



Land use Summary 1999–2015

for the South West NRM Region

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Citation

DSITI. 2016, Land use Summary 1999–2015: South West NRM region, Department of Science, Information Technology and Innovation, Queensland Government.

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Cover photo: South West Queensland pasture © Andrew Clark

Acknowledgements

We wish to acknowledge the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) who coordinate the Australian Collaborative Land Use and Management Program (ACLUMP).

The QLUMP team includes staff from DSITI and four business centres of the Department of Natural Resource and Mines (DNRM) South Region. The input from the regions has been extremely valuable in respect of their mapping skills, local knowledge and capacity to engage regional experts in compiling updated land use mapping data.

May 2016

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Executive Summary

The Queensland Land use Mapping Program (QLUMP) has updated the land use mapping in the South West Natural Resource Management (NRM) Region to 2015. QLUMP has revised the earlier mapping products (1999 and 2006) and derived land use change mapping products. Land use is classified under the Australian Land use and Management (ALUM) Classification.

Grazing native vegetation was the dominant land use class in the South West NRM region, accounting for 92% of the region in 2015. This represents a small reduction from 1999 and 2006—where this land use class accounted for 95% of the region. The *nature conservation* land use class accounted for 4% of the region in 2015—an increase from 2% in 1999 and 2006.

Analysis of the **net** land use summary for each land use map (1999, 2006 and 2015) shows:

- *Nature conservation* increased by 53% or 233,397ha between 2006 and 2015. This is the result of the establishment of new, and expansion of existing national parks in the region. The largest of which was Currawinya National Park—south-west of Eulo.
- *Managed resource protection* increased by 1,688% or 339,941ha between 2006 and 2015. This was mainly due to the establishment and/or expansion of nature refuges such as Bulloo Downs (144,744ha)—south west of Thargomindah; Gilmore (78,761ha)—north of Adavale; and Carnarvon Station (56,769ha)—in the far north-east of the region.
- *Grazing native vegetation* decreased by 3% or 576,830ha between 2006 and 2015.
- *Cropping* increased by 196% or 14,356ha between 1999 and 2006 due to the establishment of dryland agriculture—east of Augathella and south-west of Bollon.
- *Irrigated cropping* increased by 140% or 1,285ha between 1999 and 2006 and an additional 38% or 834ha between 2006 and 2015.
- *Irrigated perennial horticulture* increased by 141% or 193ha between 1999 and 2006 entirely due to the expansion of an olive farm north of Charleville.
- *Irrigated cropping – cotton* increased by 32% or 213ha between 1999 and 2006 and 87% or 772ha between 2006 and 2015.

Land use change mapping products are derived at the secondary level of the ALUM classification. Analysis of each period shows that between:

- 1999–2006, 24,345ha or 0.1% of the region's land use changed. 65% of the total land use change was from *grazing native vegetation* to *cropping* (15,895ha).
- 2006–2015, 589,930ha or 3.2% of the region's land use changed. 97% of the total land use change was from the conversion of *grazing native vegetation* into conservation estates:
 - 234,929ha to *nature conservation*, including expansion of Currawinya and Culgoa Floodplain National Parks and establishment of Binya and Narkoola National Parks
 - 339,055ha to *managed resource protection*, including Bulloo Downs, Gilmore, Carnarvon Station, Jamba Dhandan Duringala and Rosevale Nature Refuges.
- 1999–2015, 610,350ha or 3.3% of the region's land use changed. 94% of the total land use change was associated with the conversion of *grazing native vegetation* into conservation estates, as shown above in the 2006–2015 period.

Introduction

The [Queensland Land use Mapping Program](#) (QLUMP) is a joint initiative of the Department of Science, Information Technology and Innovation (DSITI) and the Department of Natural Resources and Mines (DNRM). QLUMP is part of the [Australian Collaborative Land use and Management Program](#) (ACLUMP) coordinated by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). ACLUMP promotes nationally consistent land use information.

Land use and land management practices have a profound impact on Queensland's natural resources, agricultural production and the environment. The availability of consistent and reliable spatial information regarding land use is critical for sustainable natural resource management by Australian, Queensland and local governments, Natural Resource Management (NRM) regional groups, industry groups, community groups and land managers.

QLUMP has updated land use mapping in the South West NRM region to 2015. This report presents and summarises land use mapping including:

- revised 1999 and 2006 land use datasets including improvements and corrections to the originals
- 2015 land use dataset
- land use change datasets between 1999–2006, 2006–2015 and 1999–2015
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2015 land use dataset.

Methodology

Mapping is performed in accordance with ACLUMP guidelines. The methodology is accurate, reliable, cost-effective, and makes best use of available databases, satellite imagery and aerial photography.

The Australian Land use and Management (ALUM) classification (Figure 1, page 6) shows five primary classes, identified in order of increasing levels of intervention or potential impact of land use; water is included separately as a sixth primary class. Within the primary classes is a [three-level hierarchical structure](#). Primary, secondary and tertiary levels broadly describe the potential degree of modification or impact of land use on the landscape. The secondary level in the three-level hierarchical structure is the minimum attribution level for land use mapping in Queensland.

Primary and secondary levels relate to land use (i.e. the principal use of the land in terms of the objectives of the land manager). The tertiary level includes data on commodities or infrastructure. For example, crops such as cereals or infrastructure such as urban residential. Where possible, class attribution is performed to the tertiary level. For instance, QLUMP consistently maps land use classes *sugar* and *cotton* (dryland and irrigated) to tertiary level.

The mapping scale is 1:50,000 with a minimum mapping unit of two hectares and a width of 50 metres for linear features.

The 2006 land use dataset formed the basis for the 2015 land use dataset. The 1999 and 2006 land use maps were revised and improved in addition to compiling an updated land use map for 2015. This was achieved primarily by interpretation of Landsat 8 Operational Land Imager (OLI)

and SPOT6/7 satellite imagery, high-resolution orthophotography, scanned aerial photography and inclusion of expert local knowledge. An ESRI ArcSDE geodatabase replication environment was used to overlay land use datasets on imagery and digitised or modified areas previously omitted or incorrectly mapped in 1999 and 2006. Land use change maps were then derived (at the secondary level of the ALUM classification) for the periods 1999–2006, 2006–2015 and 1999–2015.

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated agriculture. Therefore, local expert knowledge provided by state government regional staff, natural resource management groups, agricultural industries and landholders was an important component of the mapping methodology. Field surveys were also undertaken to verify areas of uncertainty.

The land use mapping methods used by QLUMP are described in full in the ABARES handbook: [Guidelines for land use mapping in Australia: principles, procedures & definitions – Edition 4.](#)

