

Land Use Mapping at Catchment Scale

Principles, Procedures and Definitions



The Bureau of Rural Sciences

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Foreword

Land use information is needed to address a wide range of Australia's natural resources management issues. It is currently being used to help efforts to ameliorate catchment salinity, nutrient and sediment problems, assess agricultural productivity and opportunities for diversification, plan pests and diseases control and plan for emergency responses.

A recently completed national scale data set that gives an overview of land use activities across the continent is being used to help set priorities and allocate resources at the national level. However, most natural resource management problems need to be tackled at a more detailed regional or catchment scale - where the scale of mapping required ranges between 1:25,000 to 1:250,000 depending on land use intensity. Land use mapping of this more detailed kind has been completed or is underway for about 60% of the continent. Plans to complete the national coverage are being developed.

This document, which contains nationally agreed land use mapping principles procedures, has been prepared to assist agencies and organisations involved in the production of land use mapping at regional or catchment scale. It is also a primary reference for the Australian Land Use and Management (ALUM) Classification and its application. Updates will be produced from time to time - the current version is available via the Bureau of Rural Sciences land use mapping web page (see Further information).

National compliance standards for land use data, including the ALUM Classification, will be maintained as part of Australian Spatial Data Infrastructure (ASDI). Additional information about current progress in regional and national land use mapping and agreed mapping specifications is available from Bureau of Rural Sciences, the National Land and Water Resources Audit and partner agencies.

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Financial support for land use mapping undertaken to date and now underway has been provided by the National Land and Water Resources Audit, the Murray-Darling Basin Commission and the Department of Agriculture, Fisheries and Forestry Australia, through the Natural Heritage Trust. Substantial financial contributions have also been made by each of the State agencies collaborating in this work.

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A. Introduction

The Bureau of Rural Sciences (BRS) is working with the National Land and Water Resources Audit (Audit) and other Commonwealth and State agencies to develop a number of land use and land management practice digital data sets for Australia. The Bureau's interests focus on

- ensuring critical catchment scale land use information is available for land management and policy needs
- developing effective mapping tools for land use decision makers
- establishing appropriate land use mapping standards and specifications
- facilitating and coordinating land use mapping across jurisdictions.

A joint Commonwealth-State workshop was held in February 1999 at BRS to consider a land use classification scheme for Australia (Barson 1999). This workshop agreed that a modified version of a land use classification scheme developed by Baxter and Russell in 1994 (Baxter and Russell 1994) for the Murray-Darling Basin Commission (MDBC) would be suitable. It would promote the creation of nationally consistent, although not necessarily uniform, land use datasets, meet a wide range of user needs, and make the best use of existing data and available resources.

This classification scheme, the Australian Land Use and Management (ALUM) Classification, was used in land use mapping for the Audit and Phase 1 of the MDBC's Landmark Project. It was amended in July 2000 on completion of these projects and again in a BRS workshop in October 2000 (BRS 2000) attended by State and Commonwealth agencies that established procedures for an expanded Commonwealth-State mapping program funded by the MDBC and AFFA (through the Natural Heritage Trust).

The purpose of this document is to support the implementation of land use mapping at catchment scales (1:25,000 to 1:250,000 depending on land use intensity) in Australia, particularly collaborative Commonwealth-State land use mapping programs supported by the Audit, MDBC and AFFA. It relates the key concepts and principles that underpin the ALUM Classification, presents the land use classes and definitions that apply to the current version (v4) of the classification, and provides guidance in areas where there may be difficulty associated with class allocation. It also outlines the agreed basis of the mapping procedure, including data and metadata specifications.

B. Key concepts

Because of the general reliance on remotely sensed data (either satellite-based or airborne) for land use mapping, there is often confusion between the terms 'land use' and 'land cover'. The distinction between 'land use' and 'land management practice' is also poorly understood.

Land cover refers to the physical surface of the earth in total, including various combinations of vegetation types, soils, exposed rocks, water bodies as well as anthropogenic elements such as agriculture and built environments. Land cover classes can generally be discriminated by characteristic patterns using remote sensing.

Land use is the land management objective – the purpose to which land is put. Some land uses, such as agriculture, have a characteristic land cover pattern. These generally appear in land cover classifications. Other land uses, such as nature conservation, are not readily discriminated by a characteristic land cover pattern.

Land management practice is the means by which the land management objective is achieved - the 'how' of land use (eg cultivation practices for cropping such as fallow cultivation, minimum tillage and direct drilling). Patterns in land cover can relate to both land management practice and land use, resulting in confusion between the two.

The ALUM Classification framework is based on land use. It is a structure onto which attributes describing commodities or land management practices can be attached. Land management practices information has been identified as a particular need of many users of land use data and is of critical importance in terms of sustainability. BRS is developing other datasets for land management practice information. Water, although a land cover attribute, is also a key part of the classification.

