Land use mapping for improved biosecurity outcomes

Project overview

This project produced an updated map of all land uses for the state of Tasmania for 2015, with a major focus on horticultural and intensive animal production areas for improved biosecurity risk management and emergency disease preparedness. Information from state biosecurity databases and other sources have been used to map the location and extent of these intensive uses which are known to be vulnerable to likely pest and disease incursions. Land use is mapped and classified according to the national guidelines (ABARES 2011, 2015) and the Australian Land Use and Management (ALUM) classification version 8 (ABARES 2016) and completed to secondary level as a minimum, with mapping to the tertiary level with commodity information for the priority land use classes. Data and tools were generated to support improved biosecurity risk assessment and emergency preparedness and planning in close partnership with Biosecurity Tasmania who will embed land use mapping as a prerequisite tool for biosecurity planning, response and training. MoU's with partner organisations allows increased information sharing and links with biosecurity information and industry and has transformed Land Use mapping to an ongoing program. The dataset also provides a complete, seamless, fully attributed land use coverage for Tasmania which is incorporated into the national compilation of the catchment scale land use map.
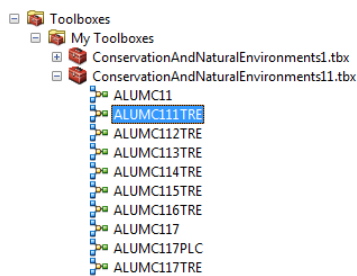
Detailed methodology

The project used existing datasets where possible in a modelling process to produce a draft layer with the gaps provided by expert knowledge, aerial photography, imagery and fieldwork. Detailed mapping for biosecurity needs included intensive uses of Production nurseries, Dairies, livestock aggregation points (Horse studs, Saleyards/stockyards and Abattoirs) and agricultural production areas of Irrigated grapes.

The modelling process predominantly uses authoritative data which is derived from scales ranging from 1:5000 to 1:25000 and provides information for reserves and administrative boundaries (Tasmanian Reserve Estate, Local Government Areas, Public Land Classification, Private Timber Reserves), parcel and property (Parcels, VISTAS, Property), infrastructure and utilities (buildings, community facilities, transport), hydrography, and vegetation (TASVEG, Forest Groups- plantation).

All mapped land use codes, source of data and confidence are represented in Table A. A land use code can have multiple data sources.
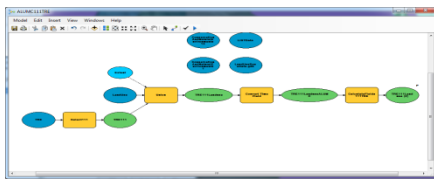
Modelling process

To commence the 2015 Land Use map a desktop land use spatial layer was created using ArcGIS 10 ModelBuilder stringing together a sequence of geoprocessing tools. The resulting layer creates a partial coverage (approximately 70%) of Tasmania which is populated with data and knowledge from Departmental and external sources. This repeatable process using models to build processing workflows to extract data was developed for the 2013 land use iteration. This project builds upon the previously Department of Agriculture and Water Resources funded Land Use 2013 mapping project.
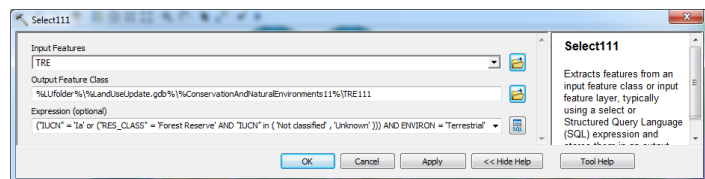

Figure 1. Primary and secondary toolboxes and tertiary models

An ArcGIS Toolbox was created for each primary and secondary level of the ALUM Classification that was relevant to Tasmanian land use. Within each toolbox models were created for tertiary levels for each dataset, multiple models for the same level and land use code were created when more than one dataset was available (Fig. 1).

Within a model a sequence of geoprocessing tools and models supply the output of one tool to another tool as input to create an output of a land use (Fig. 2). The geoprocessing tools query to extract features (Fig. 3), perform operations of overlay, format into the recommended ALUM Classification data structure and calculate attributes with the applicable land use ALUM Classification v8 codes and information.
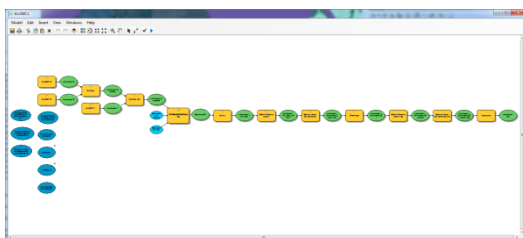

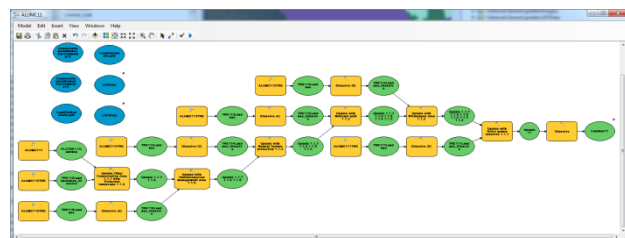**Figure 2.** Model sequence of geoprocessing tools

Figure 3. Geoprocessing select query tool

Individual land use models are then grouped together at the primary (Fig. 4) and secondary (Fig. 5) levels to perform further selection and overlay geoprocessing operations.