1	2	3	4	5	6
Conservation and Natural Environments 1.1.0 Nature conservation 1.1.1 Strict nature reserves 1.1.2 Wilderness area 1.1.3 National park 1.1.4 Natural feature protection 1.1.5 Habitat/species management area 1.1.6 Protected landscape 1.1.7 Other conserved area 1.2.0 Managed resource protection 1.2.1 Biodiversity 1.2.2 Surface water supply 1.2.3 Groundwater 1.2.4 Landscape 1.2.5 Traditional Indigenous uses 1.3.0 Other minimal use 1.3.1 Defence land-natural areas 1.3.2 Stock route 1.3.3 Residual native cover 1.3.4 Rehabilitation	Production from Relatively Natural Environments 2.1.0 Grazing native vegetation 2.2.0 Production forestry 2.2.1 Wood production 2.2.2 Other forest production	Production from Dryland Agriculture and Plantations 3.1.0 Plantation forestry 3.1.1 Hardwood production 3.1.2 Softwood production 3.1.3 Other forest production 3.1.4 Environmental forest plantation 3.2.0 Grazing modified pastures 3.2.1 Native/exotic pasture mosaic 3.2.2 Woody fodder plants 3.2.3 Pasture legumes 3.2.4 Pasture legume/grass mixtures 3.2.5 Sown grasses 3.3.0 Cropping 3.3.1 Cereals 3.3.2 Beverage and spice crops 3.3.3 Hay and silage 3.3.4 Oil seeds 3.3.5 Sugar 3.3.6 Cotton 3.3.7 Alkaloid poppies 3.3.8 Pulses 3.4.0 Perennial horticulture 3.4.1 Tree fruits 3.4.2 Oleaginous fruits 3.4.3 Tree nuts 3.4.4 Vine fruits 3.4.5 Shrub nuts fruits and berries 3.4.6 Perennial flowers and bulbs 3.4.7 Perennial vegetables and herbs 3.4.8 Citrus 3.4.9 Grapes 3.5.0 Seasonal horticulture 3.5.1 Seasonal fruits 3.5.2 Seasonal nuts 3.5.3 Seasonal flowers and bulbs 3.5.4 Seasonal vegetables and herbs 3.6.0 Land in transition 3.6.1 Degraded land 3.6.2 Abandoned land 3.6.3 Land under rehabilitation 3.6.4 No defined use 3.6.5 Abandoned perennial horticulture	Production from Irrigated Agriculture and Plantations 4.1.0 Irrigated plantation forestry 4.1.1 Irrigated hardwood production 4.1.2 Irrigated softwood production 4.1.3 Irrigated other forest production 4.1.4 Irrigated environmental forest plantation 4.2.0 Grazing irrigated modified pastures 4.2.1 Irrigated woody fodder plants 4.2.2 Irrigated pasture legumes 4.2.3 Irrigated legume/grass mixtures 4.2.4 Irrigated sown grasses 4.3.0 Irrigated cropping 4.3.1 Irrigated cereals 4.3.2 Irrigated beverage and spice crops 4.3.3 Irrigated hay and silage 4.3.4 Irrigated oil seeds 4.3.5 Irrigated sugar 4.3.6 Irrigated cotton 4.3.7 Irrigated alkaloid poppies 4.3.8 Irrigated pulses 4.3.9 Irrigated rice 4.4.0 Irrigated perennial horticulture 4.4.1 Irrigated tree fruits 4.4.2 Irrigated oleaginous fruits 4.4.3 Irrigated tree nuts 4.4.4 Irrigated vine fruits 4.4.5 Irrigated shrub nuts fruits and berries 4.4.6 Irrigated flowers and bulbs 4.4.7 Irrigated vegetables and herbs 4.4.8 Irrigated citrus 4.4.9 Irrigated grapes 4.5.0 Irrigated seasonal horticulture 4.5.1 Irrigated fruits 4.5.2 Irrigated nuts 4.5.3 Irrigated flowers and bulbs 4.5.4 Irrigated vegetables and herbs 4.5.5 Irrigated turf farming 4.6.0 Irrigated land in transition 4.6.1 Degraded irrigated land 4.6.2 Abandoned irrigated land 4.6.3 Irrigated land under rehabilitation 4.6.4 No defined use (irrigation) 4.6.5 Abandoned irrigated perennial horticulture	Intensive Uses 5.1.0 Intensive horticulture 5.1.1 Shadehouses 5.1.2 Glasshouses 5.1.3 Glasshouses (hydroponic) 5.1.4 Abandoned intensive horticulture 5.2.0 Intensive animal husbandry 5.2.1 Dairy sheds with yards 5.2.2 Cattle feedlots 5.2.3 Sheep feedlots 5.2.4 Poultry farms 5.2.5 Piggeries 5.2.6 Aquaculture 5.2.7 Horse studs 5.2.8 Stockyards/saleyards 5.2.9 Abandoned intensive animal husbandry 5.3.0 Manufacturing and industrial 5.3.1 General purpose factory 5.3.2 Food processing factory 5.3.3 Major industrial complex 5.3.4 Bulk grain storage 5.3.5 Abattoirs 5.3.6 Oil refinery 5.3.7 Sawmill 5.3.8 Abandoned manufacturing/industrial 5.4.0 Residential and farm infrastructure 5.4.1 Urban residential 5.4.2 Rural residential with agriculture 5.4.3 Rural residential without agriculture 5.4.4 Remote communities 5.4.5 Farm buildings/infrastructure 5.5.0 Services 5.5.1 Commercial services 5.5.2 Public services 5.5.3 Recreation and culture 5.5.4 Defence facilities-urban 5.5.5 Research facilities 5.6.0 Utilities 5.6.1 Fuel powered electricity generation 5.6.2 Hydro electricity generation 5.6.3 Wind farm electricity generation 5.6.4 Electricity substations and transmission 5.6.5 Gas treatment, storage and transmission 5.6.6 Water extraction and transmission 5.7.0 Transport and communication 5.7.1 Airports/aerodromes 5.7.2 Roads 5.7.3 Railways 5.7.4 Ports and water transport 5.7.5 Navigation and communication 5.8.0 Mining 5.8.1 Mines 5.8.2 Quarries 5.8.3 Tailings 5.8.4 Extractive industry not in use 5.9.0 Waste treatment and disposal 5.9.1 Effluent pond 5.9.2 Landfill 5.9.3 Solid garbage 5.9.4 Incinerators 5.9.5 Sewage/sewerage	Water 6.1.0 Lake 6.1.1 Lake-conservation 6.1.2 Lake-production 6.1.3 Lake-intensive use 6.1.4 Lake-saline 6.2.0 Reservoir/dam 6.2.1 Reservoir 6.2.2 Water storage-intensive use/ farm dams 6.2.3 Evaporation basin 6.3.0 River 6.3.1 River-conservation 6.3.2 River-production 6.3.3 River-intensive use 6.4.0 Channel/aqueduct 6.4.1 Supply channel/aqueduct 6.4.2 Drainage channel/aqueduct 6.4.3 Stormwater 6.5.0 Marsh/wetland 6.5.1 Marsh/wetland-conservation 6.5.2 Marsh/wetland-production 6.5.3 Marsh/wetland-intensive use 6.5.4 Marshland-saline 6.6.0 Estuary/coastal waters 6.6.1 Estuary/coastal waters-conservation 6.6.2 Estuary/coastal waters-production 6.6.3 Estuary/coastal waters-intensive use
Minimum level of attribution					

Figure 1: Australian Land use and Management (ALUM) classification, Version 7

Data Limitations

Land use features that are linear, such as roads and railways, are not mappable at a scale of 1:50,000 with a specified minimum mapping width of 50 metres. As a result, the area estimates of these **linear features** represent only a small proportion of the actual area within this land use type in Queensland. This is of relevance to the following land use classes: (Figure 2a, page 8)

- *transport and communication*
- *rivers*

Similarly, land uses that fall under the QLUMP minimum mapping area of two hectares are not explicitly mapped but aggregated into the surrounding land use class. This will have the effect of over-estimating the area of some land use classes. For example, *grazing native vegetation* where roads, drainage lines, and small dams are included (Figure 2b, page 8).

Livestock grazing occurs on a range of pasture types including native and exotic as well as mixtures of both. Identifying and separating these pasture types using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary land use classes of *grazing modified pastures* and *grazing irrigated modified pastures* have not been mapped explicitly from the *grazing native vegetation* class.

The distinction between (dryland) *cropping* and *irrigated cropping* was not always evident and it is likely there is some misclassification in these classes. QLUMP undertook field surveys and together with local knowledge confirmed areas of irrigation where possible. An area's proximity to water sources (watercourse or dam) was also used. In addition, areas mapped as *irrigated cropping* are potentially only irrigated on a supplementary basis and may not have actually been irrigated in 1999, 2006 or 2015 (Figure 2c and d, page 8).

The *rural residential* land use class is a source of possible thematic error. Properties on the fringes of suburban settlements, hobby farms and subdivisions in isolated localities with comparatively small lot sizes were mapped to this class. The use of Queensland Valuation System (QVAS) was helpful in mapping this class, based on whether or not the land owner was classified as a primary producer. Residential features greater than 0.2 hectares and less than 16 hectares were mapped as rural residential. This class may be misclassified with *grazing native vegetation* and *other minimal use*, especially on larger properties.

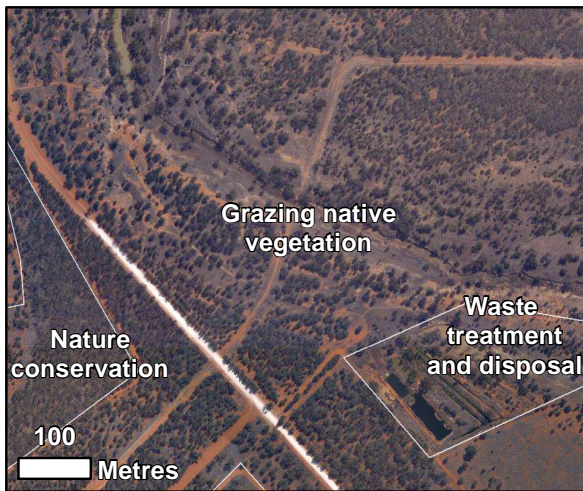
A combination of the Queensland Herbarium's [wetlands](#) and [regional ecosystem](#) datasets provided the basis for mapping *marsh/wetlands*, *lakes*, *rivers* and *reservoir/dams*. The ephemeral nature of many of these water features can lead to confusion as they may be present in one image and either absent or different in subsequent or earlier dated imagery. As a result, there may be errors, omissions and disagreement in the mapping of features such as farm dams, reservoirs, lakes, wetlands and other water features. Many water features, whilst exceeding the minimum mappable area requirements, do not meet the criteria for linear or uniform features.

The 1999, 2006 and 2015 land use datasets are a snapshot of what was interpreted as the primary land use in these years. However, effort was given to distinguishing between an actual land use change and a rotation. For example, an area that is usually cropped, but is not used for that particular purpose in the year of interest, was still mapped as *cropping* in the 2015 dataset even though no crop was present in that year. This was not considered an actual land use change, but rather a rotation, as the primary land use for that field would still be *cropping*.

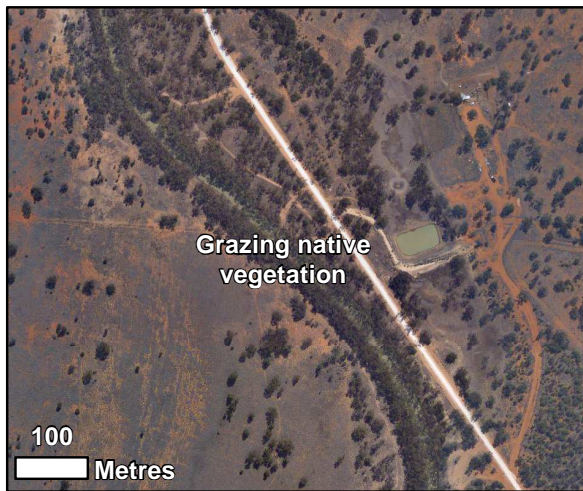
The 1999 and 2006 land use mapping has been revised and improved through the interpretation of the most suitable imagery available. On occasion this was Landsat (30m), which raises some

uncertainty in respect of accurately classifying the intensive land use classes. The minimum mapping unit (2ha) also contributes to the uncertainty through the aggregation of otherwise individual land use features, particularly at cadastral parcel level. These limitations may therefore lead to omission and commission errors in the classification of the intensive land use classes in earlier mapping products and the land use change products from which they are derived.