C. Principles

A land use nomenclature and classification scheme entails the ordering of land use or land management in a systematic and logically consistent way. The ALUM Classification has a three-tiered hierarchical structure with primary, secondary and tertiary classes broadly structured in terms of the potential degree of modification and impact on a putative 'natural state' (essentially unmodified native land cover).

Primary and Secondary classes relate to land use - the prime use of the land defined in terms of the management objectives of the land manager. Tertiary classes can include commodity groups, commodities, land management practice, or land cover (eg vegetation) information. The classification is intended to be flexible such that new land uses or management systems can be accommodated as long as there is no conflict with other existing items.

The principles that underpin the ALUM Classification / Baxter-Russell approach include

- **Level of intervention** - The classification is based on identification and delineation of types and levels of intervention in the landscape, rather than descriptions of land use based on outputs. Precedence is also given to the modelling capabilities of data over monitoring capabilities, and monitoring capabilities over descriptive uses.
- **Generality** - The classification is designed to provide for users who are interested in both processes (eg land management practices) and outputs (eg commodities)
- **Hierarchical structure** - A hierarchical structure provides for and promotes aggregation/disaggregation of related land uses, the addition of levels or classes and relevance at a range of scales.
- **Prime use** – Parcels of land may be subject to a number of concurrent land uses. Land use class allocation is generally based on the primary land management objective of the nominated land manager. A multiple use production forest, for example, has as its main management objective the production of timber, although it also may also provide conservation, recreation, grazing and water catchment services. These secondary or ancillary uses can be recorded for mapping purposes.

D. Land use class definitions - ALUM Classification v4

Five primary levels of land use are distinguished in order of generally increasing levels of intervention or potential impact on the natural landscape. Water is also included in the classification as a sixth primary class. The minimum expected level of attribution from land use mapping programs currently coordinated through BRS is indicated in part E ALUM Classification - minimum attribution.

- 1. Conservation and natural environments** - Land used primarily for conservation purposes, based on the maintenance of the essentially natural ecosystems present.
- 2. Production from relatively natural environments** - Land used primarily for primary production based on limited change to the native vegetation.
- 3. Production from dryland agriculture and plantations** - Land used mainly for primary production, based on dryland farming systems.
- 4. Production from irrigated agriculture and plantations** - Land used mostly for primary production based on irrigated farming.
- 5. Intensive uses** - Land subject to extensive modification, generally in association with closer residential settlement, commercial or industrial uses.
- 6. Water** - Water features. Water is regarded as an essential aspect of the classification, but it is primarily a cover type.

(i) CONSERVATION AND NATURAL ENVIRONMENTS

A relatively low level of human intervention, with the anticipated consequence of little change to natural ecosystems. There may be change in the condition of the land in response to natural processes in isolation from any imposed use. The land may be formally reserved by government for conservation purposes, or conserved through other legal or administrative arrangements. Areas may have multiple uses, however nature conservation is the prime use. Some land may be unused as a result of a deliberate decision of the government or landowner, or due to circumstance.

1.1 Nature Conservation Tertiary classes 1.1.1 – 1.1.6 are based on the Collaborative Australian Protected Areas Database (CAPAD) classification.

1.1.1 Strict nature reserve Protected area managed mainly for science. An area of land possessing outstanding or representative ecosystems, geological or physiological features and/or species, which is available primarily for scientific research and/or environmental monitoring.

1.1.2 Wilderness area Protected area managed mainly for wilderness protection. A large area of unmodified or slightly modified land, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

1.1.3 National park Protected area managed mainly for ecosystem conservation and recreation. A natural area of land, designated to: a) protect the ecological integrity of one or more ecosystems for this and future generations; b) exclude exploitation or occupation detrimental to the purposes of designation of the area,

and c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

1.1.4 Natural feature protection Protected area managed for conservation of specific natural features. Area containing one or more specific natural or natural/cultural feature which is of outstanding value because of its inherent rarity, representative or aesthetic qualities or cultural significance.

1.1.5 Habitat/species management area Protected area managed mainly for conservation through management intervention. Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species. This may include areas on private land.

1.1.6 Protected Landscape Protected areas managed mainly for landscape conservation and recreation. Area of land where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, cultural and/or ecological value, and often with high biological diversity.

1.1.7 Other conserved area Land under forms of nature conservation protection that fall outside the scope of the CAPAD classification, including heritage agreements, voluntary conservation arrangements, registered property agreements etc

1.2 Managed resource protection Tertiary classes 1.2.1 – 1.2.4 are based on the CAPAD classification. These areas are managed primarily for the sustainable use of natural ecosystems. This includes areas with largely unmodified natural systems managed primarily to ensure the long-term protection and maintenance of biological diversity, water supply, aquifer or landscape while providing a sustainable flow of natural products and services to meet community needs.