Figure 4. Primary models

Figure 5. Secondary models

The models have created a time saving semi-automated process for future iterations of land use, especially of authoritative data produced annually ie Tasmanian Reserve Estate, Forest Groups (Hardwood and Softwood Plantation). There is also a geoprocessing record of how the modelled layer has been created. ArcGIS ModelBuilder allowed straightforward changes to models to implement version 8 changes to the ALUM Classification.

Dairies

A draft dairy 2015 land use layer was created from the 2013 land use layer where Lu_code = 5.2.1, areas mapped of dairy grazing, sheds and yards. This was then updated with the provision of Tasmanian Dairy Industry Authority (TDIA) dairy shed locations generated using the app Collector for ArcGIS customized for their needs by staff in the Emergency Services GIS DPIPWE. TDIA is responsible for the food safety licensing, inspection and auditing of dairy processors and dairy farms.

Location data of dairy sheds and effluent ponds is collected every year and supplied through a MoU with TDIA to a DPIPWE platform. Land use mapping for the Dairy industry is valuable to inform Water Quality Improvement Plans as part of the Dairy clean rivers program and to implement containment strategies in a biosecurity response situation.

From the TDIA location data a dairy shed extent was mapped using the statewide orthophoto of aerial imagery and Google Earth and attributed as 5.2.1 Dairy shed and yards (Fig. 6), commodity 'cattle dairy'. The remaining part of the property used for dairying was attributed as either 4.2.0 Grazing irrigated modified pastures or 3.2.0 Grazing modified pastures, commodity 'cattle dairy' with the extent mapped using the statewide orthophoto of aerial imagery (Fig. 7), Google Earth and Landsat imagery summer 2014/2015 generated through DPIPWE's Land Cover program. This grazing attribution was a significant change from the 2013 Land Use map where sheds and pastures were both coded as 5.2.1. This aligns with the national approach and meets the needs of the dairy industry by recording the commodity.

Figure 6. 5.2.1 Dairy sheds and yards

Figure 7. 4.2.0 Grazing irrigated modified pastures

Additional data and validation were from expert knowledge of NRM staff, Peter Harrison Farm Mapping Services and mapping assistance from a UTas GIS volunteer student.

Irrigated grapes

A draft irrigated grapes 2015 layer was created from the 2013 land use layer where Lu_code = 4.4.9, with the modelling process selecting data from TASVEG (spatial layer of Tasmania's vegetation), VISTAS (Valuation Information System Tasmania) and Cadastral property owner information and validated using imagery (Fig. 8), Google Earth, and expert knowledge from the wine industry.

Wine Tasmania is the peak body representing Tasmania's grape growers and winemakers, their Technical and Extension officer, Paul Smart, provided invaluable validation advice.

A draft 2015 4.4.9 layer was provided to Wine Tasmania as a kmz file. The file was displayed in Google maps and overlayed with TasVine (a map of vineyard locations to assist landscape fire users in reducing potential negative impacts of fire and smoke on their neighbouring vineyards) and then shared via google drive to enable an effective and productive updating and validation tool between WineTas and Land Use mapper. Validation knowledge was also obtained from the Tasmanian Institute of Agriculture (TIA – Dr Fiona Kerslake); TIA is a joint venture between the University of Tasmania and the Tasmanian Government.

Figure 8. Aerial imagery of 4.4.9 irrigated grapes

Biosecurity Tasmania

Through a MoU with Biosecurity Tasmania (BT) processes are being developed to exchange data and information relating to land use and to form technical advisory or working groups to facilitate, coordinate and sponsor the development of land use information.

At the commencement of the 2015 land use project, presentations to BT senior management and operational staff allowed the promotion of ACLUMP and the development of nationally consistent land information and mapping and the opportunity to use catchment scale land use as a base dataset to substantially improve risk assessment and surveillance reporting by moving to a spatial approach. Discussions are ongoing to ensure field collection systems are compatible with land use mapping processes and information.