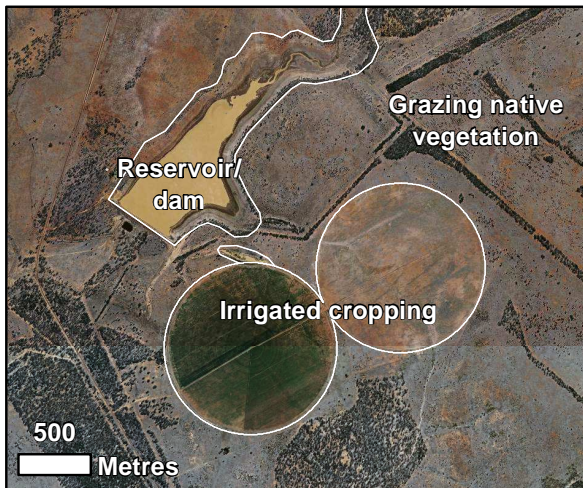
The 2015 land use map was largely compiled from Landsat 8 OLI satellite imagery, acquired in winter 2015 supplemented by scanned aerial photography. The 2006 land use map was revised using a combination of scanned aerial photography and SPOT5 2.5m pan-sharpened satellite imagery. The 1999 land use map was revised with Landsat 7 Enhanced Thematic Mapper Plus (ETM+) satellite imagery (30m) acquired in winter. This was also supplemented by scanned aerial photography where available.



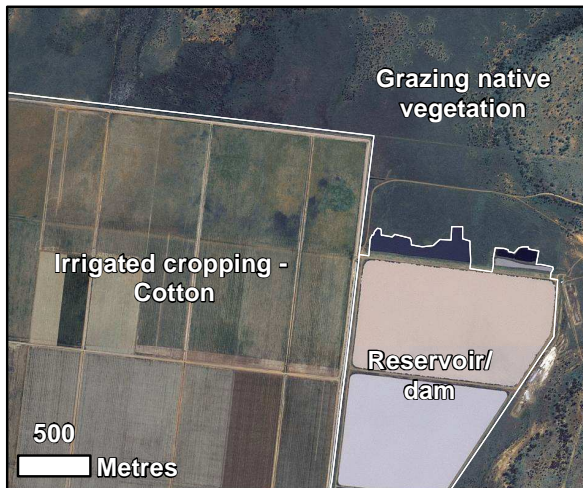
a. Transport and river land use – linear features not mapped



b. Drainage, road and small dam features are aggregated into the surrounding land use



c. Irrigated cropping showing infrastructure – central pivot irrigation



d. Irrigated cropping – cotton

Figure 2: Examples (a–d) of land use features

Products

1999, 2009 and 2015 land use datasets

Land use datasets for the South West NRM region are presented at the secondary level of the ALUM classification (Figure 1, page 6) in:

- 1999 land use dataset — Figure 3 (page 10)
- 2006 land use dataset — Figure 4 (page 12)
- 2015 land use dataset — Figure 5 (page 14)

Summary statistics for each are presented in:

- 1999 land use — Table 1 (page 11)
- 2006 land use — Table 2 (page 13)
- 2015 land use — Table 3 (page 15)

All statistics presenting the area of land use classes are reported in hectares (ha).

Grazing native vegetation and *nature conservation* are the dominant land use classes in the South West NRM region.

Table 1 (page 11) and Table 2 (page 13) shows that for both 1999 and 2006, the *grazing native vegetation* land use class accounted for 95% of the NRM region whilst *nature conservation* accounted for 2%.

For 2015—Table 3 (page 15) shows the *grazing native vegetation* land use class decreased to 92% while the *nature conservation* land use class had risen, accounting for 4% of the NRM region.

Analysis of the specific land use changes from one secondary class to another for 1999–2006, 2006–2015 is presented in the section on page 18. Analysis of the land use change for 1999–2015 has been included as Appendix A on page 25.

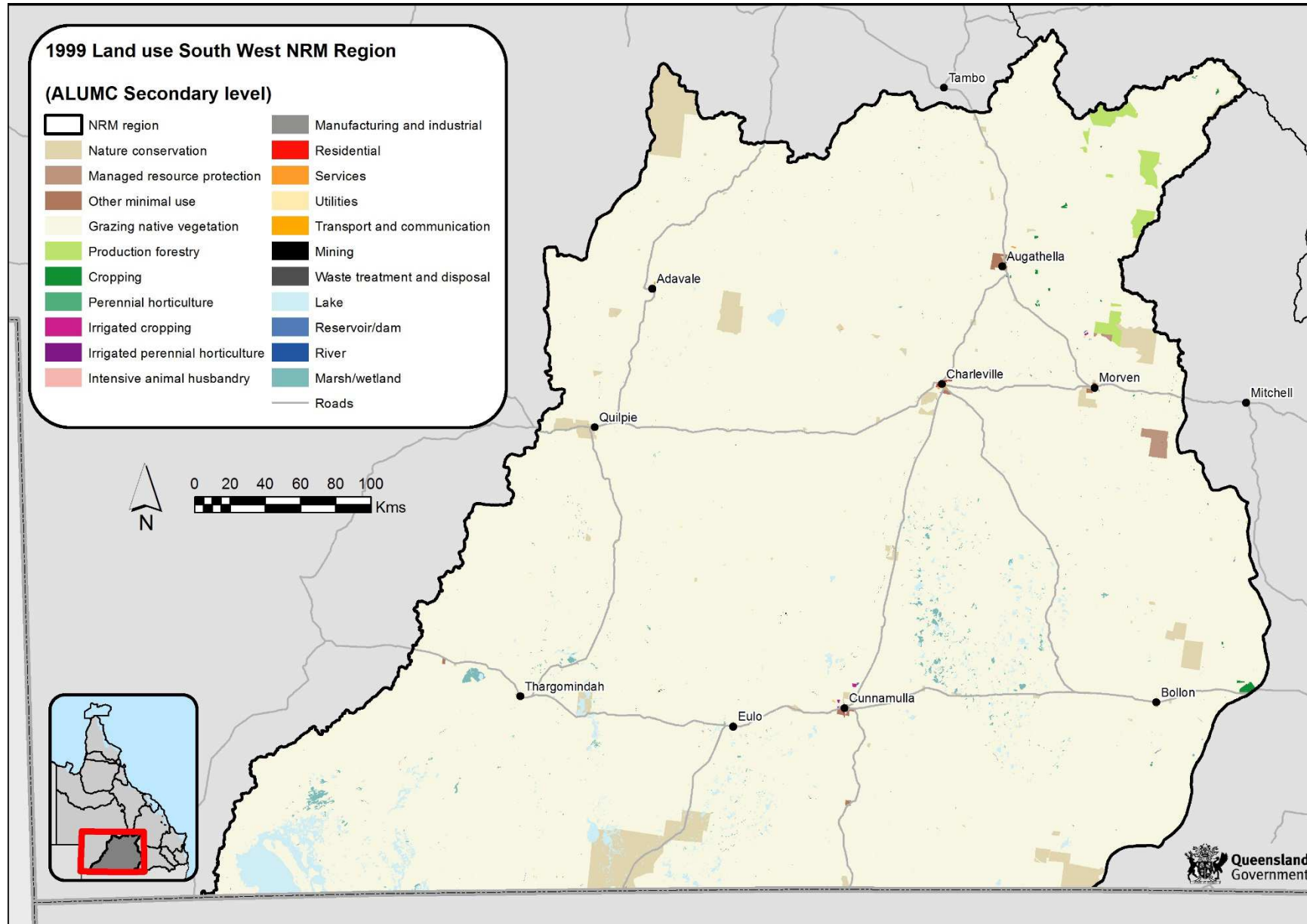


Figure 3: 1999 land use map for the South West NRM region

Table 1: Summary statistics of land use in 1999 in the South West NRM region

Land use code	Land use class	Area (ha) ³	Area (%)
1	Conservation and natural environments	481,839	2.57
1.1	Nature conservation	447,429	2.39
1.2	Managed resource protection	19,665	0.11
1.3	Other minimal use	14,745	0.08
2	Production from relatively natural environments	17,900,446	95.65
2.1	Grazing native vegetation ¹	17,827,011	95.25
2.2	Production forestry	73,435	0.39
3	Production from dryland agriculture and plantations	7,324	0.04
3.3	Cropping	7,322	0.04
3.4	Perennial horticulture	2	<0.01
4	Production from irrigated agriculture and plantations	1,053	0.01
4.3	Irrigated cropping	916	<0.01
4.3.6	Irrigated cropping – Cotton ²	674	<0.01
4.4	Irrigated perennial horticulture	137	<0.01
5	Intensive uses	6,121	0.03
5.2	Intensive animal husbandry	30	<0.01
5.3	Manufacturing and industrial	182	<0.01
5.4	Residential and farm infrastructure	1,931	0.01
5.5	Services	1,965	0.01
5.6	Utilities	8	<0.01
5.7	Transport and communication	1,662	0.01
5.8	Mining	253	<0.01
5.9	Waste treatment and disposal	90	<0.01
6	Water	318,436	1.70
6.1	Lake	263,606	1.41
6.2	Reservoir/dam	3,631	0.02
6.3	River	1,196	0.01
6.5	Marsh/wetland	50,002	0.27
Total		18,715,219	100.00

¹grazing native vegetation includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

²the area of land use classes at or below the tertiary level are shown as a subset of the total area at the secondary level.

³total figures for primary land use class may contain rounding errors.