1.2.1 Biodiversity Managed for biodiversity

1.2.2 Surface water supply Managed as a catchment for water supply

1.2.3 Groundwater Managed for groundwater

1.2.4 Landscape Managed for landscape integrity

1.2.5 Traditional indigenous uses Management primarily for traditional indigenous use

1.3 Other minimal use Areas of land that are largely unused (in the context of the prime use) but may have ancillary uses. This may be the result of a deliberate decision by the manager or the result of circumstances. The land may be available for use but for various reasons remains 'unused'.

1.3.1 Defence Natural areas allocated to field training, weapon testing and other field defence uses.

1.3.2 Stock route Stock reserves under intermittent use or unused.

1.3.3 Remnant native cover Land under native cover, either primarily unused or used for non-production purposes eg to conserve native vegetation and wildlife or for natural resources protection.

1.3.4 Rehabilitation Land under rehabilitation or unused because of weed infestation, salinisation, scalding and similar hazards.

(ii) PRODUCTION FROM RELATIVELY NATURAL ENVIRONMENTS

Land generally subject to relatively low levels of intervention. The land may not be used more intensively owing to its limited capability. The structure of the native vegetation generally remains intact despite deliberate use, although the floristics of the vegetation may have changed markedly. Where the native vegetation structure is, for example, open woodland or grassland, the land may be grazed. Where the native grasses have been deliberately and extensively replaced with improved species, the use should be treated under 3. Primary production from dryland agriculture and plantations. Where multiple uses apply, the prime use should be used in assigning areas to an appropriate land use class.

2.1 Livestock grazing Land uses based on grazing by domestic stock on native vegetation with limited or no attempt at pasture modification. Some change in species composition will have occurred but the structure of the native vegetation type will be essentially intact. Tertiary classes provide an opportunity to link the ALUM Classification with the native vegetation classes of the National Vegetation Information System (NVIS). The classification suggested at this level in the land use hierarchy is based on the structural formation of the dominant native vegetation (NVIS level II), simplified as shown below. NVIS definitions apply.

2.1.1 Forest

2.1.2 Woodland

2.1.3 Open woodland

2.1.4 Shrubland

2.1.5 Grassland

2.1.6 Other

2.2 Production Forestry Commercial wood production from native forests and related activities on public and private land. Multiple uses may apply such as sawlog and pulp production, as well as non-forest activities such as recreation and agriculture. Tertiary classes provide an opportunity to link the ALUM Classification with National Forest Inventory (NFI) forest types. The classification suggested at this level in the land use hierarchy is based on NFI forest type, as shown below. NFI definitions apply.

2.2.1 Rainforest Crown canopy cover > 80%

2.2.2 Tall eucalypt forest Eucalypt forest > 30m

2.2.3 Medium eucalypt forest Eucalypt forest 10-30m

2.2.4 Callitris forest Callitris dominates overstorey

2.2.5 Acacia forest Acacia dominates overstorey

(iii) PRODUCTION FROM DRYLAND AGRICULTURE AND PLANTATIONS

Land in this class is used primarily for primary production, based on dryland farming systems. Native vegetation has largely been replaced by introduced species through clearing, the sowing of new species, the application of fertilisers or the dominance of volunteer species. The range of activities in this category includes plantation forestry, pasture production for stock, cropping and fodder production, and a wide range of horticultural production.

3.1 Plantation forestry Land on which plantations of trees or shrubs has been established to provide forest products. Suggested Tertiary classes are

- 3.1.1 Hardwood plantation**
- 3.1.2 Softwood plantation**
- 3.1.3 Plantation forest nurseries**

3.2 Farm forestry planted trees, usually grown in conjunction with pasture, fodder or crop production. Farm forestry is often multi-purpose, including natural resources management and protection. The National Farm Forestry Inventory has suggested the following Tertiary classes.

- 3.2.1 Woodlots** Areas established primarily for the production of firewood or posts or for natural resources protection
- 3.2.2 Windbreaks** Areas established primarily for shade or shelter purposes
- 3.2.3 Production of trees and crops** A range of pasture, crop and tree combinations, with the growing of trees having primacy

3.3 Grazing modified pastures Pasture and forage production, both annual and perennial, based on a significant degree of modification or replacement of the initial native vegetation. Land under pasture at the time of mapping may be in a rotation system so that at another time the same area may be, for example, under cropping. Land in a rotation system should be classed according to the land use at the time of mapping. Suggested Tertiary classes for legume and grass pasture types can be fitted to the pasture attributes collected through the ABS Agricultural Census.

- 3.3.1 Native/exotic pasture mosaic** Pastures in which there is a substantial native species component despite extensive modification or replacement of native vegetation. This class may apply where native and exotic pasture is patterned at a relatively fine spatial scale.
- 3.3.2 Woody fodder plants** Woody plants used primarily for the purpose of providing forage for livestock grazing. Examples include Tagastaste and Leucaena.
- 3.3.3 Legumes**
- 3.3.4 Legume/grass mixtures**
- 3.3.5 Sown grasses**

3.4 Cropping Land under cropping. Land under cropping at the time of mapping may be in a rotation system so that at another time the same area may be, for example, under pasture. Land in a rotation system should be classed according to the land use at the time of mapping. They can vary markedly over relatively short distances in response to change in the nature of the land and the preferences of the land manager. They may also change over time in response to market conditions. Fodder production, such as lucerne hay, is treated as a crop - there is no harvesting by stock involved. At the Tertiary level it is suggested that classes be based on commodities / commodity groups that relate to ABS level 2 agricultural commodity categories (See part K ABS agricultural commodity levels).