TAPdb

Data and information stored in BT's Tasmanian Agricultural Producers Database (TAPdb) provided access to identify parcels with intensive animal production and intensive horticulture land uses ie Horse studs, livestock aggregation points. Work has commenced with the alignment of ALUMCv8 with TAPdb industry codes to create a consistent and logical link with both datasets whilst also maintaining a biosecurity focus. This alignment is an ongoing responsibility for both parties to assist biosecurity decision makers. The development of a draft Land use map on theLIST was created for a nursery reviewing process which will progress to a 'Live' Land use map for review between releases.

Nurseries

A nursery review process was presented to BT which involved knowledge, contribution and support for nursery validation. Along with Emergency Services GIS DPIPWE a land use nursery review project was created in LISTmap displaying desktop modelled draft spatial data of nursery polygons to view and comment through a spatial environment. To aid in decision making the review project in LISTmap displayed aerial imagery (state wide of various dates up to 2015), biosecurity property information and desktop modelled nurseries and with geometry and/or attribute issues/comments being recorded in a nursery editing layer. This LISTmap review environment was built in a relatively

short time and developed a simple and effective tool to explain and use for validation by existing knowledge of DPIPWE staff and also a successful platform for future validation purposes.

The draft nursery 2015 land use layer was created through a modelling process selecting data from Cadastral property owner information and selected records from land use 2013 where Commod_desc = 'Nursery' and updated with TAPdb parcel nursery information, aerial imagery (Fig.9) and Google searches. Polygons are mapped as 5.1.1 Production nurseries for nurseries with any production component and 5.5.1 Commercial services for retail and/or wholesale nurseries with no production component with the type/s of nursery recorded in the comments field i.e. Nursery production. This level of information is important within the horticultural sector as Tasmanian nurseries are recognised as a key stakeholder in Tasmanian biosecurity, and a centralised ongoing revised system is critical for effective timely response.

Figure 9. 5.1.1 Production nurseries

Livestock aggregation points

Biosecurity planning identified critical place aggregation points and their role in managing

biosecurity risks and disease outbreaks. Aggregation areas of abattoirs, stockyards and saleyards were created from TAPdb parcel records and modelled from VISTAS (Valuation Information System Tasmania) and Cadastral property owner information. Identified parcels were then viewed over imagery (Fig. 10) (statewide orthophoto of aerial imagery, Google Earth) enabling mapping of the extent of intensive land use. A UTas GIS volunteer student was involved to assist map and validate the extent.

Figure 10. 5.2.7 Saleyards/stockyards

Areas of horse studs were created from TAPdb parcel records, listed as breeders, and modelled from TASVEG (spatial layer of Tasmania's vegetation), VISTAS (Valuation Information System Tasmania) and Cadastral property owner information. Identified parcels were then viewed with imagery (Fig. 11) (State ortho, Google Earth) to map the extent of this intensive land use (class 5.2.6). A UTas GIS volunteer student was involved to assist map and validate the extent.

Figure 11. 5.2.6 Horse studs

Ancillary datasets

Below is a list of datasets and imagery utilised to produce the updated 2015 land use map. The currency of the land use is from 2012 to 2017 with the source data ranging from 1984 to 2017.

Modelled

1. Tasmanian Reserve Estate
    http://dpipwe.tas.gov.au/conservation/development-planning-conservation-assessment/planning-tools/tasmanian-reserve-estate-spatial-layer

2. Public Land Classification
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=d924bf33-9150-46a1-b339-b350efa8332c

3. Parcels
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=1a1d7f68-9a7f-4493-80a5-d21eeb3dd516

4. VISTAS
    Data request from Office of the Valuer-General

5. Local Government Reserves
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=5cff8723-56ce-4ce7-ad7a-c8245fbfc31e

6. TASVEG
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=6e3d672d-cdc1-40f3-8ee4-b45c5de68b68

7. Private Timber Reserves
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=a914c163-bff4-40be-a8f7-c3ba81696e31

8. Forest Groups
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=c41df4e9-7ee8-4651-b28b-5c20372428cf

9. Tasmap Vegetation
    Topographic base map for TASMAP series mapping – vegetation. DPIPWE use only

10. Parcels property owners addresses
    Parcels with linked property attributes from VISTAS for DPIPWE use only

11. Cadastral owners address
    Cadastral Data with linked attributes of owner details for DPIPWE use only

12. Building polygons and points
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=16cf2130-425b-4bce-9593-24e337317a71

13. Hydrography
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=1df4ff66-4bad-4a5b-97b6-dd26a85eab03

14. Tasmap Infrastructure
    Topographic base map for TASMAP series mapping – infrastructure i.e. Marine; Oyster bed. DPIPWE use only.