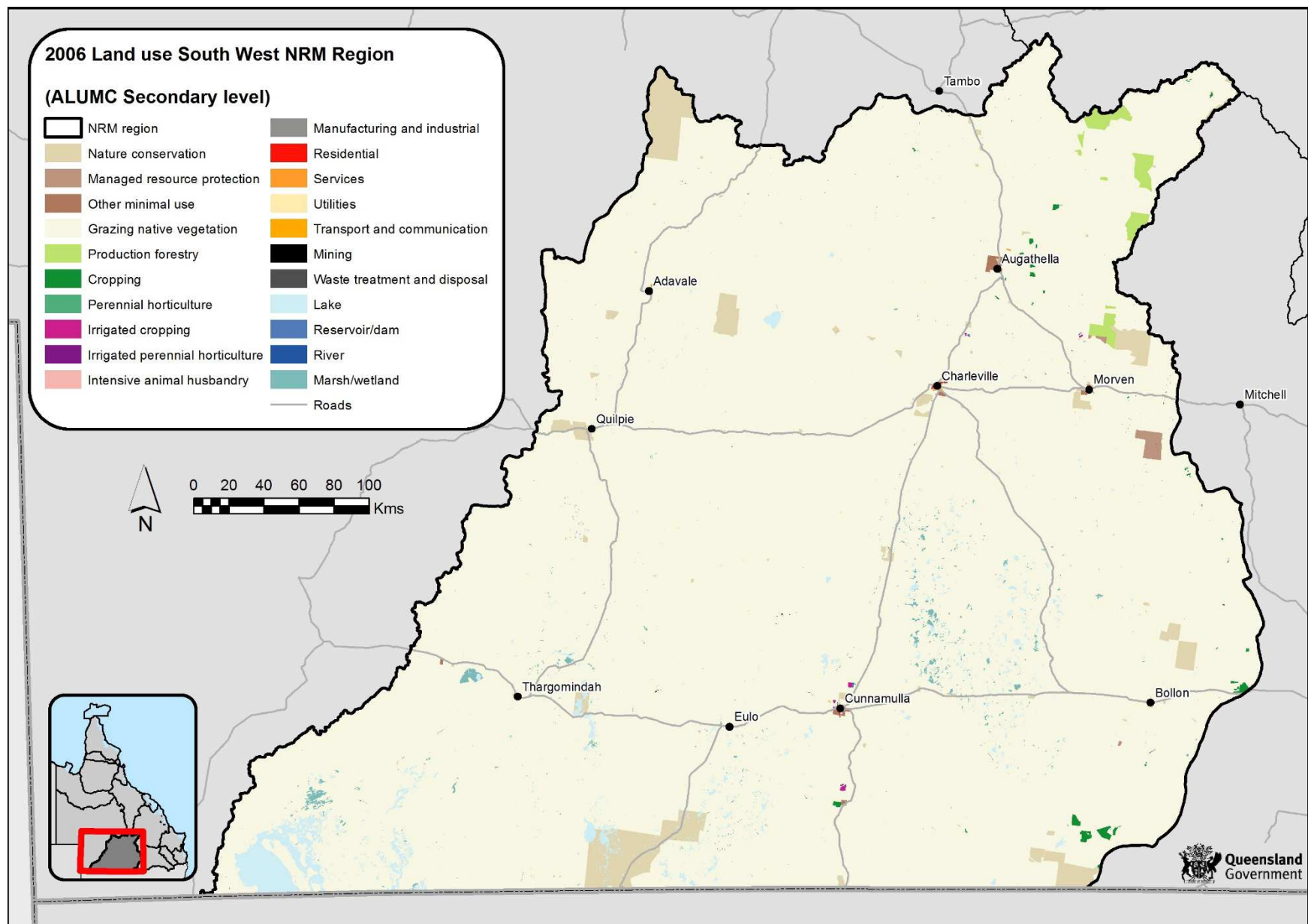


Figure 4: 2006 land use map for the South West NRM region

Table 2: Summary statistics of land use in 2006 in the South West NRM region

Land use code	Land use class	Area (ha) ³	Area (%)
1	Conservation and natural environments	477,876	2.55
1.1	Nature conservation	443,002	2.37
1.2	Managed resource protection	20,135	0.11
1.3	Other minimal use	14,739	0.08
2	Production from relatively natural environments	17,888,038	95.58
2.1	Grazing native vegetation ¹	17,814,603	95.19
2.2	Production forestry	73,435	0.39
3	Production from dryland agriculture and plantations	21,680	0.12
3.3	Cropping	21,678	0.12
3.4	Perennial horticulture	2	<0.01
4	Production from irrigated agriculture and plantations	2,531	0.01
4.3	Irrigated cropping	2,201	0.01
4.3.6	Irrigated cropping - Cotton ²	887	<0.01
4.4	Irrigated perennial horticulture	330	<0.01
5	Intensive uses	6,178	0.03
5.2	Intensive animal husbandry	30	<0.01
5.3	Manufacturing and industrial	192	<0.01
5.4	Residential and farm infrastructure	1,954	0.01
5.5	Services	1,965	0.01
5.6	Utilities	8	<0.01
5.7	Transport and communication	1,662	0.01
5.8	Mining	277	<0.01
5.9	Waste treatment and disposal	90	<0.01
6	Water	318,916	1.70
6.1	Lake	263,606	1.41
6.2	Reservoir/dam	4,112	0.02
6.3	River	1,196	0.01
6.5	Marsh/wetland	50,002	0.27
Total		18,715,219	100.00

¹ *grazing native vegetation* includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

² the area of land use classes at or below the tertiary level are shown as a subset of the total area at the secondary level.

³ total figures for primary land use class may contain rounding errors.

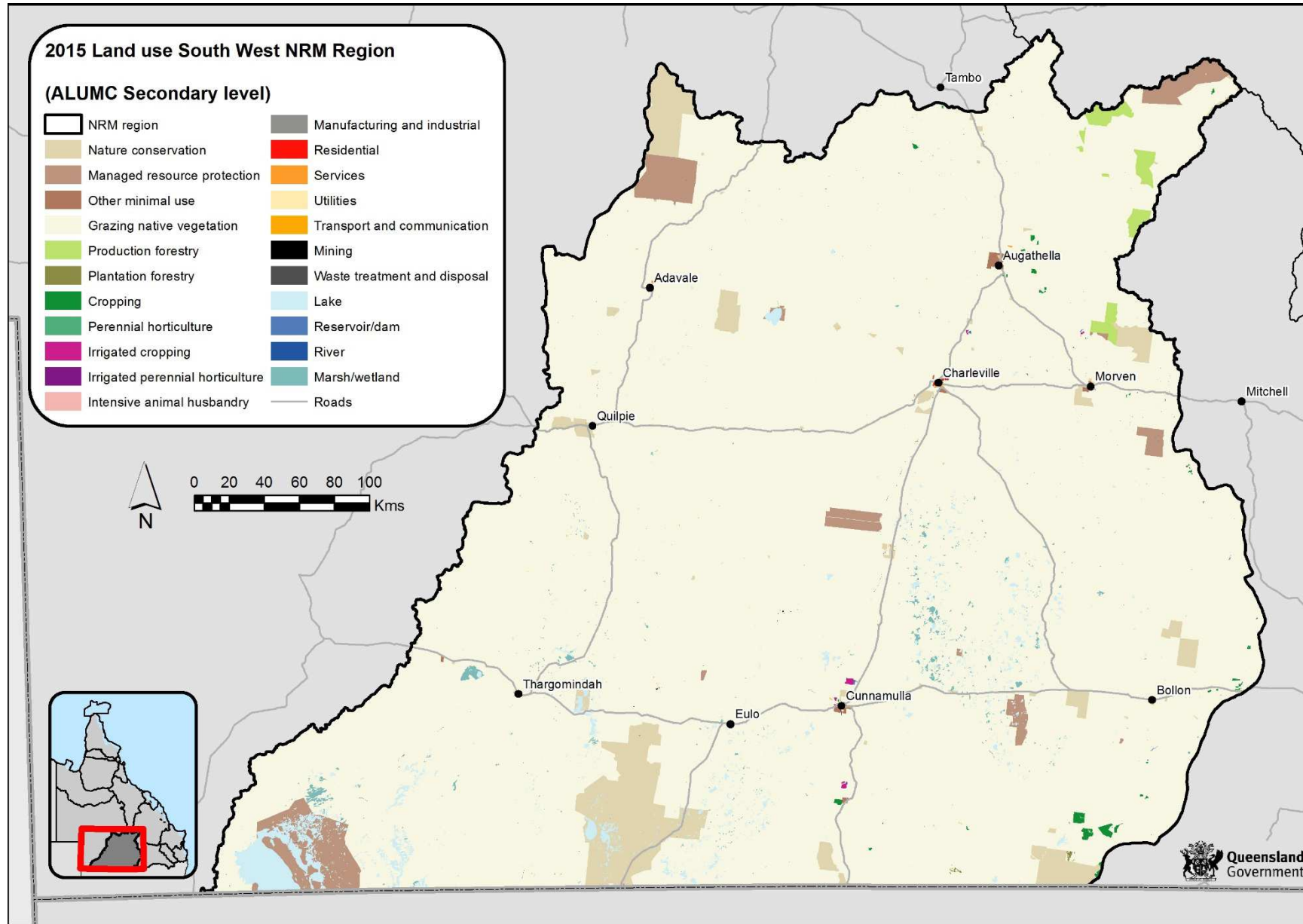


Figure 5: 2015 land use map for the South West NRM region

Table 3: Summary statistics of land use in 2015 in the South West NRM region

Land use code	Land use class	Area (ha) ³	Area (%)
1	Conservation and natural environments	1,051,401	5.62
1.1	Nature conservation	676,399	3.61
1.2	Managed resource protection	360,076	1.92
1.3	Other minimal use	14,926	0.08
2	Production from relatively natural environments	17,312,759	92.51
2.1	Grazing native vegetation ¹	17,237,774	92.11
2.2	Production forestry	74,985	0.40
3	Production from dryland agriculture and plantations	23,092	0.12
3.1	Plantation forestry	1,673	0.01
3.3	Cropping	21,399	0.11
3.4	Perennial horticulture	21	<0.01
4	Production from irrigated agriculture and plantations	3,365	0.02
4.3	Irrigated cropping	3,035	0.02
4.3.6	Irrigated cropping – Cotton ²	1,659	0.01
4.4	Irrigated perennial horticulture	330	<0.01
5	Intensive uses	6,375	0.03
5.2	Intensive animal husbandry	30	<0.01
5.3	Manufacturing and industrial	204	<0.01
5.4	Residential and farm infrastructure	2,099	0.01
5.5	Services	1,965	0.01
5.6	Utilities	8	<0.01
5.7	Transport and communication	1,662	0.01
5.8	Mining	317	<0.01
5.9	Waste treatment and disposal	90	<0.01
6	Water	318,229	1.70
6.1	Lake	263,606	1.41
6.2	Reservoir/dam	4,150	0.02
6.3	River	1,196	0.01
6.5	Marsh/wetland	49,276	0.26
Total		18,715,219	100.00

¹grazing native vegetation includes all pastures (modified and unmodified). No distinction is made in respect of tree cover.

