); 99.6% (456 million hectares) of the combined jurisdictional data (which was given second priority); 32% (189 million hectares) of the PSMA Land Tenure dataset (which was given third priority); and 16% (120 million hectares) of the NFI *Tenure of Australia's forests (2013) v2.0* dataset (Table 2). Of the 189 million hectares for which national land tenure information was derived from the PSMA Land Tenure dataset, 99.9% was located in SA and WA. Of the 120 million hectares for which national land tenure information was derived from the NFI *Tenure of Australia's forests (2013) v2.0* dataset, 95% was located in WA.

Table 2 Area of land in the data sources used in NFI tenure dataset

Data source	Area available and of utility[a] ('000 hectares)	Area used for national land tenure dataset ('000 hectares)	Proportion of data source area that was used for national land tenure dataset
Department of Defence estate data	3,534	3,534	100%
Jurisdictional land tenure data	457,945	456,099	99.6%
PSMA Land Tenure Data	581,353	188,834	32%
NFI *Tenure of Australia's forests (2013) v2.0*	768,906	120,422	16%

[a] Area available and of utility is the extent of land tenure source information of sufficient value that could be translated to an NFI tenure class.

4.2 Land tenure by NFI tenure class

In the final spatial dataset attributed by NFI tenure classes, and intersected with the spatial forest cover from *Forests of Australia (2018)*, 'Leasehold forest' and 'Private forest' tenure together cover more than two-thirds of continental Australia, with 42% (326 million hectares) and 32% (249 million hectares), respectively. 'Other Crown land' tenure covers 14% (107 million hectares), 'Nature conservation reserve' tenure covers 9.5% (73.0 million hectares), and 'Multiple-use public forest' tenure covers 1.5% (11.2 million hectares). Just 0.5% (4.03 million hectares) is 'Unresolved tenure', consisting of areas where no tenure has been allocated as well as areas where no tenure data were available (Table 3).

Table 3 Total land and forest area in NFI tenure dataset, by NFI tenure class

NFI tenure class[a]	Land area		Forest area[b]	
	Area ('000 hectares)	As proportion of total land area	Area ('000 hectares)	As proportion of total forest area
Leasehold forest	325,893	42%	47,268	35%
Multiple-use public forest	11,229	1.5%	10,673	8.0%
Nature conservation reserve	73,003	9.5%	21,752	16%
Other Crown land	106,620	14%	11,102	8.3%
Private forest	249,143	32%	42,436	32%
Unresolved tenure	4,026	0.5%	806	0.6%
Total	**768,915**	**100%**	**134,037**	**100%**

[a] NFI tenure classes applied across the whole landscape whether forest or non-forest.
[b] Reported in *Australia's State of the Forests Report 2018*, derived from intersecting the land tenure area with the forest coverage in the *Forests of Australia (2018)* dataset.
Note: Totals may not tally due to rounding.

Table 3 also shows the total forest area of each tenure class, calculated from the *Tenure of Australia's forests (2018)* dataset and reported in *Australia's State of the Forests Report 2018*. By forest area, 'Leasehold forest' and 'Private forest' tenure together comprise more than two-thirds of Australia's total forest area, with 35% (47 million hectares) and 32% (42 million hectares), respectively. 'Nature conservation reserve' tenure covers 16% (22 million hectares),

'Other Crown land' tenure covers 8.3% (11 million hectares), and 'Multiple-use public forest' covers 8.0% (11 million hectares. Just 0.6% of forest (0.8 million hectares) is in the 'Unresolved tenure' class (Table 3).

Figure 1 shows an example of the output forest tenure dataset across a landscape in the Hunter Valley, NSW. This example shows the Wollemi National Park, Pokolbin State Forest and Singleton Military Area and their respective forest tenure classes of 'Nature conservation reserve', 'Multiple-use public forest' and 'Other Crown land', as well as areas of 'Private forest'. A map of the entire *Tenure of Australia's forests (2018)* dataset is shown in

Figure A1 in Appendix A.