15. Community facilities
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=79368b65-0975-4efb-8560-ddbc58dcbec8

16. Built Area
    Topographic base map for TASMAP series mapping – built areas. DPIPWE use only.

17. Transport
    https://www.thelist.tas.gov.au/app/content/data/geo-meta-data-record?detailRecordUID=1ab7e34f-811c-4521-a549-212f295acc97

Other datasets / knowledge

1. TAPdb
   Biosecurity Tasmania's **T**asmanian **A**gricultural **P**roperty **D**ata**b**ase searches of industry enterprises for properties.

2. TDIA
   The Tasmanian Dairy Industry Authority (TDIA) is responsible for the food safety licensing, inspection and auditing of dairy processors and dairy farms. MoU supply of Dairy point locations generated with Collector for ArcGIS.

3. NRM
   Responsible for the planning, delivery and implementation of integrated natural resource management.

4. Dairy Tas
   Tasmanian service delivery arm of Dairy Australia, investing farmer levies and other funds to support Tasmanian Dairy Industry.

5. TIA
   Tasmanian Institute of Agriculture is a joint venture between the University of Tasmania and the Tasmanian Government.

6. WineTas
   Wine Tasmania is the peak body for Tasmanian grape growers and winemakers.

7. Biosecurity Tasmania
   The services provided by Biosecurity Tasmania contributes to and supports Tasmania's relative pest and disease free status, food safety, animal welfare and product integrity to

strengthen and advance the State's primary industries and the sustainability of its environment. The Biosecurity Tasmania Division deals with animal health, food safety, chemical management, diagnostic services, barrier protection, invasive species and matters of biosecurity in Tasmania.

8. Esk mapping
Land use mapping of the Swan and Duck catchments by Esk mapping and GIS for the agricultural land mapping project. Esk mapping and GIS provide services to manage information spatially.

9. Field mapping 2015
Dairy validation.

Imagery

1. State Orthophoto
Aerial photographs geometrically corrected such the scale is uniform, the state wide coverage of photos vary in quality and at numerous different points in time are stitched together.

2. Google Earth
Viewing images captured during 2015.

3. Landsat 8 2014/15
Landsat 8 cloud free mosaic of scenes summer 2014/15 generated through DPIPWE's land cover program.

Ancillary dataset and imagery limitations, assumptions and or exclusions

Due to resource and time limitations and focus on biosecurity issues not all mapping was updated to 2015. These areas with previous land use mapping attribution (mapped in 2012 to 2014) total 1 783 638 ha (where Luc_date < date '2015-02-10 00:00:00') or approximately 25% of Tasmania and these areas are listed in Tables B and C. Areas not updated with 2015 mapping will be a priority for the next update.

Imagery was not specifically purchased for this project but sourced from existing aerial photography, Google Earth and Landsat composites which were all immediately available but of varying dates and quality. Imagery was an effective tool for land use extent identification and validation. Aerial photography of the state is a composite orthophoto of various dates and scales, consisting of pre 2013 film captured with aerial camera and contractor supply of digitally captured imagery through the Tasmanian Imagery Program. Google Earth imagery was of high quality and generally cloud free with dates during 2015 for most areas. The Landsat mosaic of cloud free scenes of summer 2014/15 created though DPIPWE's land cover program has a resolution of 30 m and was generally used for defining irrigation areas for cropping and dairy grazing. Individual scenes of Sentinel 2 imagery from the European Space Agency Copernicus program where available for 2015 were used in conjunction with Landsat data to assist in mapping irrigated agricultural activities.

Field validation was only accomplished for dairy grazing due to limited resources and time restraints. Validation for other land uses was achieved through aerial orthophotos, imagery and expert knowledge for areas where confidence attribution was below 'Very confident' (1). Field validation was also challenged by desktop mapping when it had occurred 12 months or more after 2015. As many of the ancillary datasets used in the modelling process have had fieldwork completed, further field validation was not required.

A number of datasets used in the modelled desktop mapping attributed a land use with a confidence level of 'Not very confident' (4) i.e. VISTAS, TASVEG. When this was the only source of information these datasets were only used as guides to interpret land use and required more than 1 other dataset to provide relevant information to improve the confidence level to 'Reasonably confident' or higher. Table A shows the confidence levels of the various input datasets used for each land use. The confidence levels are highly dependent on type, currency, number of data sources and spatial analysis.

The quality of the source information strongly determines the confidence level. The majority of Conservation and Natural Environments codes were assigned using reserve information which has a legal status and thus the highest confidence as the IUCN categories in the Tasmanian Reserve Estate layer directly relate to the ALUM classification v8. Other reserve information is sourced from the Public Land Classification and Local Government Reserves.

On completion of a composite land use map from desktop modelling, local knowledge, field validation and unmapped areas infilled from past iterations, topology corrections are performed removing sliver polygons and gaps.

It was assumed agricultural land on dairy properties identified from TASVEG and imagery were areas of dairy cattle grazing. Dryland and irrigated grazing was predominately determined from the Landsat mosaic clearly identified in the summer of 2014/15. Irrigation was also mapped and compared using Google Earth and aerial photography.