²the area of land use classes at or below the tertiary level are shown as a subset of the total area at the secondary level.

³total figures for primary land use class may contain rounding errors.

Overall (net) land use change

Analysis of the overall (net) land use summary for each land use map (1999, 2006 and 2015) by primary land use class shows: (Tables 1–3, pages 11, 13, 15)

- *Conservation and natural environments* decreased by 1% or 3,963ha between 1999 and 2006 and increased by 120% or 573,525ha between 2006 and 2015
- *Production from relatively natural environments* decreased by 0.1% or 12,408ha between 1999 and 2006 and a further 3% or 575,280ha between 2006 and 2015
- *Production from dryland agriculture and plantations* increased by 196% or 14,356ha between 1999 and 2006 and a further 7% or 1,412ha between 2006 and 2015
- *Production from irrigated agriculture and plantations* increased by 140% or 1,478ha between 1999 and 2006 and a further 33% or 834ha between 2006 and 2015
- *Intensive uses* increased in each era—1% or 57ha between 1999 and 2006 and 3% or 197ha between 2006 and 2015
- *Water* increased by 0.2% or 480ha between 1999 and 2006 and decreased 0.2% or 687ha between 2006 and 2015.

Figure 6 presents the overall (net) changes in land use within the South West NRM region by primary land use class. The chart shows the net reduction or gain between 1999 and 2006 (first column of each primary land use class) and between 2006 and 2015 (second column). Each series sums to zero.

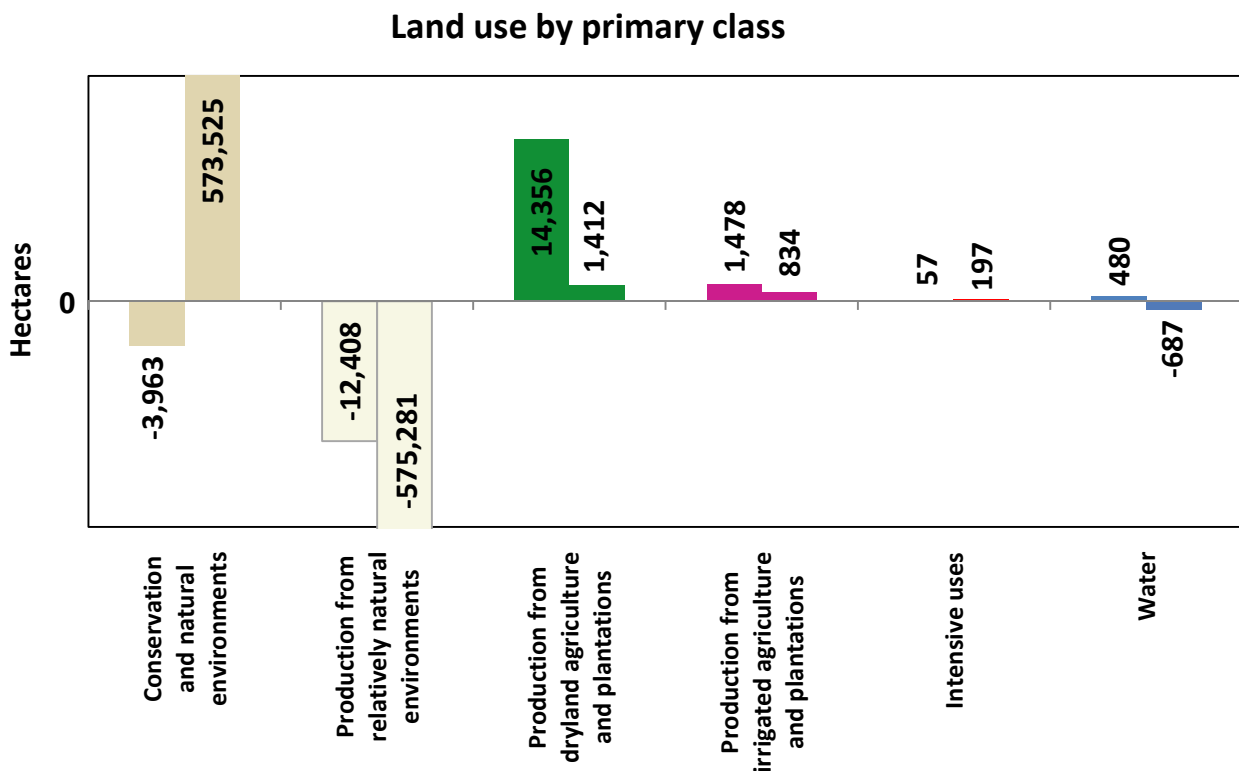


Figure 6: Net land use change by primary class (1999–2009 and 2009–2015) in the South West NRM region

Further analysis of the **net** change at the **secondary land use class** shows: (Tables 1–3, pages 11, 13, 15)

- *Nature conservation* initially decreased by 1% or 4,427ha between 1999 and 2006 but then increased by 53% or 233,397ha between 2006 and 2015. This is the result of the establishment of new, and expansion of existing national parks in the South West NRM region. The largest change in this class was the expansion of Currawinya National Park—south-west of Eulo, which accounts for 188,371ha of the net land use change between 2006 and 2015.
- *Managed resource protection* increased by 2% or 470ha between 1999 and 2006 and then increased by 1,688% or 339,941ha between 2006 and 2015. This was mainly due to the establishment and/or expansion of nature refuges such as Bulloo Downs (144,744ha)—south west of Thargomindah; Gilmore (78,761ha)—north of Adavale; and Carnarvon Station (56,769ha)— in the far north-east of the South West NRM region.
- *Grazing native vegetation* decreased by 0.1% or 12,408ha between 1999 and 2006 and decreased by a further 3% or 576,830ha between 2006 and 2015.
- *Cropping* increased by 196% or 14,356ha between 1999 and 2006 due to the establishment of dryland agriculture—east of Augathella and south-west of Bollon. It then decreased by 1% or 279ha between 2006 and 2015.
- *Irrigated cropping* increased by 140% or 1,285ha between 1999 and 2006 and an additional 38% or 834ha between 2006 and 2015.
- *Reservoir/dam* increased by 13% or 480ha between 1999 and 2006 and an additional 1% or 39ha between 2006 and 2015.
- *Irrigated perennial horticulture* increased by 141% or 193ha between 1999 and 2006 entirely due to the expansion of an olive farm north of Charleville.
- *Residential and farm infrastructure* increased by 1% or 23ha between 1999 and 2006 and additional 7% or 145ha between 2006 and 2015.

QLUMP consistently maps the **tertiary land use class** of *irrigated cropping – cotton*. The **net** land use change was: (Tables 1–3, pages 11, 13, 15)

- *Irrigated cropping – cotton* increased by 32% or 213ha between 1999 and 2006 and 87% or 772ha between 2006 and 2015.

Land use change datasets (1999–2006, 2006–2015 and 1999–2015)

Figures 7, 8 and 9 (pages 20, 23 and 27) show the land use change datasets for the South West NRM region. The data has been presented relative to the **change in intensity** of the land use at the secondary level of the ALUM classification.

For example, change from 2.1.0 (*grazing native vegetation*) to 3.3.0 (*cropping*) is an increase in land use intensity, whilst change from 2.1.0 (*grazing native vegetation*) to 1.1.0 (*nature conservation*) is a decrease. This is highlighted in the ALUM classification (Figure 1, page 6). Moving down and from left to right through the classification, the level of intervention or potential impact of land use increases.

Land use change mapping products have been compiled for three epochs (1999, 2006 and 2015). At the secondary level of the ALUM classification, the total area of land use change is:

- 1999–2006: 24,345ha (0.1% of the region). Of this, 22,337ha (92% of the total change) is mapped as an increase in land use intensity, whilst 2,008ha (8%) is a decrease.
- 2006–2015: 589,930ha (3.2% of the region). Of this, 10,290ha (2% of the total change) is mapped as an increase in land use intensity, whilst 579,640ha (98%) is a decrease.
- 1999–2015: 610,350ha (3.3% of the region). Of this, 30,664ha (5% of the total change) is mapped as an increase in land use intensity, whilst 579,686ha (95%) is a decrease.

The land use change totals between the two eras (1999–2006 and 2006–2015) will not add up to match those compiled for the 1999–2015 era. This is because land use change mapping only accounts for land use at a specific moment in time; some change will result from land use rotation, whilst some may be the result of more than one change event. For example, an area mapped as *grazing native vegetation* in 1999 may have been mapped as *cropping* in 2006 before transitioning back to *grazing native vegetation* in 2015. These changes would be reflected in each of the land use change mapping products as change from *grazing native vegetation* to *cropping* in 1999–2006, and change from *cropping* to *grazing native vegetation* in 2006–2015, and no change at all in 1999–2015.