- 3.4.1 Cereals**
- 3.4.2 Beverage & spice crops**
- 3.4.3 Hay & silage**
- 3.4.4 Oil seeds & oleaginous fruit**

- 3.4.5 Sugar**
- 3.4.6 Cotton**
- 3.4.7 Tobacco**
- 3.4.8 Legumes**

3.5 Perennial horticulture Crop plants living for more than two years that are intensively cultivated, usually involving a relatively high degree of nutrient, weed and moisture control. Suggested Tertiary classes are based on the ABS commodities Level 2 categories that relate to horticulture (See part K ABS agricultural commodity levels).

- 3.5.1 Tree fruits**
- 3.5.2 Oleaginous fruits**
- 3.5.3 Tree nuts**
- 3.5.4 Vine fruits**
- 3.5.5 Shrub nuts fruits & berries**
- 3.5.6 Flowers & bulbs**
- 3.5.7 Vegetables & herbs**

3.6 Seasonal horticulture Crop plants living for less than two years that are intensively cultivated, usually involving a relatively high degree of nutrient, weed and moisture control. Suggested Tertiary classes are based on the ABS commodities Level 2 agricultural commodity categories that relate to horticulture (See part K ABS agricultural commodity levels).

- 3.6.1 Fruits**
- 3.6.2 Nuts**
- 3.6.3 Flowers & bulbs**
- 3.6.4 Vegetables & herbs**

(iv) PRODUCTION FROM IRRIGATED AGRICULTURE AND PLANTATIONS

Agricultural land uses that depend on irrigation. This includes land uses that receive only one or two irrigations per year, through to those uses that rely on irrigation for much of the growing season. This class includes agricultural land uses where water is applied to promote additional growth over normally dry periods, depending on the season, water availability and commodity prices. Baxter and Russell (1994) argue that the degree of intervention involved in irrigation and its potential impacts on hydrology and geohydrology are sufficient to warrant creation of this primary class.

4.1 Irrigated plantation forestry Land on which irrigated plantations of trees or shrubs has been established to provide forest products.

- 4.1.1 Irrigated hardwood plantation**
- 4.1.2 Irrigated softwood plantation**
- 4.1.3 Irrigated plantation forest nurseries**

4.2 Irrigated farm forestry Irrigated trees usually growing in conjunction with pasture, fodder or crop production.

- 4.2.1 Irrigated woodlots** Areas established primarily for the production of firewood or posts
- 4.2.2 Irrigated windbreaks**

4.2.3 Irrigated production of trees and crops A range of pasture, crop and tree combinations, involving irrigation, with the production of trees having primacy.

4.3 Irrigated modified pastures Irrigated pasture production, both annual and perennial, based on a significant degree of modification or replacement of the initial native vegetation. This class may include land in a rotation system that at other times may be under cropping. Land in a rotation system should be classed according to the land use at the time of mapping. Cropping/pasture rotation regimes are treated as land management practice.

4.3.1 Irrigated woody fodder plants Irrigated woody plants used primarily for the purpose of providing forage for livestock grazing.

4.3.2 Irrigated legumes

4.3.3 Irrigated legume/grass mixtures

4.3.4 Irrigated sown grasses

4.4 Irrigated cropping Land under irrigated cropping. This class may include land in a rotation system that at other times may be under pasture. Land in a rotation system should be classed according to the land use at the time of mapping. Cropping/pasture rotation regimes are treated as land management practice.

4.4.1 Irrigated cereals

4.4.2 Irrigated beverage & spice crops

4.4.3 Irrigated hay & silage

4.4.4 Irrigated oil seeds & oleaginous fruit

4.4.5 Irrigated sugar

4.4.6 Irrigated cotton

4.4.7 Irrigated tobacco

4.4.8 Irrigated legumes

4.5 Irrigated perennial horticulture Irrigated crop plants living for more than two years that are intensively cultivated, usually involving a relatively high degree of nutrient, weed and moisture control.

4.5.1 Irrigated tree fruits

4.5.2 Irrigated oleaginous fruits

4.5.3 Irrigated tree nuts

4.5.4 Irrigated vine fruits

4.5.5 Irrigated shrub nuts fruits & berries

4.5.6 Irrigated flowers & bulbs

4.5.7 Irrigated vegetables & herbs

4.6 Irrigated seasonal horticulture Irrigated crop plants living for less than two years that are intensively cultivated, usually involving a relatively high degree of nutrient, weed and moisture control.

