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Title:

LAND TENURE OF AUSTRALIA 2010–11 TO 2015–16, 250 M

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AUSTEN_250m

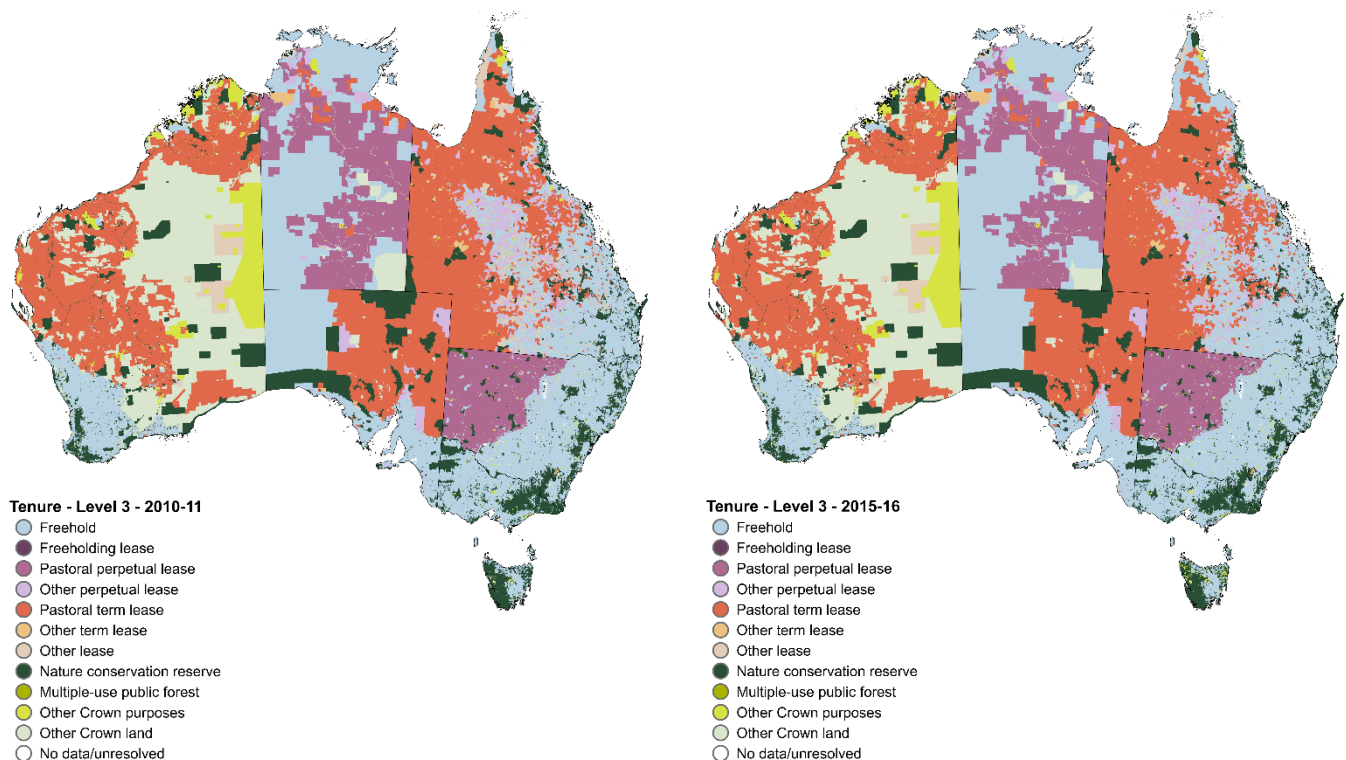
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Abstract:

The *Land tenure of Australia 2010–11 to 2015–16* is a data package of seamless continental rasters combining tenure information from state, territory, and Australian government agencies at a resolution of 250 by 250 metres. The data package contains an independent raster for each target period, a combined change raster at the most detailed classification level and a data caveat raster of known uncertainties in the product.

Land tenure is classified according to a four-tiered hierarchical structure, ordered in increasing level of detail. Level 1 distinguishes between the basic land title types of freehold and Crown land. Level 2 splits Crown land into leasehold, dedicated or reserved for Crown purposes and other Crown land. Level 3 further distinguishes Crown land, defining leasehold type or Crown purposes type based on term and purpose. Leasehold types are split into freeholding lease, pastoral perpetual lease, other perpetual lease, pastoral term lease, other term lease, and other lease. Crown purposes are split into nature conservation reserve, multiple-use public forest and other Crown purposes. Level 4 distinguishes land with an Indigenous land grant, either Crown land held on behalf of, or freehold land owned by, traditional owner groups. Level 4 does not include native title which applies alongside tenure.

The *Land tenure of Australia 2010–11 to 2015–16* data package is a product of the Australian Collaborative Land Use and Management Program.

Descriptive information

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Acknowledgements:

This data package was produced by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) within the Australian Government Department of Agriculture, Water and the Environment as part of the Australian Collaborative Land Use and Management Program (ACLUMP). ACLUMP, of which ABARES is a partner, is a consortium of Australian Government, and state and territory government partners that promotes the development of nationally consistent land use, land cover and land management practice information for Australia.

Spatial data sourced from and used with permission of: ACT Office of the Surveyor-General and Land Information, NSW Department of Customer Service, NSW Department of Finance, Services and Innovation – Spatial Services, NSW Department of Planning, Industry and Environment – Crown Lands and Water, NT Department of Infrastructure, Planning and Logistics, PSMA Australia Limited, Queensland Department of Resources, SA Department for Infrastructure and Transport, SA Department for Environment and Water, Tasmanian Department of Primary Industries, Water and Environment, Victorian Department of Environment, Land, Water and Planning, Victoria Department of Jobs, Precincts and Regions, WA Department of Planning, Lands and Heritage, WA Department of Biodiversity, Conservation and Attractions, and WA Department of Primary Industries and Regional Development.