Summary statistics presenting the land use change at the secondary level for 1999–2006 and 2006–2015 are shown in Table 4 (page 19) and Table 5 (page 22). The change from 1999–2015 is presented in Appendix A (page 25).

1999–2006 Land use change

A total of 24,345ha or 0.13% of the total area of the South West NRM region changed from one secondary land use class to another for 1999–2006. The conversion of *grazing native vegetation* into *cropping* dominates the 1999–2006 land use change map with 15,895ha or 65% of the total change mapped. Analysis of the land use change from 1999–2006 is presented in Table 4 and Figure 7 (page 20).

The land use changes at secondary level of the ALUM classification are summarised in Table 4. This table illustrated the land use changes between 1999 and the updated land use map for 2006. For example, 193ha of *grazing native vegetation* in 1999 changed to *irrigated perennial horticulture* in 2006.

Changes in selected secondary land use classes show:

- From a total of 18,374ha of *grazing native vegetation* in 1999—15,895ha changed to *cropping*, 1,072ha changed to *irrigated cropping* and 480ha changed to *reservoir/dam*.
- 4,427ha changed from *nature conservation* to *grazing native vegetation* due to the issuing of grazing leases on camping and water reserves.
- 1,539ha of *cropping* changed to *grazing native vegetation*.

Table 4: Summary statistics for land use change at secondary level for 1999–2006 in the South West NRM region

Land use change 1999–2006		2006 Land use (ha)										
		Managed resource protection	Grazing native vegetation	Cropping	Irrigated cropping	Irrigated cropping - Cotton	Irrigated perennial horticulture	Manufacturing and industrial	Residential and farm infra.	Mining	Reservoir/dam	Total
1999 Land use (ha)	Nature conservation		4,427									4,427
	Other minimal use							3	2			5
	Grazing native vegetation	470		15,895	1,072	213	193	7	20	24	480	18,374
	Cropping		1,539									1,539
	Total	470	5,966	15,895	1,072	213	193	10	23	24	480	24,345

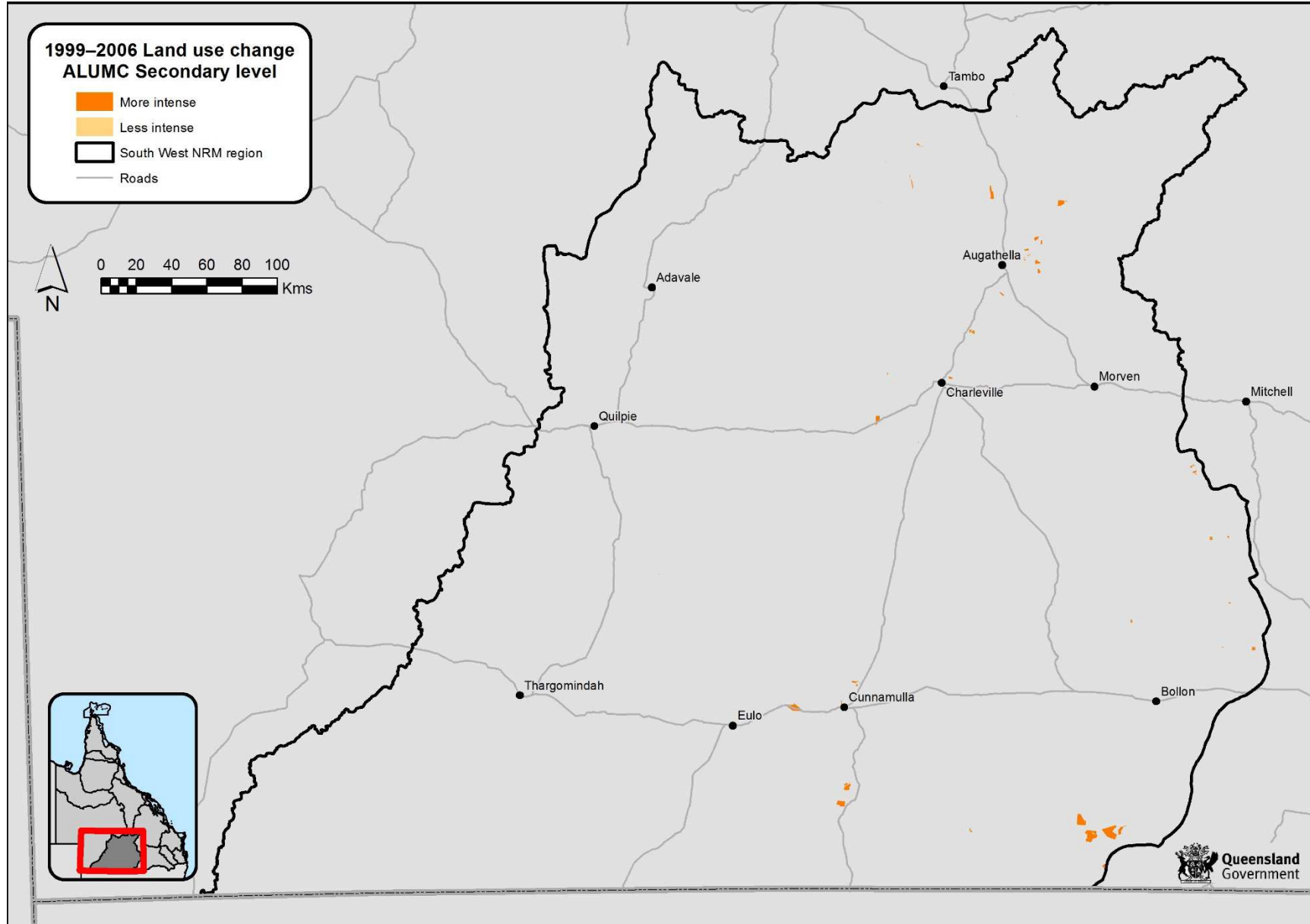


Figure 7: 1999–2006 land use change map at secondary level for the South West NRM region

2006–2015 Land use change

The land use changes mapped at the secondary level for 2006–2015 totals 589,930ha or 3.15% of the total area for the South West NRM region. Analysis of the land use change for 2006–2015 is presented in Table 5 (page 22) and Figure 8 (pages 23).

The change was dominated by the conversion of *grazing native vegetation* into the conservation estates, with 234,929ha changing to *nature conservation* (national parks), and 339,055ha changing to *managed resource protection* (nature refuges).

The land use changes to the *nature conservation* class were largely accounted for in the expansion of the Currawinya National Park (south of Eulo) and Culgoa Floodplain National Park (south of Bollon). Also contributing were the establishment of new estates—Binya National Park (south of Cunnamulla) and Narkoola National Park (west of Bollon).

New nature refuges including Bulloo Downs, Gilmore, Carnarvon Station, Jamba Dhandan Duringala and Rosevale all contributed to the land use change to *managed resource protection*.

Other changes in selected secondary land use classes show:

- 4,370ha of *grazing native vegetation* changed to *cropping*—south of Bollon and east of Augathella.
- Interestingly, the above land use change was offset by 4,489ha of *cropping* changing to *grazing native vegetation* elsewhere in the region.
- 1,550ha of *grazing native vegetation* changed to *production forestry*—due to the expansion of the Orkadilla State Forest north of Morven.
- 825ha of *grazing native vegetation* changed to *irrigated cropping – cotton* (north of Cunnamulla)

Table 5: Summary statistics for land use change at secondary level for 2006–2015 in the South West NRM region

Land use change 2006–2015		2015 Land use (ha)														
		Nature conservation	Managed resource protection	Other minimal use	Grazing native vegetation	Production forestry	Plantation forestry	Cropping	Perennial horticulture	Irrigated cropping	Irrigated cropping - Cotton	Manufacturing and industrial	Residential and farm infra.	Mining	Reservoir/dam	Total
2006 Land use (ha)	Nature conservation				1,530									2		1,532
	Other minimal use												15			15
	Grazing native vegetation	234,929	339,055	201		1,550	1,673	4,370	21	86	825	12	131	38	39	582,929
	Cropping		160		4,489											4,649
	Perennial horticulture				2											2
	Irrigated cropping				24											24
	Irrigated cropping - Cotton				54											54
	Marsh/wetland		726													726
	Total	234,929	339,941	201	6,099	1,550	1,673	4,370	21	86	825	12	145	40	39	589,930