Figure 1 Example of the *Tenure of Australia's forests (2018)* dataset, Hunter Valley NSW
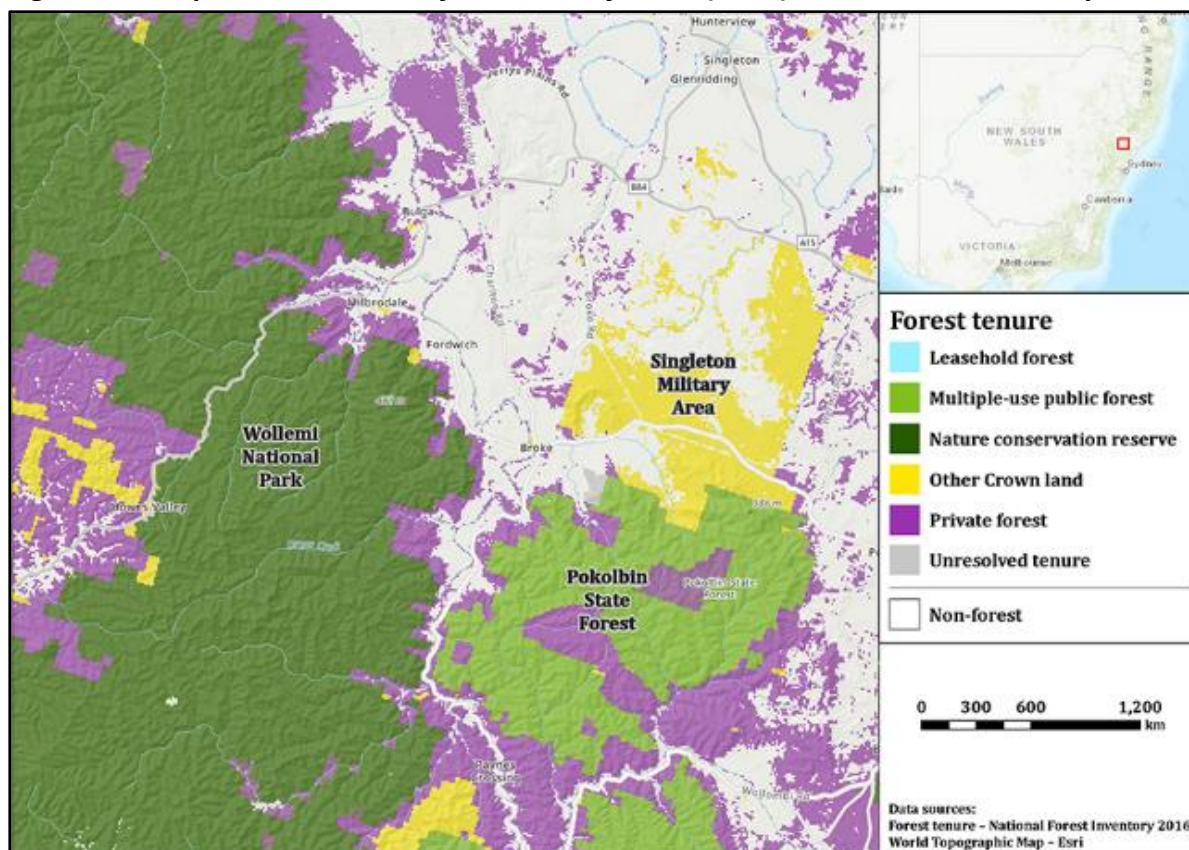
4.3 Land tenure comparison

The output national tenure dataset *Tenure of Australia's forests (2018)* was compared to the land tenure dataset used for assembling the *Tenure of Australia's forests (2013) v2.0*. The comparison identified the instances of anomalous tenure classification in the 2013 datasets had been corrected by the updated approach used to generate the *Tenure of Australia's forests (2018)* dataset.

For example, in the *Tenure of Australia's forests (2018)* dataset, Wilsons Promontory National Park, Victoria, is designated as 'Nature conservation reserve' tenure in its entirety, in line with the direct evidence of the tenure for that area. Puckapunyal Military Base is included as 'Other Crown land' tenure, and the full areas of Great Sandy National Park and the Southwest National Park are both included as 'Nature conservation reserve' tenure.