Some authoritative datasets are available every 12 months which would support annual land use updates. For example, Tasmanian Reserve Estate and Forest groups (plantation forests) and parcels data defining State Forest tenure and hence wood production forestry are available annually. An annual land use update would include the most current authoritative data. For example, in the 2015 Land Use Tasmanian Reserve Estate and Forest groups (plantation forests) were as at the end of June 2014.

Planning scheme data was incomplete and not used in this iteration. It is anticipated this dataset will assist future validation in particular of Rural residential with and without agriculture (classes 5.4.2 and 5.4.3). There is also a move to create a Tasmanian planning scheme that will have a set of consistent statewide guidelines that replaces 30 different schemes across the state.

The final output is a 2015 iteration of the land use map for Tasmania at a scale of 1:25 000 with a minimum mapping unit of 2 hectares. Smaller areas were mapped where data was either provided at that mapping unit or is seen to be significantly important to map at less than 2 hectares. Table D provides a list of the mapped land uses, their associated area and proportion of the state.

Application of dataset for biosecurity outcomes

Nursery industry

Nurseries in the horticultural sector operate at retail, wholesale and/or production levels and are a key stakeholder in Tasmanian biosecurity. Land use mapping has created a centralised system containing nursery information for critical and effective planning to respond to plant disease and pest incursions such as Blueberry rust and Myrtle rust. Nurseries with any whole plant or bulb production are attributed as 5.1.1 Production nurseries and nurseries undertaking no production (retail and/or wholesale) are attributed as 5.5.1 Commercial services.

Dairy industry

Dairy Tasmania are supportive of ongoing land use mapping which is critical for biosecurity planning and to inform Water Quality Improvement Plans being delivered across the state as part of the DairyTas Clean Rivers Program.

Livestock industry

Livestock aggregation locations for initial biosecurity planning progresses into managing biosecurity risks and disease outbreaks. Intensive livestock mapping will also assist in the improved swiftness to a disease response both in terms of identifying locations with potential exposure as well as assisting with planning to manage animals during response operations.

References

ABARES 2011, *Guidelines for land use mapping in Australia: principles, procedures and definitions*, A technical handbook supporting the Australian Collaborative Land Use and Management Program, 4th edition, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, available at
data.daff.gov.au/data/warehouse/pe_abares99001806/GuidelinesLandUseMappingLowRes2011.pdf.

ABARES 2015, *Addendum to the Guidelines for land use mapping in Australia: principles, procedures and definitions*, 4th edition, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, available at
data.daff.gov.au/data/warehouse/pe_abares99001806/AddendumGuidelinesLandUseMapping2015_v1.0.0.pdf.

ABARES 2016, *The Australian Land Use and Management Classification Version 8,* Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, available at
http://data.daff.gov.au/data/warehouse/9aaI/2016/alumc9aaI20161017/AustLandUseMgtClassfnVersion8_v1.0.0.pdf.

Table A. Data sources and associated confidence for each land use code in Tasmanian Land Use 2015

Legend	
Modelled only	1 = Very confident
Modelled and 2015	
Modelled and past iteration	2 = Confident
Modelled and 2015 and past iteration	
2015 only	3 = Reasonably confident
2015 and past iteration	
past iteration only	4 = Not very confident

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
111	✓	1																														1
112	✓	1																														
113	✓	1																														1
114	✓	1																									2					1
115	✓	1																														1
116	✓	1																														1
117	✓	1	2																								2					1,2
120	✓	1																									2					1,2
121	✓	1																									2					
122	✓		2																													
124	✓		2																													
125	✓			2	3																											
130	✓		3	3		3																					2			3		1,2,3,4

Tasmanian Government Department of Primary Industries, Parks, Water and Environment 2017

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
131	✓			3			3																									
132																																2,3
133																											2			2,3		2,3
134																											2					
210																											2			3		2,3,4
220	✓	2	2	2				2																			2					1
310	✓						4,2,3,1																				2			2	2	1
311	✓								1																					2	2	1
312	✓								1																						2	1
320																					1	1	2,3,4				2			1,2,3	1,2,3	1,2,3,4
321																														2		1,2,3,4
322																																1
323																																1,2
324																																1,2
325																																1,2,3
330																											2			2		1,2,3
333																																1,2
337																																1
340																														2		
342																														3		
353																																2
360																																1,2