Constraints

LEGAL CONSTRAINTS ASSOCIATED WITH THE MATERIAL

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Additional information about this material

Purpose for which the material was obtained:

The land tenure datasets provide the spatial representation of the legal regime in which land is owned, leased, reserved or unallocated to a defined purpose in Australia. Land tenure at its simplest is either freehold (private) or non-freehold Crown (public) land. These datasets allow change in Australia's land tenure to be explored between 2010–11 and 2015–16 for various tenure types. These land tenure datasets are also input layers to the *Land use of Australia 2010–11 to 2015–16, 250 m* data package.

How to use this data:

1. These datasets have been made for change analysis. With the nature of archived datasets, change may reflect improved data quality. The data caveat raster should be used to track possible data issues with the data.
2. The equal area projection (Australian Albers EPSG:3577) is provided for area calculations. The accuracy of the raw area estimates is affected by the 250 by 250 m resolution of the tenure datasets and the input datasets used in their construction.
3. These datasets do not provide a comprehensive assessment of Australia's nature conservation reserve system. Only the tenure type of Crown land nature conservation reserve is captured. Nature conservation reserves can occur on freehold land.
4. Freehold land owned by government and government entities, where declared, are included in other Crown purposes, as they are not consistently defined across state and territories as public or private land.
5. These datasets do not consider Indigenous peoples' rights and interests in all lands, only for land granted under Indigenous land grant instruments.
6. No data/unresolved tenure captures areas where there is no tenure data or conflicting data sources. This category includes water features that have unallocated tenure categories in state and territory registers.

Progress status of this material:

Final

Maintenance and update frequency:

As needed

KEYWORD(S)

ANZLIC search words:

AGRICULTURE
BOUNDARIES
BOUNDARIES Administrative
FORESTS
FORESTS Natural
FORESTS Plantation
LAND
LAND Ownership
LAND Conservation
LAND Conservation Reserve
LAND Use

General keywords:

Tenure
Land tenure
Ownership
Ownership Indigenous
Crown land
Public land
Reserve
Leasehold
Pastoral lease
Freehold
Private land
Land use
Australian Collaborative Land Use and Management Program (ACLUMP)

TOPICS

ABARES topic categories:

Agriculture
Land Use

ISO topic categories:

Planning
Cadastre
Boundaries
Farming
Environment

SPATIAL EXTENT(S)

Description of spatial extent:

Australian Land

Spatial bounding box included in:

North: -9.995 degrees; South: -44.004 degrees; East: 154.004 degrees; West: 112.505 degrees.

Spatial area included in:

Australian Mainland. Australia excluding external territories.

Projection:

The datasets are available in equal area EPSG:3577 projections.

Coordinate reference details in Well-Known Text for equal area projection EPSG:3577:

```
PROJCS["GDA94 / Australian Albers",  
GEOGCS["GDA94",  
DATUM["Geocentric_Datum_of_Australia_1994",  
SPHEROID["GRS 1980",6378137,298.257222101,  
AUTHORITY["EPSG","7019"]],  
TOWGS84[0,0,0,0,0,0,0],  
AUTHORITY["EPSG","6283"]],PRIMEM["Greenwich",0,  
AUTHORITY["EPSG","8901"]],  
UNIT["degree",0.0174532925199433,  
AUTHORITY["EPSG","9122"]],  
AUTHORITY["EPSG","4283"]],  
PROJECTION["Albers_Conic_Equal_Area"],PARAMETER["standard_parallel_1",-18],  
PARAMETER["standard_parallel_2",-36],  
PARAMETER["latitude_of_center",0],  
PARAMETER["longitude_of_center",132],  
PARAMETER["false_easting",0],PARAMETER["false_northing",0],  
UNIT["metre",1,  
AUTHORITY["EPSG","9001"]],  
AXIS["Easting",EAST],  
AXIS["Northing",NORTH],  
AUTHORITY["EPSG","3577"]]
```

DATA PACKAGE CONTENTS

Table 1 Description of the Land tenure of Australia 2010–11 to 2015–16, 250 m data package

Folder or file name	Description
AUSTEN_250m_2010_11_alb.zip	AUSTEN raster dataset providing 2010–11 tenure. GeoTIFF, 16-bit integer; coordinate system GDA94/Australian Albers (EPSG: 3577); resolution 250 by 250 metres. Assigned the colour ramp used for the Level 4 land tenure classes. For attribute table description, see Table 2.
AUSTEN_250m_2015_16_alb.zip	AUSTEN raster dataset providing 2016–15 tenure. GeoTIFF, 16-bit integer; coordinate system GDA94/Australian Albers (EPSG: 3577); resolution 250 by 250 metres. Assigned the colour ramp used for the Level 4 land tenure classes. For attribute table description, see Table 2.
AUSTEN_250m_CHANGE_2010_11_2015_16_alb.zip	AUSTEN observed change raster dataset providing 2010–11 tenure, 2015–16 tenure, 2010–11 to 2015–16 tenure change and change attributes. GeoTIFF, 16-bit integer; coordinate system GDA94/Australian Albers (EPSG: 3577); resolution 250 by 250 metres. For attribute table description, see Table 3.
AUSTEN_250m_DC_2010_11_to_2015_16_alb.zip	AUSTEN data caveat raster dataset showing known data limitations at a pixel level. GeoTIFF, 16-bit integer; coordinate system GDA94/Australian Albers (EPSG: 3577); resolution 250 by 250 metres. For attribute table description, see Table 4.
Maps.zip	
• Tenure-L1_20YY_YY.png; .pdf	Map showing the AUSTEN dataset tenure classes in Level 1; either 2010–11 or 2015–16.
• Tenure-L2_20YY_YY.png; .pdf	Map showing the AUSTEN dataset tenure classes in Level 2; either 2010–11 or 2015–16.
• Tenure-L3_20YY_YY.png; .pdf	Map showing the AUSTEN dataset tenure classes in Level 3; either 2010–11 or 2015–16.
• Tenure-L4_20YY_YY.png; .pdf	Map showing the AUSTEN dataset tenure classes in Level 4; either 2010–11 or 2015–16.
• TenureCaveat_2010_11_to_2015_16.png; .pdf	Map showing the AUSTEN dataset data caveats for change reporting.
• TenureChange-L[classification level]_2010_11_to_2015_16.png; .pdf	Map showing for the AUSTEN dataset where tenure change occurred between 2010-11 and 2015-16, at Level 3 and Level 4.
Symbology.zip	Folder containing files to visualise rasters in ESRI ArcMap. The .clr files are ESRI colour map files and the .lyr files are ESRI raster symbology files.