5 Discussion

Land tenure is important in understanding the ownership of Australia's forest lands, and underpins the management intent for different forest areas. For example, tenure datasets contain information on the extent of publicly and privately owned forests, as well as leasehold areas that are privately managed, and contain information on the extent to which Australia's forests are managed for multiple-uses or are formally protected in nature conservation reserves.

The approaches for determining tenure for the NFI and for reporting through the SOFR series have varied over time, owing to differences in data availability and accuracy, and the cost of dataset development. Furthermore, the accuracy and reliability of past methods of tenure determination is unknown, as these methods were never validated against a known authoritative source of tenure. The preparation of tenure data for reporting in SOFR 2013 primarily used the then newly available PSMA Land Tenure dataset for all of Australia; however, issues were identified with land tenure information from this source. The reporting of forest tenure in SOFR 2018, through the *Tenure of the Australia's forests (2018)* dataset, was therefore re-designed so as to deliver the most complete and accurate representation, as at 2018, of the tenure of Australia's forests.

The fundamental principle of assembling a national tenure dataset is that the state and territory land title registries hold the legal tenure of land in Australia. Information on the extent of property land parcels is derived from associated legal survey documents. Different spatial representations of tenure have been assembled over time, and will likely continue to do so in future, but all have been originally derived from the state and territory registries. Commonly, the spatial representation of such documents is a cadastre database, with this being the source of spatial information for subsequent dissemination and analysis. Selection of the most accurate spatial representation of the original tenure information has been judged the best method for determining the tenure of Australia's forests for inclusion in the National Forest Inventory and reporting in *Australia's State of the Forests Report 2018*. This approach balanced accuracy and time efficiency, and not all areas of inconsistent tenure classification could be reviewed; at a local scale some inconsistent tenure classification may occur. Nevertheless, this approach delivers the most complete and accurate picture of the tenure of Australia's forests.

This new approach incorporates in a specific priority order the multiple national, state and territory sources of tenure data and information. It integrates information from the Department of Defence, from states and territories, and from PSMA Australia, with any remaining gaps in coverage being filled from the previous NFI tenure dataset. All 3.5 million hectares of the Defence estate dataset, and nearly all of the 458 million hectares of supplied jurisdictional datasets, were used to provide tenure information on 61% of Australia's total land area. Of the remaining land area, 189 million hectares of PSMA Land Tenure data was used (25% of total land area) and 120 million hectares of the *Tenure of Australia's forests (2013) v2.0* dataset was used (16% of total land area), with these four datasets together providing almost complete national coverage.

Following translation of the various jurisdictional and other tenure classification schemas into the NFI tenure schema, the tenure dataset was intersected with the spatial forest cover from *Forests of Australia (2018)*. The resultant dataset showed that 'Leasehold forest' and 'Private forest' tenure comprise more than two-thirds of Australia's total forest area, with 35% (47 million hectares) and 32% (42 million hectares), respectively. 'Nature conservation reserve' tenure covers 16% (22 million hectares), 'Other Crown land' tenure covers 8.3% (11 million hectares), and 'Multiple-use public forest' covers 8.0% (11 million hectares).

6 Conclusion and wider applicability

This ABARES Technical Report describes how forest tenure information has been assembled for the NFI and reported in the *Australia's State of the Forests Report* series, using national land tenure classes defined for utility in regards to forests. Tenure information in the final *Tenure of*

Australia's forests (2018) dataset predominantly used data from state and territory sources, supplemented by data from the Department of Defence and PSMA Australia.