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
361																																1,2,3
410																																1
420																					1,2	1	2,4					2	1		1,2,3,4	1,2,3,4	1,2,3,4
421																																2
422																																2
423																												2					
424																																2
430																												2			2,3	2	1,2,4
431																																1,2
432																																	1
434																																	2
437																																	2
440	✓			4			4			3																	2			2,3		1,2
441	✓	3					3																							2		2
442																														2		
443	✓						3			3																				1		
444																																2
445	✓				4		4																							2		2
446	✓						4					4																		2		2
449	✓						4			2,3		4								2				1	1,2,3					1,2,3,4		2
450	✓				4		4					4																		2		1
453	✓				4		4																							2		1,2
454	✓									3																						

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
455	✓						3					3																				
510	✓				4		4					4																				
511																				1,2						1				1		
512	✓						3					3																				
513	✓						4					4								2												
515																														3,4		
520																																2
521																					1											1,2
522	✓						4					4																				1
523	✓				4		4					2	4																			
524	✓				4		4					4																				
525	✓				4		4					4			3	2										2						1
526	✓				4		4					4								2,3												1,2
527	✓				4							3								2												2
530	✓		2				4					4	4	4												2				2		1,2,3
532	✓						2					2									2									2		2
533																																1,2
535																				1,2,3												2
537	✓						3					3	3	3																3		2
541	✓			4			3					2,3	4	4			4									2				2		1,2,3
542																										2				2		1,2,3
543	✓			4			3,4					2,3	4	4			4	4											3	2		1,2,3

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
544																																2,3
545																													2	2,3		2,3
550																											2					2,3
551	✓						4					4				2				1,2						2	2		2	1,2,3		1,2,3
552	✓						4					2,4				2											2					1,2,3
553	✓			4		3	2,3,4					2,4				2	4										2		2	2		1,2,3
554	✓			4			4																									
555	✓			2,4													4															1,2
560																											2					2
561	✓											4																				
562	✓						3										3															2
563	✓															2																1,3
565	✓											4				2																2
566	✓											4				2																
567	✓						4					4				2																
570																																2
571	✓						4					4				2											2					1,2,3
572	✓																3										2			2		2,3
573	✓																3										2					2,3
574	✓						4					4				2																2,3
580																											2			2		2,3
581	✓															2																2

Land use	Modelled	Tasmanian Reserve Estate	Public Land Classification	Parcels	VISTAS	Local Government Reserves	TASVEG	Private Timber Reserves	Forest Groups	Tasmap Vegetation	Parcels property owners	Cadastral owners address	Building polygons	Building points	Hydrography	Tasmap Infrastructure	Community facilities	Built Area	Transport	TAPdb	TDIA	NRM	Dairy Tas	TIA	WineTas	Biosecurity Tasmania	Esk mapping	Field mapping 2015	State Orthophoto	Google Earth	Landsat 8 2014/15	previous iteration
582	✓						2					2				2																2,3
583	✓														1	2																3
584																																2
590	✓											4				3																1,2,3
593																																2
595	✓			4								4			3	2																2
610	✓														1																	2
611	✓	1													1																	
612	✓														1																	
620																											2					2,3
621	✓														1																	2
622	✓														1															3		3
630	✓	1													1												2					2,3
631	✓	1													1																	1
640																																2,3
650																											2					2,3
651																											2					
654	✓														3															2		2,3
660	✓														1														2			2
661	✓	1		1											1																	1,2

Table B. Areas of land use not updated in Tasmanian Land Use 2015 sorted by land use code

Lu_code	Area_ha	Lu_code	Area_ha
1.1.1	1	5.3.2	2
1.1.3	46	5.3.3	3
1.1.4	3	5.3.5	1
1.1.5	15	5.3.7	3
1.1.7	367	5.4.1	10235
1.2.0	118	5.4.2	1062
1.3.0	26232	5.4.3	77253
1.3.2	33	5.4.4	786
1.3.3	542109	5.4.5	162
2.1.0	174104	5.5.0	61
2.2.0	360	5.5.1	339
3.1.0	187	5.5.2	82
3.1.1	3531	5.5.3	2314
3.1.2	320	5.5.5	9
3.2.0	677518	5.6.0	9
3.2.1	91505	5.6.2	24
3.2.2	21	5.6.3	253
3.2.3	24	5.6.5	176
3.2.4	371	5.7.0	26
3.2.5	221	5.7.1	370
3.3.0	12153	5.7.2	21659
3.3.3	195	5.7.3	1492
3.3.7	3	5.7.4	24
3.5.3	44	5.8.0	1048
3.6.0	6557	5.8.1	2
3.6.1	9596	5.8.2	130
4.2.0	11899	5.8.3	3
4.2.1	55	5.8.4	14
4.2.2	21	5.9.0	67
4.2.4	597	5.9.3	4
4.3.0	77613	5.9.5	3
4.3.1	113	6.1.0	6216
4.3.4	39	6.2.0	1873
4.3.7	1129	6.2.1	8
4.4.0	1212	6.2.2	118
4.4.1	33	6.3.0	196
4.4.4	10	6.3.1	1
4.4.5	74	6.4.0	158
4.4.6	37	6.5.0	6873
4.4.9	23	6.5.4	1303
4.5.3	55	6.6.0	26
5.2.0	16	6.6.1	10141
5.2.1	2	**Total area (ha)**	**1783638**
5.2.2	7		
5.2.6	428		
5.2.7	83		
5.3.0	28		