Note: Each .tif raster dataset contains a .tif.aux.xml auxiliary file storing information including raster statistics, histogram, and attributes. 'YY' denotes the year; '_11' for 2010–11 and '_16' for 2015–16. [classification level]: 1, 2, 3 or 4. [jurisdiction]: AUST = Australia; ACT = Australian Capital Territory; NSW = New South Wales; NT = Northern Territory; OT = Other Territories (Jervis Bay); SA = South Australia; Tas = Tasmania; Vic = Victoria; WA = Western Australia.

DATA DICTIONARY

Table 2 Attributes of each tenure target period raster (AUSTEN_250m_20YY_YY_alb.zip)

Field name	Field description	Data type
Value	Tenure code in the target year. First digit represents Level 1, second digit Level 2, third digit Level 3 and the fourth digit Level 4 of the land tenure hierarchical classification. Refer to Table A1.5. a	Integer, range: 1001 to 2302
Count	Count of the number of raster cells in each class of Value	Integer count
L1N	Level 1 tenure classification code. Refer to Table A1.2. a	Integer, range: 1 to 2
L1_DESC	Description of the Level 1 land tenure classes in the target period. Refer to Table A1.2.	String, width 150
L2N	Level 2 tenure classification code. Refer to Table A1.3. a	Integer, range: 10 to 23
L2_DESC	Description of the Level 2 land tenure classes in the target period. Refer to Table A1.3.	String, width 150
L3N	Level 3 tenure classification code. Refer to Table A1.4. a	Integer, range: 100 to 230
L3_DESC	Description of the Level 3 land tenure classes in the target period. Refer to Table A1.4.	String, width 150
L4N	Level 4 tenure classification code. Refer to Table A1.5. a	Integer, range: 1001 to 2302
L4_DESC	Description of the Level 4 land tenure classes in the target period. Refer to Table A1.5.	String, width 150

a The first two integers are -1 for Offshore and 0 for No data/unresolved tenure.

Table 3 Attributes of the change raster dataset (AUSTEN_250m_CHANGE_2010_11_to_2015_16_alb.zip)

Field name	Field description	Data type
Value	Unique number of all possible combinations given to each land tenure change combination.	Integer, range: 0 to 182
Count	Count of the number of raster cells in each class of Value	Integer count
TEN11	Tenure code in the year 2010–11. First digit represents Level 1, second digit Level 2, third digit Level 3 and the fourth digit Level 4 of the land tenure hierarchical classification. Refer to Table A1.5. a	Integer, range: 1001 to 2302
TEN11_DESC	Description of the Level 4 land tenure classes in the year 2010–11. Refer to Table A1.5	String, width 150
TEN16	Tenure code in the year 2015–16. First digit represents Level 1, second digit Level 2, third digit Level 3 and the fourth digit Level 4 of the land tenure hierarchical classification. Refer to Table A1.5. a	Integer, range: 1001 to 2302
TEN16_DESC	Description of the Level 4 land tenure classes in the year 2015–16. Refer to Table A1.5	String, width 150
TCH	Observed tenure change code. Refer to Table A2.1. a	Integer, range: -1 to 2
TCH_DESC	Description of observed tenure change code. Refer to Table A2.1.	String, width 150
T11_16	Change in tenure code from the year 2010–11 to 2015–16.	String, width 150
T11_16DESC	Change in tenure class description from the year 2010–11 to 2015–16.	String, width 150

a The first two integers are -1 for Offshore and 0 for No data/unresolved tenure.

Table 4 Attributes of the data caveat raster (AUSTEN_250m_DC_2010_11_to_2015_16_alb.zip)

Field name	Field description	Object ID
Value	Data caveat code. The code describes the data caveat related to using the cell for change detection. Refer to Table A2.2.	Integer, range: -1 to 7
Count	Count of the number of raster cells in each class of Value	Integer count
DC_DESC	Description of data caveat code. Describes the data caveat related to using the cell for change detection. Refer to Table A2.2.	String, width 150

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Process used to generate this material

LINEAGE STATEMENT

Lineage:

ABARES has produced these raster datasets from vector datasets provided by state, territory and Australian government agencies and other entities. The date of mapping reflects the best available data sources for both time periods (2009 to 2012 for 2010–11, and 2014 to 2016 for 2015–16). The datasets were constructed by combining jurisdictional land title information from digital cadastre databases or their equivalents with Indigenous land grant instruments areas. All vector data was rasterised by cell centre to a resolution of 50 by 50 metres, then resampled by mode to 250 by 250 metres. This corresponded to a simple majority rasterisation. All data processing used the Python spatial libraries Geospatial Data Abstraction Library (GDAL) (v2.4.1), Rasterio (v1.1.2) and GeoPandas (v0.6.2). All geo-processing occurred in Australian Geographic GDA 1994 (EPSG:4283) with the raster datasets provided in Australian Albers 1994 (EPSG:3577).

All input datasets were reclassified into nationally consistent tenure classes using a four-tiered hierarchy (Appendix 1). Level 1 describes the land title type, distinguishing between freehold or non-freehold and held by the Crown as the state, territory, or the Commonwealth of Australia. Level 2 splits Crown land into leasehold, Crown purposes or other Crown land. Level 3 describes leasehold and Crown purposes types. Level 4 distinguishes whether land is granted to Indigenous peoples under Indigenous land grant instruments. Each level of the hierarchy is maintained within a 4-digit code.