4.6.1 Irrigated fruits

4.6.2 Irrigated nuts

4.6.3 Irrigated flowers & bulbs

4.6.4 Irrigated vegetables & herbs

(v) INTENSIVE USES

Land uses involving high levels of interference with natural processes, generally in association with closer settlement. The level of intervention may be sufficiently high as to completely remodel the natural landscape — the vegetation, surface and groundwater systems and the land surface.

5.1 Intensive horticulture Intensive forms of plant production.

5.1.1 Shadehouses

5.1.2 Glasshouses

5.1.3 Glasshouses (hydroponic)

5.2 Intensive animal production Intensive forms of animal production. Agricultural production facilities such as feedlots, piggeries etc may be included as Tertiary classes.

5.2.1 Dairy

5.2.2 Cattle

5.2.3 Sheep

5.2.4 Poultry

5.2.5 Pigs

5.3 Manufacturing and industrial Factories, workshops, foundries, construction sites etc. The processing of primary produce eg sawmills, pulp mills, abattoirs, etc is included in this class.

5.4 Residential

5.4.1 Urban residential houses, flats, hotels, etc

5.4.2 Rural residential Characterised by agriculture in a peri-urban setting, where agriculture does not provide the primary source of income.

5.5 Services

5.5.1 Commercial services Shops, markets, financial services, etc

5.5.2 Public services Education, community services, etc

5.5.3 Recreation and culture Parks, sports grounds, camping grounds, swimming pools, museums, places of worship, etc

5.5.4 Defence facilities Defence research and development establishments, testing areas, firing ranges, etc. Defence lands of significant area, retaining natural cover should be allocated to 1.3.1

5.5.5 Research facilities government and non-government research and development areas

5.6 Utilities

5.6.1 Electricity generation/transmission Coal-fired, gas-fired, solar-powered, wind-powered or hydroelectric power stations, sub-stations, powerlines, etc

5.6.2 Gas treatment, storage and transmission Facilities associated with the gas production and supply

5.7 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 radar stations, beacons, etc

5.8 Mining

5.8.1 Mines

5.8.2 Quarries

5.8.3 Tailings Tailings areas and other previously mined areas under rehabilitation are included in 1.3.4

5.9 Waste treatment and disposal Waste material and disposal facilities associated with industrial, urban and agricultural activities.

5.9.1 Stormwater

5.9.2 Landfill Disposal of solid inert wastes (but not including over-burden)

5.9.3 Solid garbage Disposal of putrescible wastes including waste from processing plants

5.9.4 Incinerators

5.9.5 Sewage

(vi) WATER

Water features are regarded as essential to the classification because of their importance for natural resources management and as points of reference in the landscape. The inclusion of water is, however, complicated as its normally classified as a land cover type. At the secondary level the classification identifies water features, both natural and artificial. Tertiary classes relate water features to intensity of use.

6.1 Lake

6.1.1 Lake - conservation Feature associated with uses included in 1. Conservation and Natural Environments.

6.1.2 Lake - production Feature associated with uses included in 2. Production from Relatively Natural Environments.

6.1.3 Lake - intensive use Feature associated with uses included in 5. Intensive Uses, including aquaculture.

6.2 Reservoir

6.2.1 Water storage and treatment

6.2.2 Reservoir - intensive use Feature associated with uses in 5. Intensive Uses, including aquaculture.

6.2.3 Evaporation basin Disposal of irrigation drainage waters.

6.2.4 Effluent pond

6.3 River

6.3.1 River - conservation Feature associated with uses in 1. Conservation and Natural Environments.

6.3.2 River - production Feature associated with uses in 2. Production from Relatively Natural Environments.

6.3.3 River - intensive use Feature associated with uses in 5. Intensive Uses, including aquaculture.

6.4 Channel/aqueduct

6.4.1 Supply channel/aqueduct

6.4.2 Drainage channel/aqueduct

6.5 Marsh/wetland

6.5.1, Marsh/wetland - conservation Feature associated with uses in 1. Conservation and Natural Environments.

6.5.2, Marsh/wetland - production Feature associated with uses in 2. Production from Relatively Natural Environments.

6.5.3, Marsh/wetland - intensive use Feature associated with uses in 5. Intensive Uses, including aquaculture.

6.6 Estuary/coastal waters

6.6.1 Estuary/coastal waters - conservation Feature associated with uses in 1. Conservation and Natural Environments.

6.6.2 Estuary/coastal waters - production Feature associated with uses in 2. Production from Relatively Natural Environments.

6.6.3 Estuary/coastal waters - intensive use Feature associated with uses in 5. Intensive Uses, including aquaculture.

E. ALUM Classification - minimum attribution

The minimum level of attribution expected from land use mapping programs currently coordinated through BRS using the ALUM Classification (v4) is indicated below.