Table C. Areas of land use not updated in Tasmanian Land Use 2015 sorted by area

Lu_code	Area_ha	Lu_code	Area_ha
6.3.1	1	6.4.0	158
5.3.5	1	5.4.5	162
1.1.1	1	5.6.5	176
5.3.2	2	3.1.0	187
5.8.1	2	3.3.3	195
5.2.1	2	6.3.0	196
5.3.7	3	3.2.5	221
1.1.4	3	5.6.3	253
5.3.3	3	3.1.2	320
5.9.5	3	5.5.1	339
5.8.3	3	2.2.0	360
3.3.7	3	1.1.7	367
5.9.3	4	5.7.1	370
5.2.2	7	3.2.4	371
6.2.1	8	5.2.6	428
5.5.5	9	4.2.4	597
5.6.0	9	5.4.4	786
4.4.4	10	5.8.0	1048
5.8.4	14	5.4.2	1062
1.1.5	15	4.3.7	1129
5.2.0	16	4.4.0	1212
4.2.2	21	6.5.4	1303
3.2.2	21	5.7.3	1492
4.4.9	23	6.2.0	1873
5.7.4	24	5.5.3	2314
3.2.3	24	3.1.1	3531
5.6.2	24	6.1.0	6216
6.6.0	26	3.6.0	6557
5.7.0	26	6.5.0	6873
5.3.0	28	3.6.1	9596
4.4.1	33	6.6.1	10141
1.3.2	33	5.4.1	10235
4.4.6	37	4.2.0	11899
4.3.4	39	3.3.0	12153
3.5.3	44	5.7.2	21659
1.1.3	46	1.3.0	26232
4.2.1	55	5.4.3	77253
4.5.3	55	4.3.0	77613
5.5.0	61	3.2.1	91505
5.9.0	67	2.1.0	174104
4.4.5	74	1.3.3	542109
5.5.2	82	3.2.0	677518
5.2.7	83	**Total area (ha)**	**1783638**
4.3.1	113		
6.2.2	118		
1.2.0	118		
5.8.2	130		

Table D. Land uses mapped in Tasmanian Land Use 2015

Land use code	Land use description	Area ha	% of total Area
1.1.1	Strict nature reserves	22183	0.318%
1.1.2	Wilderness area	7012	0.101%
1.1.3	National park	1485780	21.325%
1.1.4	Natural feature protection	29472	0.423%
1.1.5	Habitat/species management area	294654	4.229%
1.1.6	Protected landscape	124235	1.783%
1.1.7	Other conserved area	567333	8.143%
1.2.0	Managed resource protection	793597	11.390%
1.2.1	Biodiversity	7125	0.102%
1.2.2	Surface water supply	246	0.004%
1.2.4	Landscape	13	0.000%
1.2.5	Traditional indigenous uses	52037	0.747%
1.3.0	Other minimal use	26348	0.378%
1.3.1	Defence land - natural areas	3540	0.051%
1.3.2	Stock route	33	0.000%
1.3.3	Residual native cover	551731	7.919%
1.3.4	Rehabilitation	18	0.000%
2.1.0	Grazing native vegetation	179497	2.576%
2.2.0	Production native forests	802274	11.515%
3.1.0	Plantation forests	51803	0.744%
3.1.1	Hardwood plantation forestry	236978	3.401%
3.1.2	Softwood plantation forestry	76068	1.092%
3.2.0	Grazing modified pastures	739623	10.616%
3.2.1	Native/exotic pasture mosaic	91868	1.319%
3.2.2	Woody fodder plants	21	0.000%
3.2.3	Pasture legumes	24	0.000%
3.2.4	Pasture legume/grass mixtures	371	0.005%
3.2.5	Sown grasses	221	0.003%
3.3.0	Cropping	12284	0.176%
3.3.3	Hay and silage	195	0.003%
3.3.7	Alkaloid poppies	3	0.000%
3.4.0	Perennial horticulture	3	0.000%
3.4.2	Olives	1	0.000%
3.5.3	Seasonal vegetables and herbs	44	0.001%
3.6.0	Land in transition	6557	0.094%
3.6.1	Degraded land	9596	0.138%
4.1.0	Irrigated plantation forestry	33	0.000%
4.2.0	Grazing irrigated modified pastures	97068	1.393%
4.2.1	Irrigated woody fodder plants	55	0.001%
4.2.2	Irrigated pasture legumes	21	0.000%
4.2.3	Irrigated legume/grass mixtures	182	0.003%