Digital Cadastre Databases (DCDB) or relevant derived layers were obtained from New South Wales, the Northern Territory, Queensland, South Australia, Tasmania and Victoria. For Western Australia, the respective departments provided properties of agricultural significance, of environmental interest, or properties maintained by the WA Department of Biodiversity, Conservation and Attractions. The Australian Capital Territory (ACT) supplied a territory plan overlay dataset which provided reserve locations. This was supplemented by a dataset from the ACT specifying multiple-use public forest which have not

changed extent since 2008. PSMA CadLite and Land Tenure datasets (PSMA Australia 2012ab, 2017ab) were used for Jervis Bay, parts of the ACT and parts of Western Australia to supplement the tenure information provided. No data patches were filled with Stock routes – Queensland (Department of Natural Resources 2007) or a digitised version of Stock routes in Western Australia (Department of Lands and Surveys 2019; PSMA 2017ab) or Tenure of Australia's forests (2018) (ABARES 2018). These were combined with jurisdictional registers which capture land granted to traditional owner groups (National Native Title Tribunal 2020). Spatial locations of the Indigenous land grant arrangements were provided by all jurisdictions except for Victoria, Jervis Bay and the ACT. Data received for New South Wales was incomplete and supplemented by the Indigenous owned category from Australia's Indigenous forest estate (2020) (ABARES 2020). For Victoria's Indigenous land grant arrangements, parcels corresponding to the *Aboriginal Lands Act 1970* (Vic) and *Aboriginal Land (Lake Condah and Framlingham Forest) Act 1987* (Vic.) were extracted from Victoria's Vicmap Property Parcel database (Department of Environment, Land, Water & Planning 2019). The boundaries of the Booderee National Park and Booderee Botanic Gardens were extracted from the Collaborative Australian Protected Areas Database 2018 (Department of the Environment and Energy 2019) for those areas granted to the Wreck Bay Aboriginal Community Council under the *Aboriginal Land Grant (Jervis Bay Territory) Act 1986* (Cth). At the date of construction, the ACT has not implemented any Aboriginal land rights legislation, although the Namadgi National Park is jointly managed and interim arrangements are in place to obtain a 99-year lease on behalf of the Ngunnawal People, no evidence of a final agreement could be found. Appendix 4 lists the datasets used from each jurisdiction.

Where a jurisdiction had multiple datasets for title information, datasets were preferentially overlaid according to the title register data structure of each jurisdiction and the data quality of each layer. Digital cadastre databases were prioritised, followed by registers kept within administering departments and then other data providers. Data governance such as collection mandate, maintenance status and inclusiveness are given higher preference. If no difference between the quality of the datasets could be established, the dataset with the largest average parcel size was preferred, to minimise loss of those features in the rasterisation process. For overlaps, where more detail could be derived from a lower preferred dataset, these were constrained to the previous level of the tenure hierarchy, identified in the higher preferred layer. For example, where Crown land type (Level 2) could be derived from a lower preferred dataset, it was constrained to Crown land (Level 1). Where leasehold and Crown purposes type (Level 3) could be derived from a lower preferred dataset these were constrained to the appropriate Level 2 class. Where any unallocated pixels occurred these were added to the other Crown land at Level 2 or other reserve and other lease at Level 3. Where Indigenous land grant registers did not allocate tenure these were derived by overlaying with other title register data. For NSW, under the *Aboriginal Land Rights Act 1983* (NSW) section 9 transfer to Aboriginal Land Councils (ALC) is only in the form of freehold or perpetual lease, where the DCDB indicated other lease types, these were interpreted to be leased on behalf of the ALC and allocated to freehold.

Tenure was constructed at a jurisdictional level then mosaicked into a national raster dataset by allocating the jurisdiction's pixel value to the equivalent pixel in a 250 m rasterised version of the Statistical Area Level 2 (SA2) Australian Statistical Geography Standard shapefile (Australian Bureau of Statistics 2016). No data voids in one year were filled with the other year's values, where possible. Where undefined leases were defined in one year but not the other, the defined lease types were assigned. This applies particularly to Queensland where the lease type in 2015–16 was assigned to undefined leases in 2010–11. No data voids smaller than 0.0002 degrees squared (~41 pixels, ~2.5km²) were filled with the most frequent value within a radius equivalent to 5 pixels around each no data void. No data voids larger than 0.0002 degrees squared were filled with Stock routes – Queensland (Department of Natural Resources 2007) or a digitised version of Stock routes in Western Australia (Department of Lands and Surveys 2019; PSMA 2017ab) and finally Tenure of Australia's forests (2018) (ABARES 2018) where these features had unresolved tenure. The auxiliary data caveat raster includes which technique was used to fill a no data pixel.

Victoria has restructured its public land management (PLM) dataset from 1:100,000 (PLM100) to 1:25,000 (PLM25). Between 2010 and 2012 dataset attribution in the PLM is inconsistent and incomplete. To address this a hybrid PLM layer was created for 2010–11. The PLM25 datasets from 2011, 2012 and 2016 and the PLM100 dataset from 2011 were analysed and tenure allocated manually for 2010–11 based on the most consistent evidence between the datasets.