 Minimum expected level of attribution

I Conservation and Natural Environments	
1.1	Nature conservatio
	<ul style="list-style-type: none"> 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	Managed resource protection
	<ul style="list-style-type: none"> 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	Other minimal use
	<ul style="list-style-type: none"> 1.3.1 Defence 1.3.2 Stock route 1.3.3 Remnant native cover 1.3.4 Rehabilitation
2 Production from Relatively Natural Environments	
2.1	Livestock grazing
2.2	Production forestry
3 Production from Dryland Agriculture and Plantations	
3.1	Plantation forestry
	<ul style="list-style-type: none"> 3.1.1 Hardwood plantation 3.1.2 Softwood plantation 3.1.3 Plantation forest nurseries
3.2	Farm forestry
	<ul style="list-style-type: none"> 3.2.1 Woodlots 3.2.2 Windbreaks 3.2.3 Tree and crop production
3.3	Grazing modified pastures
	<ul style="list-style-type: none"> 3.3.1 Native/exotic pasture mosaic 3.3.2 Woody fodder plants 3.3.3 Legumes 3.3.4 Legume/grass mixtures 3.3.5 Sown grasses
3.4	Cropping
	<ul style="list-style-type: none"> 3.4.1 Cereals 3.4.2 Beverage & spice crops 3.4.3 Hay & silage 3.4.4 Oil seeds & oleaginous fruit 3.4.5 Sugar 3.4.6 Cotton 3.4.7 Tobacco 3.4.8 Legumes

3 Production from Dryland Agriculture and Plantations (cont...)

- 3.5 Perennial horticulture
 - 3.5.1 Tree fruits
 - 3.5.2 Oleaginous fruits
 - 3.5.3 Tree nuts
 - 3.5.4 Vine fruits
 - 3.5.5 Shrub nuts fruits & berries
 - 3.5.6 Flowers & bulbs
 - 3.5.7 Vegetables & herbs
- 3.6 Seasonal horticulture
 - 3.6.1 Fruits
 - 3.6.2 Nuts
 - 3.6.3 Flowers & bulbs
 - 3.6.4 Vegetables & herbs

4 Production from Irrigated Agriculture and Plantations

- 4.1 Irrigated plantation forestry
 - 4.1.1 Irrigated hardwood plantation
 - 4.1.2 Irrigated softwood plantation
 - 4.1.3 Irrigated plantation nurseries
- 4.2 Irrigated farm forestry
 - 4.2.1 Irrigated woodlots
 - 4.2.2 Irrigated windbreaks
 - 4.2.3 Irrigated tree and crop production
- 4.3 Irrigated modified pastures
 - 4.3.1 Irrigated woody fodder plants
 - 4.3.2 Irrigated pasture legumes
 - 4.3.3 Irrigated legume/grass mixtures
 - 4.3.4 Irrigated sown grasses
- 4.4 Irrigated cropping
 - 4.4.1 Irrigated cereals
 - 4.4.2 Irrigated beverage & spice crops
 - 4.4.3 Irrigated hay & silage
 - 4.4.4 Irrigated oil seeds & oleaginous fruit
 - 4.4.5 Irrigated sugar
 - 4.4.6 Irrigated cotton
 - 4.4.7 Irrigated tobacco
 - 4.4.8 Irrigated legumes
- 4.5 Irrigated perennial horticulture
 - 4.5.1 Irrigated tree fruits
 - 4.5.2 Irrigated oleaginous fruits
 - 4.5.3 Irrigated tree nuts
 - 4.5.4 Irrigated vine fruits
 - 4.5.5 Irrigated shrub nuts fruits & berries
 - 4.5.6 Irrigated flowers & bulbs
 - 4.5.7 Irrigated vegetables & herbs
- 4.6 Irrigated seasonal horticulture
 - 4.6.1 Irrigated fruits
 - 4.6.2 Irrigated nuts
 - 4.6.3 Irrigated flowers & bulbs
 - 4.6.4 Irrigated vegetables & herbs

5 Intensive Uses

5.1	Intensive horticulture	5.1.1	Shadehouses
		5.1.2	Glasshouses
		5.1.3	Glasshouses (hydroponic)
5.2	Intensive animal production	5.2.1	Dairy
		5.2.2	Cattle
		5.2.3	Sheep
		5.2.4	Poultry
		5.2.5	Pigs
5.3	Manufacturing and industrial		
5.4	Residential	5.4.1	Urban residential
		5.4.2	Rural residential
5.5	Services	5.5.1	Commercial services
		5.5.2	Public services
		5.5.3	Recreation and culture
		5.5.4	Defence facilities
		5.5.5	Research facilities
5.6	Utilities	5.6.1	Electricity generation/transmission
		5.6.2	Gas treatment, storage and transmission
5.7	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	Mining	5.8.1	Mines
		5.8.2	Quarries
		5.8.3	Tailings
5.9	Waste treatment and disposal	5.9.1	Stormwater
		5.9.2	Landfill
		5.9.3	Solid garbage
		5.9.4	Incinerators
		5.9.5	Sewage