Looking ahead, it is likely that state and territory tenure data and information will remain central to the NFI's capacity to develop accurate and reliable national tenure information for forest land. PSMA's last release of their national Land Tenure dataset was the February 2019 release; subsequent updates have been discontinued, with no further updates scheduled. However, recent changes in the management and service delivery of land titling information at the jurisdiction level, including land tenure information and data, means that different approaches to dataset acquisition may be required in future. For example, in recent years the state governments of New South Wales, South Australia and Victoria have all opted to privatise aspects of the management and operations of their land titles offices and registries; other state and territory governments may follow suit over time. The downstream effects of such decisions for the NFI remain to be seen, but may include financial costs for access to land titling and tenure information.

Developing a forest tenure dataset for the NFI includes an interim step that interprets and compiles a dataset of national land tenure, prior to combining with forest extent information. This dataset of land tenure has potential application for other purposes for the NFI, for example, reporting the tenure of land that has had a forest loss or forest gain, and to address other questions related to land tenure and land ownership. The development of a consistent approach to reporting land tenure also facilitates the ability to conduct analysis of forest tenure change over time.

This paper also defines the guiding principles of determining national tenure, specifically recognising the jurisdictional title registers as the authoritative source of tenure, use of the most accurate spatial compilations of land tenure of the range available, and transparent translation of jurisdictional and other tenure classes to national tenure classes. These principles for determining national tenure are not specific to forest and also have potential application for other purposes and fields of study related to land tenure and land ownership, and for producing other national tenure datasets. Provided transparency is maintained, the various jurisdictional tenure classification schemas can readily be translated to suit application to wider fields of study related to land tenure and land ownership. The principles of translation are also sufficiently robust to withstand changes to the management of land tenure and to land parcel information, and changes to the format in which national and jurisdictional land tenure datasets are assembled.

Adherence to the principles of tenure determination will continue to guide the best approach for assembling and reporting forest tenure for the NFI. The approach within this report ensures Australia maintains the capacity to produce accurate and reliable forest tenure information to inform stakeholders, and fulfil national and international reporting commitments.

Appendix A

The tables in this appendix show how the tenure information in jurisdictional and PSMA Land Tenure datasets are translated to the NFI forest tenure classes.

Table A1 Translation of New South Wales DCDB tenure information to NFI forest tenure classes

Dataset/Class, value	NFI forest tenure class	Application priority[a]
LandBase/NPWSReserve	Nature conservation reserve	1
LandBase/StateForest	Multiple-use public forest	2
CrownLandPolygon where field 'crownaccounttype' from *CrownAccount* is 'Leased Crown Land'	Leasehold forest	3
LandBase/Lot, 'controllingauthorityid':		
1 – Unknown	Unresolved tenure	4
2 – Freehold	Private forest	4
3 – Crown	Other Crown land	4
4 – Local Government Authority	Private forest	4
7 – Shared Crown/Council	Other Crown land	4
12 – NSW Government	Other Crown land	4
13 – Australian Government	Other Crown land	4

[a] Application priority was used to allocate tenure where an overlap of two or more datasets occurred. For example, some national parks were included in the 'NPWSReserve' class and in the 'Lot' class with the controlling authority ID of '12 – NSW Government'. The 'NPWSReserve' class provided more specific tenure information and was given higher priority for allocating tenure.

Table A2 Translation of Northern Territory DCDB tenure information to NFI forest tenure classes

Field: 'Tenure description'	NFI forest tenure class
Building Lease	Leasehold forest
Crown Lease Perpetual	Leasehold forest
Crown Lease Term	Leasehold forest
Freehold	Private forest
Government	Other Crown land
Grazing Licence	Other Crown land
Miscellaneous Lease	Leasehold forest
Occupation Licence	Other Crown land
Pastoral Lease	Leasehold forest
Perpetual Pastoral Lease	Leasehold forest
Registered Mining Lease	Leasehold forest
Reserve	Nature conservation reserve
Right to a Freehold Title	Private forest
Special Purposes Lease	Leasehold forest
Unregistered Crown Land	Other Crown land
Vacant Crown Land	Other Crown land

Table A3 Translation of Queensland DCDB tenure information to NFI forest tenure classes