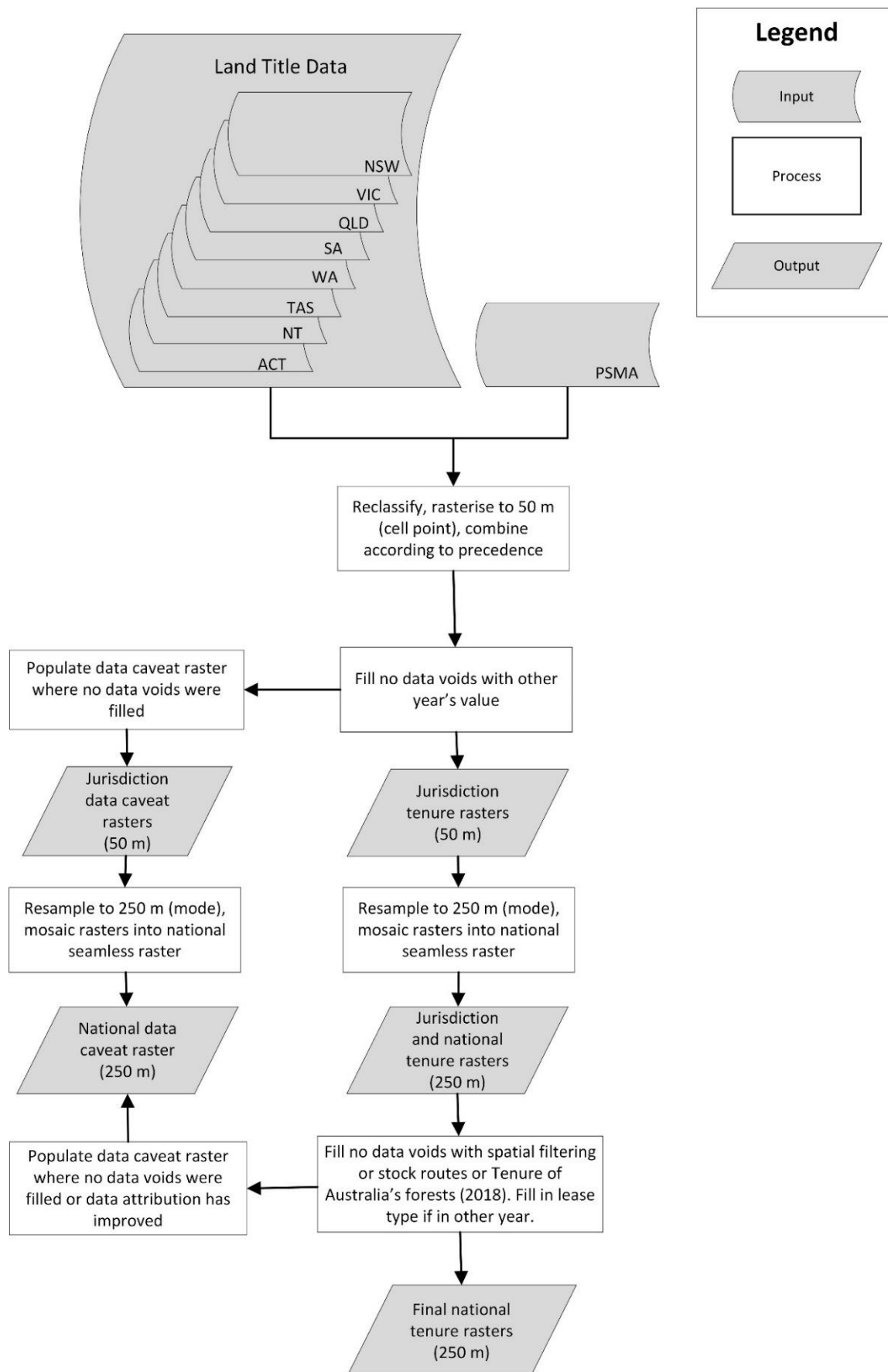
Crown land held in fee simple is not consistently defined in state or territory legislation or consistently recorded in registers. To achieve the most nationally consistent capture of Crown land held in fee simple, lands either purchased on the open market, acquired, or vested in a government entity were allocated to other Crown purposes. As these lands are acquired (by purchase or by legislation) or vested for the purpose of the government entity they fit the other Crown purposes definition.

Data structure changes in source datasets for Western Australia introduced an inconsistency in how Crown land held in fee simple was captured for the two time periods. Crown land held in fee simple is freehold land owned by the Crown. The PSMA

Land Tenure had allocated these areas to Crown land in 2010–11 and private freehold in 2015–16. Where other Crown land and other Crown purposes in 2010–11 changed to freehold in 2015–16 these were reassigned to their 2010–11 tenure types.

Figure 1 provides the process flow diagram for the construction of the tenure data package with further details in Gramenz and Stewart (forthcoming)

Figure 1 Process flow to generate the Land tenure of Australia rasters



Positional accuracy:

Horizontal: ±250 metres

Vertical: not applicable

Attribute accuracy:

Attributes are compiled exercising due care and skill. However, attribute accuracy depends in part on the accuracy of input datasets and therefore cannot be guaranteed. The methods for mapping and classifying tenure depended on jurisdictional input data available. These are available as spreadsheets for each jurisdiction.

Logical consistency:

Data was used from authoritative sources and are reliant on the logical consistency of input datasets.

Completeness:

Dataset provides coverage for Australian mainland. Tenure attribution is present for 99.98% of Australia. Residual no data voids is 0.12% of mainland Australia which includes some water features.

Information about the product description

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Additional metadata

REFERENCES

ABARES 2018, [Tenure of Australia's forests \(2018\)](#), Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, CC BY 4.0, DOI: doi.org/10.25814/5c592792c780e

ABARES 2020, [Australia's Indigenous forest estate \(2020\)](#), Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, CC BY 4.0, DOI: doi.org/10.25814/bqr0-4m20

Australian Bureau of Statistics 2016, [1270.0.55.001 - Australian Statistical Geography Standard \(ASGS\): Volume 1 - Main Structure and Greater Capital City Statistical Areas, July 2016](#), Australian Bureau of Statistics, Canberra.

Department of the Environment and Energy 2019, [Collaborative Australian Protected Areas Database \(CAPAD\) 2018 - Terrestrial](#), Commonwealth of Australia, Canberra.

Department of Environment, Land, Water & Planning 2019, [Vicmap Property – Parcel Map Polygons](#), Victoria State Government, Melbourne.

Department of Lands and Surveys 2019, [Stock routes in Western Australia](#), Western Australia Government.

Department of Natural Resources 2007, [Stock routes – Queensland](#), Queensland State Government.

Gramenz L & Stewart JB (forthcoming), Land tenure of Australia 2010-11 to 2015-16: Land account methodology, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Jacobsen R, Mutendeudzi M, Howell CL & Read SM 2019, [Development of a national tenure dataset for reporting the tenure of Australia's forests](#), ABARES technical report 19.4, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, DOI: doi.org 10.25814/5d5e34e2d3dcc

National Native Title Tribunal 2020, [Indigenous Estates: Land granted under specified Indigenous land granted instruments](#), National Native Title Tribunal, Perth.

PSMA 2012a, CadLite February 2012, Public Sector Mapping Agency Australia Limited, Canberra.

PSMA 2012b, Land Tenure February 2012, Public Sector Mapping Agency Australia Limited, Canberra.

PSMA 2017a, CadLite February 2017, Public Sector Mapping Agency Australia Limited, Canberra.