6 Water

6.1	Lake	6.1.1	Lake - conservation
		6.1.2	Lake - production
		6.1.3	Lake - intensive use
6.2	Reservoir	6.2.1	Water storage and treatment
		6.2.2	Reservoir - intensive use
		6.2.3	Evaporation basin
		6.2.4	Effluent pond
6.3	River	6.3.1	River - conservation
		6.3.2	River - production
		6.3.3	River - intensive use
6.4	Channel/aqueduct	6.4.1	Supply channel/aqueduct
		6.4.2	Drainage channel/aqueduct
6.5	Marsh/wetland	6.5.1	Marsh/wetland - conservation
		6.5.2	Marsh/wetland - production
		6.5.3	Marsh/wetland - intensive use
6.6	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

F. Land use class allocation - special cases and problems

It is inevitable that there will be areas of uncertainty in the operational application of the ALUM Classification. It may be unclear, for instance, which land use class applies to a particular activity - or an appropriate class may not be available. Alternatively, it may not be possible to confidently determine what land is being used for on the basis of available data or from field observations.

The purpose of this section is to identify currently known areas of uncertainty associated with the ALUM Classification and to provide advice as to how this uncertainty may be handled. In most cases suggestions are developed from the experience gained in State and Commonwealth land use mapping programs that have used versions of the classification. These suggestions provide a common basis for handling areas of uncertainty, and for promoting consistency and comparability between different mapping programs.

The list of class allocation issues presented here is not exhaustive - additional issues will be identified as mapping work expands into new regions with previously unmapped land uses. Descriptions of new issues, including suggestions as to their resolution, should be forwarded to BRS for inclusion in a future edition of this document (see **Further information**, p40). The issues and advice presented here will be considered in future reviews of the ALUM Classification.

(i) GENERAL ISSUES

Hierarchical ordering

Where a particular land use cannot be allocated to a land use class at given level in the classification due to ambiguity (eg several classes could apply at a particular level in the classification hierarchy) it should be allocated to the more generalised class at a higher level of the hierarchy. If the problem is the absence of an appropriate class at a particular level of the classification hierarchy, then for the purposes of the project, a new class at that level in the hierarchy may be created.

Prime use

When a number of uses apply to a particular parcel of land, class allocation should be made on the basis of the primary management objective of the land manager. This means, for example, if there is a developed residential area within a national park, this town area would be classed as 5.4.1 'Urban residential' because the prime use of this area is urban/residential, not nature conservation. Baxter and Russell state that while the principle of prime use should ideally identify the land use with the greatest potential impact on the land, this could lead to difficulties with inconsistency in the classification. In most cases there will be no difference in outcome using either approach. Information about important secondary (ancillary) land uses may be recorded as a part of the land use mapping process.

Temporal change

The temporal frequency of land use change in human-dominated landscapes varies considerably. Some land uses may be relatively stable, remaining in place over decades or more. In other cases, land use turnover may be extremely rapid - this particularly applies where land use change is geared to seasonal or annual cycles, for example pasture/crop rotations. Where rapid turnover occurs, the temporal mis-match between source data and field verification poses difficulties. The agreed principle applying to current land use mapping work is to assign land use classes to land parcels at a particular point in time. This means, in the case of crop/pasture rotations, that the assigned land use will be either a modified pasture class (3.3) or a cropping class (3.4). The particular rotation regime (which may be of critical importance in natural resource management terms) is a separate land management practice attribution issue.

Source information

More than one source of information may be available for assigning land use to a particular parcel of land. This information may be conflicting. Generally, the technical specifications and other metadata will indicate which information source should take precedence. However, if this is not self-evident then, as a general principle, the order of reliance should be 1) field observation, 2) expert knowledge (eg agriculture extension officer), 3) ancillary data, and 4) evidence from the adjoining/local areas.

Attaching additional information

A wide range of additional land information - particularly information about land cover and land management practices - can enhance the interpretation of land use. Indeed land management practices information (the 'how' of land use) is critical for addressing sustainability and other natural resource management issues. Important ancillary information of this kind may be attached to the land use classification framework as supplementary attributes.

(ii) CLASS RELATED ISSUES

1.3.3 Remnant native cover

All land uses involving conservation of, or production from, relatively natural environments retain native cover to a greater or lesser extent. However, the 'Remnant native cover', class is only appropriate where there is no applicable prime use, or where land use is indeterminate. Livestock may, for instance, occasionally graze 'Remnant native cover' but where grazing takes place on a regular or semi-regular basis and this is the intended prime use for the land then 2.1 (or 3.3.1) is the appropriate class. This class also includes unusable land, such as cliffs, rock faces, boulders, tors.