Field: 'Tenure'[a] (where 'Cover type' = 'base')	NFI forest tenure class
Boat Harbours	Other Crown land
Commonwealth Acquisition	Other Crown land
Forest Reserve[b]	Multiple-use public forest
Freehold	Private forest
Housing Land	Other Crown land
Industrial Estates	Other Crown land
Lands Lease	Leasehold forest
Mines Tenure	Leasehold forest
National Park	Nature conservation reserve
Port and Harbours Boards	Other Crown land
Railway	Other Crown land
Reserve	Other Crown land
State Forest	Multiple-use public forest
State Land	Other Crown land
Timber Reserve	Multiple-use public forest
Water Resource	Other Crown land

[a] Values for field 'Tenure' were retained when DCDB was converted to the NFI 100 metre by 100 metre (one hectare) raster. Some unique Tenure field values that describe land parcels smaller than one hectare are not included.
[b] Interim tenure for a maximum of five years. Managed by Department of National Parks, Recreation, Sport and Racing with associated conditions. This tenure allows public access and multiple uses such as grazing, apiary sites and commercial activity, but excludes timber harvesting. Any use must be ecologically sustainable and protect biodiversity in accordance with the Nature Conservation Act 1992.

Table A4 Translation of Tasmanian tenure information to NFI forest tenure classes

Field: 'Tenure'	NFI forest tenure class
Conservation & Public Reserves	Nature conservation reserve
Other Publicly Managed Land[a]	Other Crown land
Permanent Timber Production Zone (PTPZ) land	Multiple-use public forest
Private Freehold Land	Private forest

[a] Future Potential Production Forest (FPPF) land is included in the class 'Other Publicly Managed Land' as a tenure subtype.

Table A5 Translation of Victorian tenure information to NFI forest tenure classes

Field: 'Tenure description'	NFI forest tenure class
Commonwealth Land	Other Crown land
Marine	Nature conservation reserve
Non-crown land	Private forest
Other Crown land	Other Crown land
Parks and Conservation reserves	Nature conservation reserve
Plantation	Multiple-use public forest
State forest	Multiple-use public forest

Table A6 Translation of Western Australia tenure information to NFI forest tenure classes

Fields: 'Tenure', 'Category'[a]	NFI forest tenure class
Crown Land,	
5(1)(g) Reserve	Nature conservation reserve
5(1)(h) Reserve	Nature conservation reserve
Conservation Park	Nature conservation reserve
Marine Management Area	Nature conservation reserve
Marine Nature Reserve	Nature conservation reserve
Marine Park	Nature conservation reserve
Miscellaneous Reserve	Nature conservation reserve
National Park	Nature conservation reserve
Nature Reserve	Nature conservation reserve
SRT[b] – River Reserve	Nature conservation reserve
State Forest	Multiple-use public forest
Timber Reserve	Multiple-use public forest
Freehold,	
CALM[c] Exec Body Freehold	Private forest
Crown Freehold – Dept. Interest	Private forest
National Park[d]	Private forest
SRT[b] – River Reserve	Private forest
Leasehold,	
Section 16A agreement	Leasehold forest
Unallocated Crown Land,	
Section 33(2)	Other Crown land
Unallocated Crown Land – Dept. Interest[e]	Other Crown land

[a] Values for 'Tenure' and 'Category' fields were retained when tenure information was converted to the NFI 100 metre by 100 metre (one hectare) raster. Some unique Tenure field values that describe land parcels smaller than one hectare are not included.

[b] Swan River Trust.

[c] Conservation and Land Management.

[d] These records relate to the Murujuga National Park that is freehold tenure (Indigenous owned), leased back to the government and jointly managed as a national park.

[e] Former pastoral leasehold land that expired on 01 July 2015 and now proposed for conservation. 'Other Crown land' is currently the appropriate tenure class.