Land use code	Land use description	Area ha	% of total Area
4.2.4	Irrigated sown grasses	597	0.009%
4.3.0	Irrigated cropping	96890	1.391%
4.3.1	Irrigated cereals	113	0.002%
4.3.2	Irrigated beverage and spice crops	53	0.001%
4.3.4	Irrigated oilseeds	39	0.001%
4.3.7	Irrigated alkaloid poppies	1129	0.016%
4.4.0	Irrigated perennial horticulture	5244	0.075%
4.4.1	Irrigated tree fruits	86	0.001%
4.4.2	Irrigated olives	14	0.000%
4.4.3	Irrigated tree nuts	603	0.009%
4.4.4	Irrigated vine fruits	10	0.000%
4.4.5	Irrigated shrub berries and fruits	571	0.008%
4.4.6	Irrigated perennial flowers and bulbs	114	0.002%
4.4.9	Irrigated grapes	259	0.004%
4.5.0	Irrigated seasonal horticulture	207	0.003%
4.5.3	Irrigated seasonal vegetables and herbs	428	0.006%
4.5.4	Irrigated turf farming	253	0.004%
5.1.0	Intensive horticulture	100	0.001%
5.1.1	Production nurseries	243	0.003%
5.1.2	Shadehouses	3	0.000%
5.1.3	Glasshouses	84	0.001%
5.1.5	Abandoned intensive horticulture	4	0.000%
5.2.0	Intensive animal production	16	0.000%
5.2.1	Dairy sheds and yards	72	0.001%
5.2.2	Feedlots	150	0.002%
5.2.3	Poultry farms	517	0.007%
5.2.4	Piggeries	401	0.006%
5.2.5	Aquaculture	1211	0.017%
5.2.6	Horse studs	2571	0.037%
5.2.7	Saleyards/stockyards	127	0.002%
5.3.0	Manufacturing and industrial	2126	0.031%
5.3.2	Food processing factory	47	0.001%
5.3.3	Major industrial complex	96	0.001%
5.3.5	Abattoirs	51	0.001%
5.3.7	Sawmill	349	0.005%
5.4.1	Urban residential	25283	0.363%
5.4.2	Rural residential with agriculture	1529	0.022%
5.4.3	Rural residential without agriculture	161393	2.316%
5.4.4	Remote communities	786	0.011%
5.4.5	Farm buildings/infrastructure	228	0.003%
5.5.0	Services	68	0.001%
5.5.1	Commercial services	1272	0.018%
5.5.2	Public services	1788	0.026%

Land use code	Land use description	Area ha	% of total Area
5.5.3	Recreation and culture	7778	0.112%
5.5.4	Defence facilities - urban	10	0.000%
5.5.5	Research facilities	832	0.012%
5.6.0	Utilities	28	0.000%
5.6.1	Fuel powered electricity generation	26	0.000%
5.6.2	Hydro electricity generation	154	0.002%
5.6.3	Wind electricity generation	352	0.005%
5.6.5	Electricity substations and transmission	227	0.003%
5.6.6	Gas treatment, storage and transmission	18	0.000%
5.6.7	Water extraction and transmission	81	0.001%
5.7.0	Transport and communication	26	0.000%
5.7.1	Airports/aerodromes	1497	0.021%
5.7.2	Roads	41760	0.599%
5.7.3	Railways	2266	0.033%
5.7.4	Ports and water transport	180	0.003%
5.8.0	Mining	1053	0.015%
5.8.1	Mines	1684	0.024%
5.8.2	Quarries	1456	0.021%
5.8.3	Tailings	260	0.004%
5.8.4	Extractive Industry not in use	14	0.000%
5.9.0	Waste treatment and disposal	400	0.006%
5.9.3	Solid garbage	4	0.000%
5.9.5	Sewage/sewerage	346	0.005%
6.1.0	Lake	36584	0.525%
6.1.1	Lake - conservation	64293	0.923%
6.1.2	Lake - production	34143	0.490%
6.2.0	Reservoir/dam	2303	0.033%
6.2.1	Reservoir	551	0.008%
6.2.2	Water storage - intensive use/farm dams	207	0.003%
6.3.0	River	5930	0.085%
6.3.1	River - conservation	6494	0.093%
6.4.0	Channel/aqueduct	158	0.002%
6.5.0	Marsh/wetland	6989	0.100%
6.5.1	Marsh/wetland - conservation	5	0.000%
6.5.4	Marsh/wetland - saline	2776	0.040%
6.6.0	Estuary/coastal waters	61226	0.879%
6.6.1	Estuary/coastal waters - conservation	107995	1.550%
	Total	**6967378**	**100.000%**