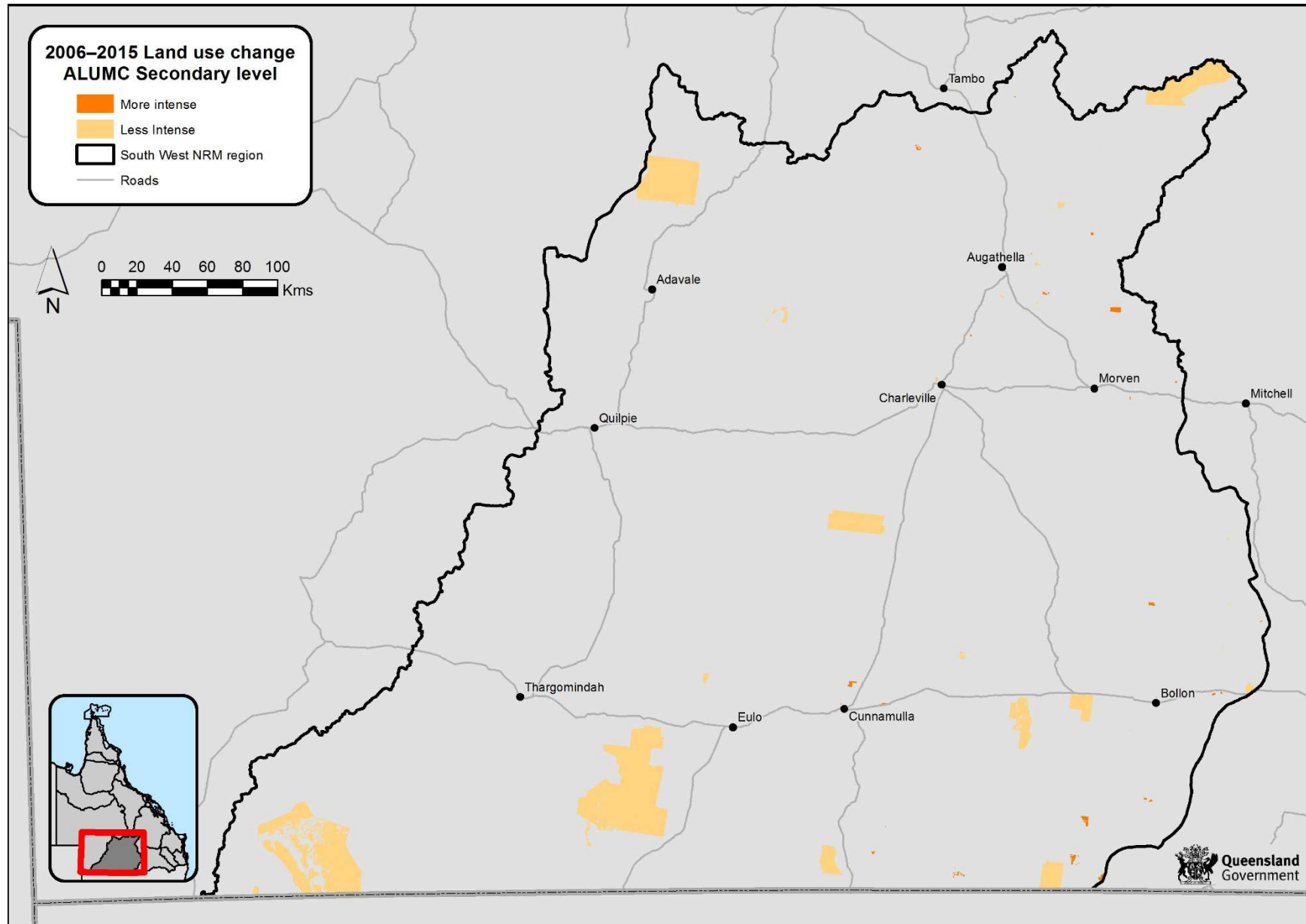


Figure 8: 2006–2015 land use change map at secondary level for the South West NRM region

Data format and availability

Download land use datasets

Use the Queensland Spatial Catalogue [QSpatial](#) to access land use data sets. Search for "**land use mapping**" in the search term field then refine your results by selecting the "**Planning Cadastre**" filter from the *choose categories* field. Metadata is also available from QSpatial.

The dataset comprises an ESRI vector geodatabase (10.2.2) at a nominal scale of 1:50,000. Within this are six feature classes: 1999 improved land use, 2006 improved land use, 2015 updated land use, 1999–2006 land use change layer, 2006–2015 land use change layer and 1999–2015 land use change layer. The feature classes are polygon datasets with attributes describing land use. Land use is classified according to the Australian Land Use and Management Classification (ALUMC) Version 7, May 2010. Note: a representation showing land use at secondary level is available when working within a geodatabase. Layer files are also available to present the land use mapping at primary, secondary or tertiary level.

Digital Data is supplied with a licence and by using the data you confirm that you have read the licence conditions included with the data and that you agree to be bound by its terms.

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Map and feature services

Use the Queensland Spatial Catalogue [QSpatial](#) to access the web mapping services of the state-wide land use layer. Search for "**land use mapping**" in the search term field then refine your results by using the *choose content type* filter and selecting "**Service**".

Request a land use map

It is possible to [request a land use map](#) from the [QLUMP](#) website based upon a specific location (lot on plan, street address or central latitude/longitude coordinates) in Queensland. The land use maps are emailed in portable document format (PDF). The maps present the most recent land use information available at the secondary level of the ALUMC.

View land use on the Queensland Globe

View the most recent Queensland land use information on the [Queensland Globe](#). Use this application to browse spatial data in Queensland, including land use and up-to-date satellite imagery. Land use is available for viewing within the *Planning and Cadastre* category globe.

Appendix A 1999–2015 Land use change

For 1999–2015, 610,350ha or 3.26% of the total South West NRM region changed from one secondary class to another. The largest land use changes were observed from the *grazing native vegetation*—which accounted for 599,340ha (98%) of the total land use change.

Analysis of the land use change for 1999–2015 is presented in Table 6 and Figure 9 (pages 26 and 27).

The conversion of *grazing native vegetation* into the conservation estates dominates the 1999–2015 land use change map. Some 339,525ha changed to *managed resource protection* and 234,929ha changed to *nature conservation*.

The land use changes to the *nature conservation* class were largely accounted for in the expansion of the Currawinya National Park (south of Eulo) and Culgoa Floodplain National Park (south of Bollon). Also, contributing were the establishment of new estates—Binya National Park (south of Cunnamulla) and Narkoola National Park (west of Bollon).

New nature refuges including Bulloo Downs, Gilmore, Carnarvon Station, Jamba Dhandan Duringala and Rosevale all contributed to the land use change to *managed resource protection*.

Other changes in selected secondary land use classes show:

- 18,326ha of *grazing native vegetation* changed to *cropping*— south of Bollon and east of Augathella.
- Interestingly, the above land use change was offset by 4,089ha of *cropping* changing to *grazing native vegetation* elsewhere in the region.
- 5,957ha of *nature conservation* changed to *grazing native vegetation*—associated with the issuing of grazing leases on camping and water reserves.
- 1,550ha of *grazing native vegetation* changed to *production forestry*—due to the expansion of the Orkadilla State Forest north of Morven.
- *Grazing native vegetation* also contributed 1,134ha and 1,038ha of land use change to the *irrigated cropping* and *irrigated cropping – cotton* land use classes respectively.
- 519ha of *grazing native vegetation* was converted to *reservoir/dam*.
- 193ha of *grazing native vegetation* changed to *irrigated perennial horticulture*—due to the expansion of an olive farm north of Charleville.
- 151ha of *grazing native vegetation* was converted to *residential and farm infrastructure*.

Table 6: Summary statistics for land use change at secondary level for 1999–2015 in the South West NRM region

Land use change 1999–2015		2015 Land use (ha)															
		Nature conservation	Managed resource protection	Other minimal use	Grazing native vegetation	Production forestry	Plantation forestry	Cropping	Perennial horticulture	Irrigated cropping	Irrigated cropping - Cotton	Irrigated perennial horticulture	Manufacturing and industrial	Residential and farm infra.	Mining	Reservoir/dam	Total
1999 Land use (ha)	Nature conservation				5,957										2		5,959
	Other minimal use												3	17			20
	Grazing native vegetation	234,929	339,525	201		1,550	1,673	18,326	21	1,134	1,038	193	19	151	62	519	599,340
	Cropping		160		4,089												4,249
	Perennial horticulture				2												2
	Irrigated cropping - Cotton				54												54
	Marsh/wetland		726														726
	Total	234,929	340,411	201	10,102	1,550	1,673	18,326	21	1,134	1,038	193	22	168	64	519	610,350