PSMA 2017b, Land Tenure February 2017, Public Sector Mapping Agency Australia Limited, Canberra.

Appendix 1 – Tenure descriptions

Table A1.1 Land tenure of Australia hierarchical classification

L1N	Level 1	L2N	Level 2	L3N	Level 3	L4N	Level 4
1	Freehold	10	Freehold	100	Freehold	1001	Freehold
						1002	Freehold - Indigenous
2	Crown land	21	Leasehold	211	Freeholding lease	2111	Freeholding lease
						2112	Freeholding lease – Indigenous a
				212	Pastoral perpetual lease	2121	Pastoral perpetual lease
						2122	Pastoral perpetual lease – Indigenous
				213	Other perpetual lease	2131	Other perpetual lease
						2132	Other perpetual lease - Indigenous
				214	Pastoral term lease	2141	Pastoral term lease
						2142	Pastoral term lease - Indigenous
				215	Other term lease	2151	Other term lease
						2152	Other term lease - Indigenous
				216	Other lease	2161	Other lease b
						2162	Other lease - Indigenous
		22	Crown purposes c	221	Nature conservation reserve d	2211	Nature conservation reserve
						2212	Nature conservation reserve - Indigenous
				222	Multiple-use public forest e	2221	Multiple-use public forest
						2222	Multiple-use public forest – Indigenous a
				223	Other Crown purposes	2231	Other Crown purposes
						2232	Other Crown purposes - Indigenous
		23	Other Crown land	230	Other Crown land f	2301	Other Crown land
						2302	Other Crown land - Indigenous

a These classes are included for completeness but are not present in the datasets. **b** For Tasmania, other lease contains licences in 2010-11 as they are not differentiated in the source data. **c** This class is equivalent to the PSMA Level 2 class Reserve. **d** This class is equivalent to the definition of nature conservation reserve used by the National Forest Inventory (Appendix A in Jacobsen et al. 2019). **e** This class is equivalent to the definition of multiple-use public forest used by the National Forest Inventory (Appendix A in Jacobsen et al. 2019). As states differ in their classification of state forests and timber reserves they are included in multiple-use public forest. **f** This class aligns with PSMA definition of vacant, unallocated, unreserved or other Crown land. This is not equivalent to the tenure class other Crown land used by the National Forest Inventory which also includes other reserves (Appendix A in Jacobsen et al. 2019).

Table A1.2 Land tenure of Australia Level 1 tenure descriptions and meanings

Code	Description	Meaning
1	Freehold	The highest form of land ownership. Land title is held in perpetuity. Includes land held by Aboriginal land trusts.
2	Crown land	Land owned by the Crown; non-freehold land.

Note: Code = L1N; Description = L1_DESC

Table A1.3 Land tenure of Australia Level 2 tenure descriptions and meanings

Code	Description	Meaning
10	Freehold	The highest form of land ownership. Land title is held in perpetuity. Includes land held by Aboriginal land trusts.
21	Leasehold	The exclusive use of Crown land leased to an entity for a specified term and purpose.
22	Crown purposes	Land reserved, dedicated, vested to, acquired, or purchased by the Crown or its authorised entities.
23	Other Crown land	Crown land unallocated to a purpose or purposes.

Note: Code = L2N; Description = L2_DESC

Table A1.4 Land tenure of Australia Level 3 tenure descriptions and meanings

Code	Description	Meaning
100	Freehold	The highest form of land ownership. Land title is held in perpetuity. Includes land held by Aboriginal land trusts.
211	Freeholding lease	Crown leasehold land where a lessee is in the process of transferring lease to freehold with instalments.
212	Pastoral perpetual lease	Crown leasehold land granted in perpetuity to an entity for primarily pastoral purposes.
213	Other perpetual lease	Crown leasehold land granted in perpetuity to an entity for non-pastoral or non-specified purposes.
214	Pastoral term lease	Crown leasehold land granted for a specified term of years to an entity for primarily pastoral purposes.
215	Other term lease	Crown leasehold land granted to an entity for a specified term of years for non-pastoral or non-specified purposes.
216	Other lease	Crown leasehold land where the purpose is specified as other or undefined.
221	Nature conservation reserve	Crown land set aside for conservation purposes. Includes heritage reserves where specified.
222	Multiple-use public forest	Crown land set aside for multiple-use forest values such as wood harvesting, recreation, and environmental protection, includes state forests and timber reserves.
223	Other Crown purposes	Crown land set aside for all other purposes including water, infrastructure, institutional, defence and other undefined reserves; or lands vested to, acquired, or purchased by the Crown or its authorised entities to deliver essential services.
230	Other Crown land	Crown land unallocated to a purpose or purposes. _____

Note: Code = L3N; Description = L3_DESC

Table A1.5 Land tenure of Australia Level 4 tenure descriptions and meanings

Code	Description	Meaning
1001	Freehold	Land title holder has the power to sell, lease, licence and mortgage the land. Minerals and petroleum remain property of the Crown. All dealings are subject to compliance to planning and environmental laws, including the protection of heritage and sacred sites. May include freehold land purchased by Aboriginal land trusts through the open market.
1002	Freehold - Indigenous	Land granted to an Aboriginal land trust as freehold. The power to sell, lease and licence the land varies with jurisdiction legislation. Minerals and petroleum rights and acquisition powers of the Crown varies between jurisdictions.
2111	Freeholding lease	Crown leasehold land where a lessee is in the process of transferring lease to freehold with instalments.
2121	Pastoral perpetual lease	Crown leasehold land granted in perpetuity to an entity for primarily pastoral purposes.
2131	Other perpetual lease	Crown leasehold land granted in perpetuity to an entity for non-pastoral or non-specified purposes.
2132	Other perpetual lease - Indigenous	Crown leasehold land granted in perpetuity to an Indigenous land trust for non-pastoral or non-specified purposes.
2141	Pastoral term lease	Crown leasehold land granted for a specified term of years to an entity for primarily pastoral purposes.
2142	Pastoral term lease - Indigenous	Crown leasehold land granted for a specified term of years to an Indigenous land trust for primarily pastoral purposes.
2151	Other term lease	Crown leasehold land granted to an entity for a specified term of years for non-pastoral or non-specified purposes.
2152	Other term lease - Indigenous	Crown leasehold land granted to an Indigenous land trust for a specified term of years for non-pastoral or non-specified purposes.
2161	Other lease	Crown leasehold land where the purpose is specified as other or undefined.
2162	Other lease - Indigenous	Crown leasehold land where the purpose is specified as other or undefined and held by an Indigenous land trust.
2211	Nature conservation reserve	Crown land set aside for conservation purposes. Includes heritage reserves where specified.
2212	Nature conservation reserve - Indigenous	Crown land vested or reserved to an Indigenous lands trust and set aside for conservation purposes. Includes heritage reserves where specified.
2221	Multiple-use public forest	Crown land set aside for multiple-use forest values such as wood harvesting, recreation, and environmental protection, includes state forests and timber reserves.
2231	Other Crown purposes	Crown land set aside for all other purposes including, water, infrastructure, institutional, defence and other undefined reserves; or lands vested to, acquired, or purchased by the Crown or its authorised entities to deliver essential services
2232	Other Crown purposes - Indigenous	Crown land vested or reserved to an Indigenous land trust for the benefit of the Indigenous.
2301	Other Crown land	Crown land unallocated to a purpose or purposes.
2302	Other Crown land - Indigenous	Unallocated Crown land held by an Indigenous land trust.