Table A7 Translation of PSMA Land Tenure information to NFI forest tenure classes

PSMA hierarchical land tenure levels				NFI forest tenure class
Level 1	**Level 2**	**Level 3**	**Level 4**	
100 Freehold	200 Freehold	300 Freehold	400 Freehold	Private forest
101 Non-freehold	201 Leasehold	301 Term Lease	401 Pastoral Term Lease	Leasehold forest
			402 Special Purpose Term Lease	Leasehold forest
			403 ACT Term Lease	Leasehold forest
			404 Other Term Lease	Leasehold forest
		302 Perpetual Lease	405 Pastoral Perpetual Lease	Leasehold forest
			406 Special Purpose Perpetual Lease	Leasehold forest
			407 Other Perpetual Lease	Leasehold forest
		303 Other Lease	408 Other Lease	Leasehold forest
	202 Reserve	304 Conservation Reserve	409 Marine Reserve	Nature conservation reserve
			410 National Park	Nature conservation reserve
			411 Other Conservation Reserve	Nature conservation reserve
			412 Water Reserve	Other Crown land
		305 Mining Reserve	413 Mining Reserve	Other Crown land
		306 Forestry Reserve	414 Multiple Use Forest	Multiple-use public forest
			415 State Forest	Multiple-use public forest
			416 Timber Reserve	Multiple-use public forest
			417 Other Forestry Reserve	Multiple-use public forest
		307 Transportation or Infrastructure Reserve	418 Stock Route	Other Crown land
			419 Transportation Reserve	Other Crown land
			420 Other Infrastructure Reserve	Other Crown land
		308 Other Reserve	421 Other Reserve	Other Crown land
	203 Vacant, Unallocated or Other Crown Land	309 Vacant, Unallocated or Other Crown Land	422 Vacant, Unallocated or Other Crown Land	Other Crown land
102 No Data	102 No Data	102 No Data	102 No Data	Unresolved tenure

Figure A1 *Tenure of Australia's forests (2018)* **dataset**
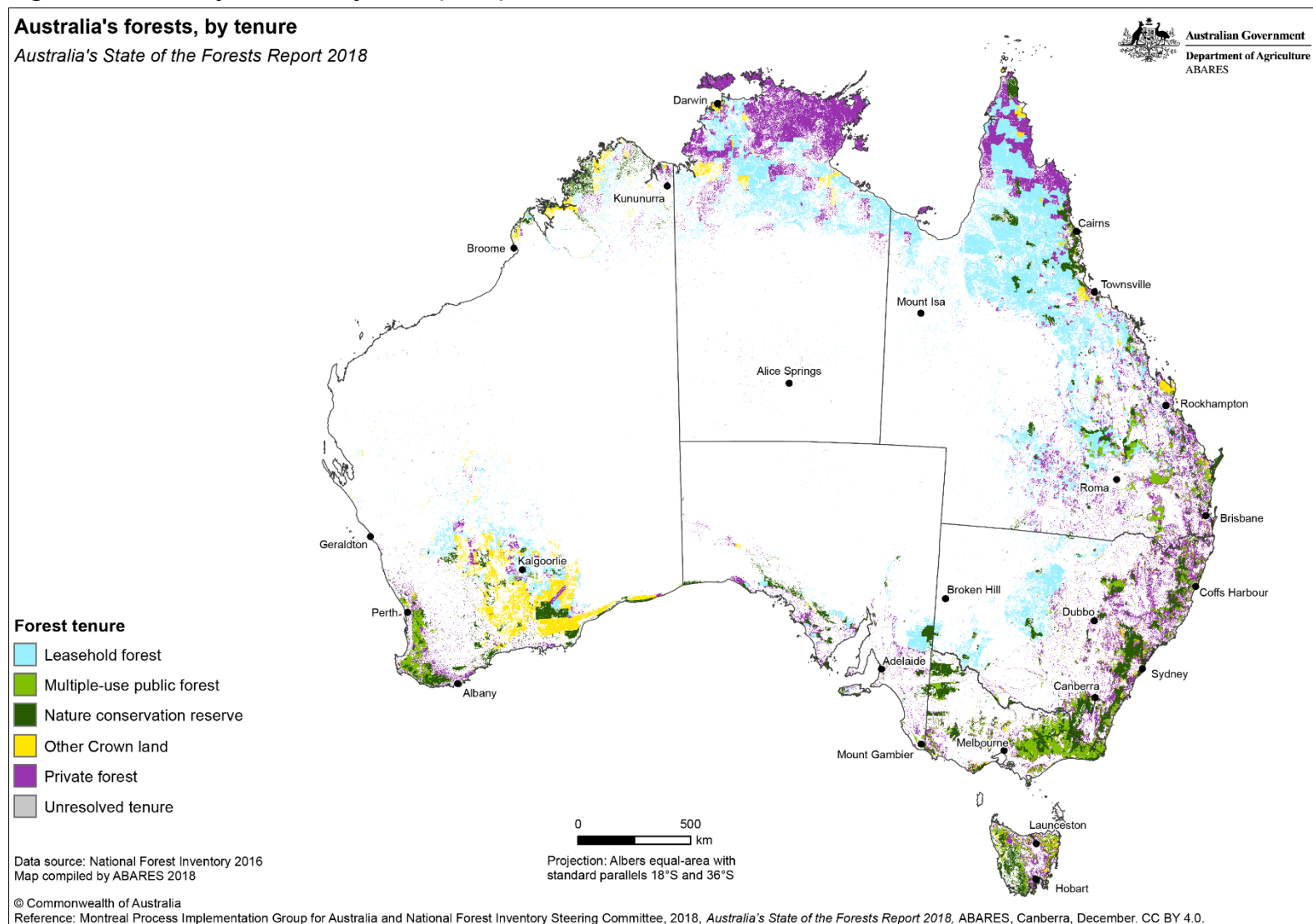
References