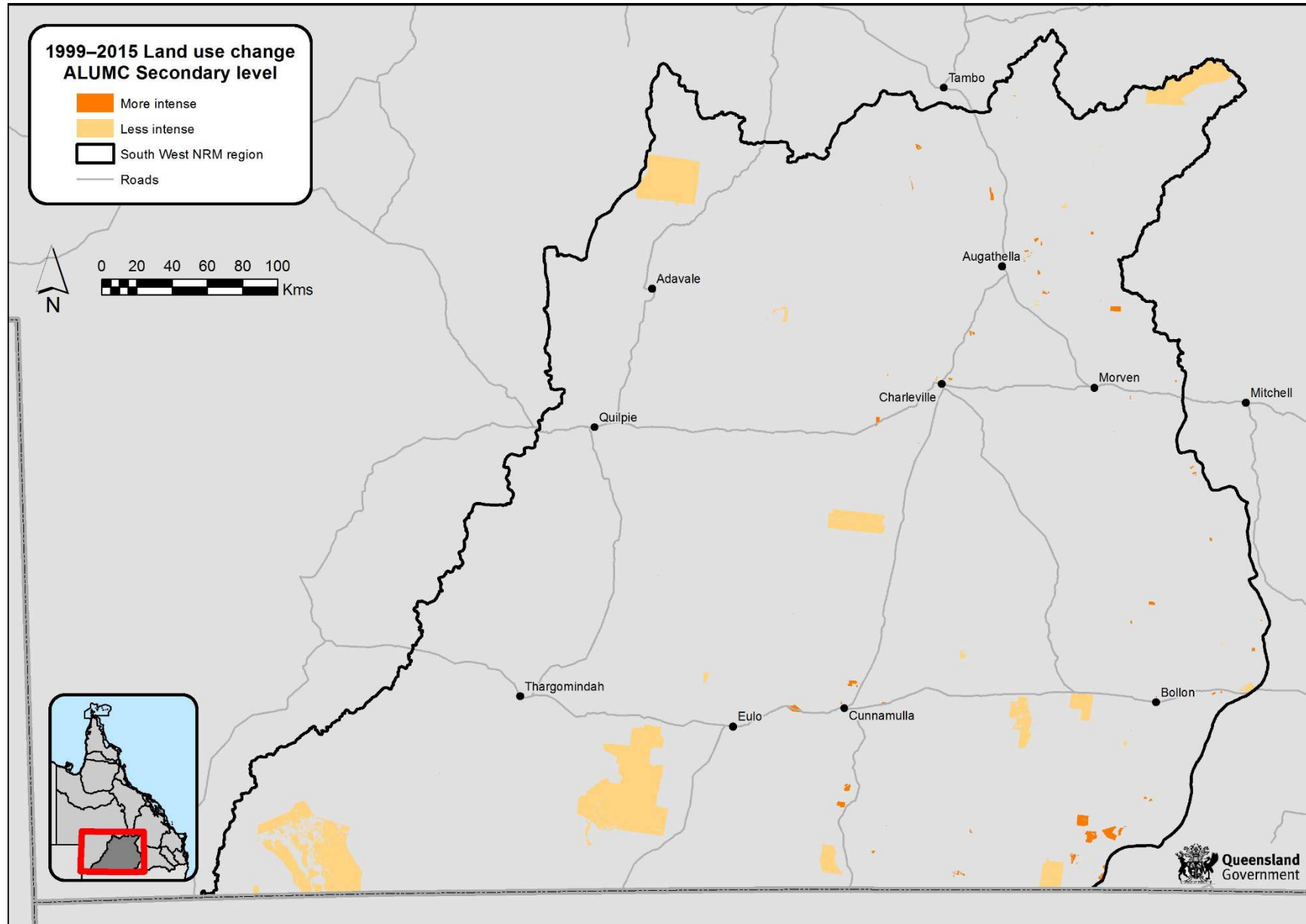


Figure 9: 1999–2015 land use change map at secondary level for the South West NRM region

Appendix B Accuracy assessment

The accuracy assessment provided reference data suitable for assessing the 2015 land use map. For each of the sample points, the true land use class was independently determined (this provided the reference data) based on desktop interpretation of the same imagery and ancillary datasets available to the mapper. These points were then compared to the mapped class (map data) and the information summarised in the error matrix. The accuracy is summarised in terms of total accuracy, Kappa and user's and producer's accuracies. Each accuracy parameter is reported using a point estimate and a 95% posterior interval. Accuracy figures are provided as probabilities between 0 and 1.

Total accuracy provides an estimate of the overall accuracy of the map, and can be expressed as the probability that a point is mapped correctly. However, the total accuracy may be misleading, particularly when a dominant class exists. The Kappa statistic attempts to overcome this problem by adjusting for chance agreement. A common rule of thumb suggests a value of Kappa between 0.6 and 0.8 represents moderate agreement between the map and the ground truth, a value greater than 0.8 suggests strong agreement. Values less than 0.2 suggest the map is only marginally improved compared to a map produced by random allocation.

The user's and producer's accuracies summarise the map's accuracy on a per-class basis. User's accuracy for class A is the probability that a point mapped as A is truly in class A. If the user's accuracy of class A is estimated to be 0.84, then from a random sample of 100 points chosen from areas on the map in this class, approximately 84 would be found to be correct when checked in the field. Producer's accuracy for class B is the conditional probability that the map will show a site as class B given its true state is class B. If the producer's accuracy for class B were 0.84, then from a random sample of 100 points known to be in class B, approximately 84 would also be in class B according to the map. An accurate map should have both high user's and producer's accuracies.

The per-class estimates of accuracy are often not precise, as only part of the total sample points are used to estimate them. As a guide, if the upper bound of the interval for either user's or producer's accuracy is less than 0.5, this may indicate a true misclassification problem rather than inadequacies in sample size.

Points that differ between the map and the reference data may be due to positional or spatial errors. Inaccurate registration of datasets is an example of spatial error. Spatial errors influence thematic accuracy. Thematic errors are the incorrect labelling of an area due to difficulties in determining the true land use in that area, or by oversight or other operational errors. The purpose is to assess the thematic accuracy of land use data. However, as described above, the separation of spatial and thematic errors may be difficult and were not undertaken. As a result, the accuracy assessment reflects properties of the land use data as a whole.

Note: the revised 1999 and 2006 land use and the land use change datasets were not accuracy assessed.

2015 land use dataset

The 2015 land use dataset was accuracy assessed with 304 points based on a stratified random sampling strategy, using the map classes (area and frequency) as the strata. The estimate of total accuracy is 0.96 (0.82, 0.99) and Kappa is 0.76 (0.41, 0.94). As the lower bound of the confidence interval for total accuracy is greater than 0.8, the mapping meets the ACLUMP specification.

Table 7 (page 30) shows the error matrix for the accuracy assessment of the 2015 land use data. For the majority of classes, the reference data agreed with the map data. For example, *nature conservation* had 30 sample points identified. For 27 of those points, the map data was also *nature conservation* and therefore correct. For three points the map data was incorrect, as the land use was found to be *grazing native vegetation*. These misclassifications reflect both thematic and spatial errors.

The column 'proportion' in Table 7 is the relative proportion in area of the classes that were assessed, not of the catchment as a whole. The areas of other classes that are not amenable to assessment, for example, *perennial horticulture* is removed from the total area before the proportions are calculated. This column will total 100%.

Table 8 (page 31) provides the user's and producer's accuracy for the 2015 South West NRM region land use dataset. This demonstrates the majority of land use classes in the catchment have been mapped accurately. The largest assessable land use class in this catchment is *grazing native vegetation* which has been mapped with very high user's and producer's accuracies of 0.964 and 0.996 respectively. The next largest class by area is *nature conservation* which also returned very high user's and producer's accuracies of 0.976 and 0.998. The error matrix (Table 7) provides more detail on the misclassifications.

Accuracy estimates based on samples with fewer than two points are not considered sufficiently reliable, and are presented as NA (not available) in the table—an example being *irrigated cropping*.

The user's and producer's accuracy results should be interpreted individually for their respective classes. It should be noted that the classes with a small area in proportion to the total area assessed, and also a small sample size, will return a wide confidence interval. The overall accuracy shows a much tighter confidence interval as it effectively summarises the accuracy results for all the assessable classes.

Some classes with low accuracies have insufficient sample points to provide precise estimates. For example, the producer's accuracy for *cropping* is 0.922; however, from the 95% interval (0.039, 0.999) it can be seen that more sample points would be required to confidently determine class accuracy.

Table 7: Error matrix for the South West NRM region 2015 land use dataset

		Reference data																			Total	Proportion (%)		
		Nature conservation	Managed resource protection	Other minimal use	Grazing native vegetation	Production forestry	Cropping	Irrigated cropping	Irrigated cropping - cotton	Irrigated perennial horticulture	Intensive animal husbandry	Manufacturing & industrial	Residential and farm infra.	Services	Utilities	Transport & communication	Mining	Waste treatment and disposal	Lake	Reservoir/dam			River	Marsh/wetland
Map data	Nature conservation	27	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30	3.61
	Managed resource protection	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	30	1.92
	Other minimal use	2	0	10	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	15	0.08
	Grazing native vegetation	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	92.10
	Production forestry	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.40
	Cropping	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0.11
	Irrigated cropping	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01
	Irrigated cropping - cotton	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.01
	Irrigated perennial horticulture	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	<0.01
	Intensive animal husbandry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	<0.01
	Manufacturing & industrial	0	0	0	0	0	0	0	0	0	0	8	1	0	0	0	0	0	0	0	0	0	9	<0.01
	Residential and farm infrastructure	0	0	0	1	0	0	0	0	0	0	0	7	1	1	0	0	0	0	0	0	0	10	0.01
	Services	0	0	1	1	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	10	0.01
	Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	<0.01
	Transport & communication	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	10	0.01
	Mining	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	10	<0.01
	Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	1	0	0	10	<0.01
	Lake	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	68	0	0	0	69	1.41
	Reservoir/dam	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	10	0.02
	River	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	3	10	0.01
Marsh/wetland	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	29	0.26	
Total	29	28	12	31	15	15	2	1	0	0	8	8	9	2	11	9	9	69	12	4	30	304	100	

Table 8: User's and producer's accuracy for the South West NRM region 2015 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.976	0.877	0.999	0.998	0.572	1.000
Managed resource protection	0.880	0.739	0.962	0.996	0.400	1.000
Other minimal use	0.634	0.386	0.837	0.698	0.018	0.954
Grazing native vegetation	0.964	0.816	0.999	0.996	0.995	0.998
Production forestry	0.958	0.782	0.999	0.981	0.143	1.000
Cropping	0.958	0.782	0.999	0.922	0.039	0.999
Irrigated cropping	NA	NA	NA	NA	NA	NA
Irrigated cropping - cotton	NA	NA	NA	NA	NA	NA
Irrigated perennial horticulture	NA	NA	NA	NA	NA	NA
Intensive animal husbandry	NA	NA	NA	NA	NA	NA
Manufacturing & industrial	0.825	0.507	0.973	0.085	0.000	0.908
Residential and farm infra.	0.646	0.353	0.880	0.430	0.003	0.976
Services	0.744	0.457	0.935	0.433	0.003	0.934
Utilities	NA	NA	NA	NA	NA	NA
Transport & communication	0.937	0.710	0.998	0.465	0.003	0.982
Mining	0.841	0.561	0.976	0.137	0.001	0.944
Waste treatment and disposal	0.838	0.556	0.974	0.042	0.000	0.818
Lake	0.977	0.921	0.997	0.948	0.336	0.996
Reservoir/dam	0.839	0.560	0.976	0.640	0.006	0.957
River	0.359	0.125	0.648	0.197	0.001	0.964
Marsh/wetland	0.842	0.684	0.943	0.603	0.077	0.893