Note: Code = VALUE or L4N; Description = L4_DESC

Appendix 2 – Change and data caveat descriptions

Table A2.1 Values, description, and meanings of the tenure observed change (TCH) attribute

TCH	TCH_DESC	Meaning
-1	Offshore	Offshore
0	No data/unresolved	No data/unresolved tenure. Captures areas where there is no tenure data or conflicting data sources; includes water features with unallocated tenure.
1	Observed difference/change	Change has been observed between 2010–11 and 2015–16, at Level 4.
2	No observed difference/change	No change has been observed between 2010–11 and 2015–16, at Level 4.

Table A2.2 Values, description, and meanings of the data caveat (DC) attribute

DC	DC_DESC	Meaning
-1	Offshore	Offshore
0	No data/unresolved	No data/unresolved tenure for this pixel. Captures where there is no tenure data or conflicting data sources; includes water features with unallocated tenure.
1	No known data caveats	No known data caveats for this pixel
2	Data attribution improved	The attribution for the pixel was improved from 2010–11 to 2015–16. This applies to the separation of leases and licences in Tasmania. Minor impact to change detection.
3	No data in 2011, filled with data from 2016	The pixel was populated with the same dataset for 2015–16 as no data was available for 2010–11. This includes leasehold pixels from 2010–11 data where lease type was defined by 2015–16 data. Change detection may be limited due to data availability issues.
4	No data in 2016, filled with data from 2011	The pixel was populated with the same dataset for 2010–11 as no data was available for 2015–16. This includes leasehold pixels from 2015–16 data where lease type was defined by 2010–11 data. Change detection may be limited due to data availability issues.
5	No data in both years, filled with despeckling process	No data was available for both target periods, so a modelled approach was used to fill no data voids. Only no data voids <0.0002 degrees squared were filled using this method. Change detection may be limited due to data availability and modelling issues.
6	No data in both years, filled with Stock routes a	No data was available for both target periods but identified as a stock route and filled. This applies to Western Australia and Queensland. Change detection may be limited due to data availability and modelling issues.
7	No data in both years, filled with Tenure of Australia's forests (2018) b	No data was available for both target periods and filled from ABARES' Tenure of Australia's forests (2018) dataset. Latest date of information/currency is 30 June 2016. This was not applied to Inland water bodies in Tasmania which remain no data. Change detection may be limited due to data availability and modelling issues.

a Stock routes assigned to other Crown purposes. **b** Tenure of Australia's forests (2018) provides tenure for forests and land. LEASE is assigned to other leases, with the other classes transferring to the equivalent class name if used to fill; freehold, nature conservation reserve, multiple-use public forest or other Crown land.

Appendix 3 – Colour tables

Table A3.1 Level 1 tenure classification symbology (RGB and hexadecimal colour values)



Level 4 code	Tenure classification - Level 1	Red	Green	Blue	Hex	Colour
1001, 1002	Freehold	183	210	227	#B7D2E3	
2111, 2112, 2121, 2122, 2131, 2132, 2141, 2142, 2151, 2152, 2161, 2162, 2211, 2212, 2221, 2222, 2231, 2232, 2301, 2302	Crown land	236	193	130	#ECC182	

Table A3.2 Level 2 tenure classification symbology (RGB and hexadecimal colour values)





Level 4 code	Tenure classification - Level 2	Red	Green	Blue	Hex	Colour
1001, 1002	Freehold	183	210	227	#B7D2E3	
2111, 2112, 2121, 2122, 2131, 2132, 2141, 2142, 2151, 2152, 2161, 2162	Leasehold	242	175	0	#F2AF00	
2211, 2212, 2221, 2222, 2231, 2232	Crown purposes	106	127	16	#6A7F10	
2301, 2302	Other Crown land	218	229	205	#DAE5CD	

Table A3.3 Level 3 tenure classification symbology (RGB and hexadecimal colour values)











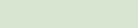
Level 4 code	Tenure classification - Level 3	Red	Green	Blue	Hex	Colour
1001, 1002	Freehold	183	210	227	#B7D2E3	
2111, 2112	Freeholding lease	106	64	97	#6A4061	
2121, 2122	Pastoral perpetual lease	176	106	146	#B06A92	
2131, 2132	Other perpetual lease	211	184	226	#D3B8E2	
2141, 2142	Pastoral term lease	224	104	75	#E0684B	
2151, 2152	Other term lease	236	193	130	#ECC182	
2161, 2162	Other lease	226	205	184	#E2CDB8	
2211, 2212	Nature conservation reserve	40	78	54	#284E36	
2221, 2222	Multiple-use public forest	168	180	0	#A8B400	
2231, 2232	Other Crown purposes	214	227	66	#D6E342	
2301, 2302	Other Crown land	218	229	205	#DAE5CD	