Commonwealth of Australia 1992, National Forest Policy Statement: A new Focus for Australia's Forests, 2nd Edition, Commonwealth of Australia, Canberra.

Commonwealth of Australia 2008, Australia's Sustainable Forest Management Framework of Criteria and Indicators 2008: Policy Guidelines, Commonwealth of Australia, Canberra.

DEPI (Department of Environment and Primary Industries) 2014, Victoria's State of the Forests Report 2013, Department of Environment and Primary Industries, Victoria.

Dillon R, Jeyasingham J, Eades S, & Read S 2015, Development of the Australia's Indigenous forest estate (2013) dataset, ABARES Research report 15.6, Canberra.

DNRM (Department of Natural Resources, Mines and Energy) 2009, Land Title Practice Manual (Queensland), Department of Natural Resources and Mines, Queensland.

DNRM (Department of Natural Resources, Mines and Energy) 2013, A guide to Land Tenure under the Land Act 1994 (Qld), Department of Natural Resources and Mines, Queensland.

Donnelly GJ and ICSM (Intergovernmental Committee on Surveying and Mapping) 2014, Fundamentals of land ownership, land boundaries and surveying, ICSM, Canberra.

FPA (Forest Practices Authority) 2017, State of the Forests Tasmania 2017, FPA, Hobart.

Jacobsen R 2017, Investigation into the reliability of National Forest Inventory land tenure information and source data, unpublished report, ABARES, Canberra.

MIG (Montreal Process Implementation Group for Australia) 2008, Australia's State of the Forests Report 2008, Bureau of Rural Sciences, Canberra.

MIG and NFISC (Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee) 2013, Australia's State of the Forests Report 2013, ABARES, Canberra.

MIG and NFISC (Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee) 2018, Australia's State of the Forests Report 2018, ABARES, Canberra.

Montreal Process Working Group 2015, The Montreal Process – Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests, The Montreal Process, 5th Edition.

National Forest Inventory 1998, Australia's State of the Forests Report 1998, Bureau of Rural Sciences, Canberra.

National Forest Inventory 2003, Australia's State of the Forests Report 2003, Bureau of Rural Sciences, Canberra.

PSMA Australia 2002, Annual Report 2001–2002, PSMA Australia, Canberra.

PSMA Australia 2011, Annual Report 2010-11, PSMA Australia, Canberra.

PSMA Australia 2012, Annual Report 2011/12, PSMA Australia, Canberra.