Table A3.4 Level 4 tenure classification symbology (RGB and hexadecimal colour values)

Level 4 code	Tenure classification - Level 4	Red	Green	Blue	Hex	Colour
1001	Freehold	183	210	227	#B7D2E3	
1002	Freehold - Indigenous	84	130	171	#5482AB	
2111	Freeholding lease	106	64	97	#6A4061	
2112	Freeholding lease – Indigenous ^a	223	212	215	#DFD4D7	
2121	Pastoral perpetual lease	176	106	146	#B06A92	
2122	Pastoral perpetual lease - Indigenous	195	173	195	#AFADC3	
2131	Other perpetual lease	211	184	226	#D3B8E2	
2132	Other perpetual lease - Indigenous	131	141	203	#8F8DCB	
2141	Pastoral term lease	224	104	75	#E0684B	
2142	Pastoral term lease - Indigenous	213	43	30	#D52B1E	
2151	Other term lease	236	193	130	#ECC182	
2152	Other term lease - Indigenous	200	143	66	#C88F42	
2161	Other lease	226	205	184	#E2CDB8	
2162	Other lease - Indigenous	81	43	27	#512B1B	
2211	Nature conservation reserve	40	78	54	#284E36	
2212	Nature conservation reserve - Indigenous	32	108	73	#206C49	
2221	Multiple-use public forest	168	180	0	#A8B400	
2222	Multiple-use public forest – Indigenous ^a	106	127	16	#6A7F10	
2231	Other Crown purposes	214	227	66	#D6E342	
2232	Other Crown purposes - Indigenous	122	184	0	#7AB800	
2301	Other Crown land	218	229	205	#DAE5CD	
2302	Other Crown land - Indigenous	232	227	190	#E8E3BE	

^a These classes are included for completeness but are not present in the datasets.

Appendix 4 – Data sources

Table A4.1 Land tenure of Australia, data sources obtained for each jurisdiction

Jurisdiction	Dataset	Data custodian	Dataset date used for	
			2010-11	2015-16
ACT	Cadlite and Land Tenure	PSMA Australia	February 2012 (date range 2010 to 2011)	February 2017 (date range 2014 to 2016)
ACT	Territory Plan Overlay Zones	Office of the Surveyor-General and Land Information	May 2011	May 2016
NSW	Digital Cadastral Database (DCDB)	NSW Department of Finance, Services and Innovation – Spatial Services	May 2011	May 2016
NSW	Crown Reserve Tenure	NSW Department of Planning, Industry and Environment – Crown Lands and Water	2011	2016
NSW	Aboriginal Land Council (ALC) – Aboriginal land trusts	NSW Department of Planning, Industry and Environment - Crown Lands and Water	2011	2016
NSW	Australia's Indigenous forest estate (2020)	Australian Bureau of Agricultural and Resource Economics and Sciences	June 2016	June 2016
NT	Digital Cadastral Database of the Northern Territory	NT Department of Infrastructure, Planning and Logistics	May 2010	May 2016
NT	Aboriginal Land Trusts	NT Department of Infrastructure, Planning and Logistics	2011	2016
Qld	Digital Cadastral Database	Queensland Department of Resources	December 2010	May 2016
Qld	Digital Cadastral Database – Lease aspatial table February 2020	Queensland Department of Resources	sort a	sort
Qld	Stock routes - Queensland	Queensland Department of Resources	2007	2007
Qld	Indigenous Interests	Queensland Department of Resources – Land and Native Title Service	sort a	sort
SA	Parcel Cadastre	SA Department for Infrastructure and Transport	2009	2015
SA	Conservation Reserve Parcels	SA Department for Environment and Water	sort a	sort
Tas.	LIST Land Tenure	Tasmania Department of Primary Industries, Water and Environment	November 2011	April 2016
Tas	LIST Authority Land b	Tasmania Department of Primary Industries, Water and Environment	sort a	sort
Vic.	Public Land Management (PLM100)	Victoria Department of Environment, Land, Water and Planning	2011	NA
Vic.	Public Land Management (PLM25)	Victoria Department of Environment, Land, Water and Planning	December 2012, July 2011, July 2016	July 2016
Vic.	Vicmap Crown Land Tenure	Victoria Department of Environment, Land, Water and Planning	May 2011	May 2016
Vic.	Victorian Land Use Information System	Victoria Department of Jobs, Precincts and Regions	2010–11	2016–2017
Vic	Vicmap Property – Parcel Map Polygons c	Victoria Department of Environment, Land, Water and Planning	May 2019	May 2019
WA	DBCA - Lands of Interest (DBCA- 012)	WA Department of Biodiversity, Conservation and Attractions	June 2011	June 2016
WA	DBCA - Legislated Lands and Waters (DBCA-011)	WA Department of Biodiversity, Conservation and Attractions	June 2011	June 2016
WA	Client Property Event System - Properties (DPIRD-018)	WA Department of Primary Industries and Regional Development	March 2011	August 2016

Jurisdiction	Dataset	Data custodian	Dataset date used for	
			2010-11	2015-16
WA	CadLite and Land Tenure	PSMA Australia	February 2012 (2012)	February 2017 (date range 2015 to 2016)
WA	Aboriginal Land Trust (ALT) Estate	WA Department of Planning , Lands and Heritage	May 2011	May 2016
Jervis Bay	Collaborative Australian Protected Areas Database (CAPAD) 2018 d	Australian Government Department of Agriculture, Water and the Environment	sort a	sort
Jervis Bay	CadLite and Land Tenure	PSMA Australia	February 2012 (2012)	February 2017 (date range 2014 to 2016)
Australia	Tenure of Australia's forests	ABARES National Forest Inventory	2018 (up to June 2016)	2018 (up to June 2016)

a Recent dataset that can be sorted to find relevant dates. **b** Only those parcels where the GOVERN_ACT is Aboriginal Lands Act are selected. **c** Extracted manually those areas identified in the *Aboriginal Lands Act 1970* and *Aboriginal Land (Lake Condah and Framlingham Forest) Act 1987*. **d** Booderee National Park and Booderee Botanic Gardens extracted. NA represents where datasets are not applicable for a target period.