2.1 Livestock grazing (Production from Relatively Natural Environments)

Difficulties may be encountered distinguishing livestock grazing on relatively natural environments from grazing on modified pastures. Some pastures, for example, can be dominated either by native species or exotics depending upon the season. Generally, where an exotic or native pasture component has been deliberately introduced or actively promoted, 3.3.1 'Native/exotic pasture mosaic' is most appropriate class. If

native pasture is irrigated, it should be allocated to class 4.3. 'Irrigated modified pastures'.

4. Production from Irrigated Agriculture and Plantations

Land which is developed for irrigation may not always be actively irrigated due to seasonal or market conditions. In these circumstances, land may be left unused or put to alternative uses such as livestock grazing on pasture. Notwithstanding the general principle that land use classes be determined on the basis of use at a particular point in time, it is suggested that areas should be assigned to irrigation if permanent infrastructure for irrigation is present.

5.4.2 Rural residential

If rural land is managed as a hobby farm, it should be allocated as rural residential - if not, it should be assigned to another use. The size of rural allotments or local government zoning plans may be useful indicators of rural residential land use.

(iii) OTHER ISSUES

Cemeteries and crematoria

Assign to 5.5.2 'Public services'.

Eucalyptus oil plantations

Assign to 3.5 'Perennial horticulture' or 4.5 'Irrigated perennial horticulture' where trees are more intensively managed (eg coppiced and therefore in a shrub form); otherwise assign to 3.1.1 'Hardwood plantation' or 4.1.1 'Irrigated hardwood plantation'

Fallow/ploughed land

Rely on context in assigning fallow or ploughed land to a particular land use – make a judgement of the most likely land use option based on the dominant activity conducted in comparable nearby areas.

Recreation areas

Assign to 1.1.7 'Other conserved area' if primarily native cover. If primarily cleared of native vegetation, then assign to 5.5.3 'Recreation and culture'.

Tea plantations; Tea-tree plantations

Assign to 3.5 'Perennial horticulture' or 4.5 'Irrigated perennial horticulture'.

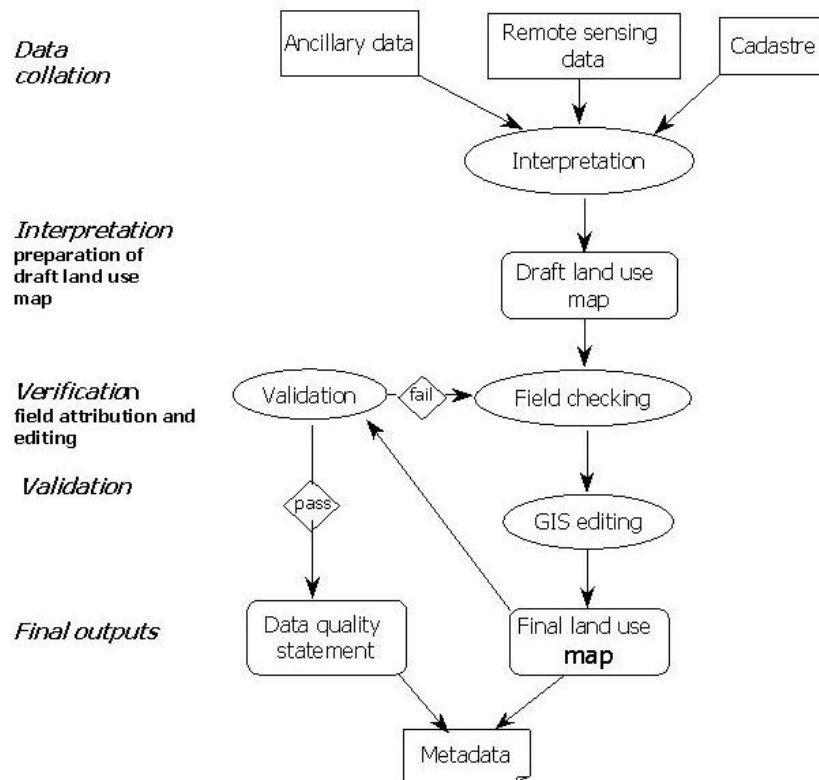
Tourist developments

Assign to 5.5.3 'Recreation and culture'.

Turf farming

Assign to either 3.5 'Perennial horticulture' or 4.5 'Irrigated perennial horticulture'

G. Land use mapping procedure



(i) DATA COLLATION

1. Acquire cadastral boundaries.
2. Acquire appropriate remotely sensed data (AP air photos, TM thematic mapper, ETM enhanced TM).
3. Acquire ancillary data.
4. Collate data in ARC/INFO GIS, check projection and adjust if necessary. Since remotely sensed data is in UTM, it is probably better to capture the GIS data in AMG and convert it to Geographic for the final outputs.
5. Create a list of mapsheets for project and assign progress code and date:

Mapsheet number, name, progress date:
Study area:

Code	Description	Date	Action
1	Data collation complete		Amend code and notify BRS.
2	Interpretation complete (prodn of draft land use maps)		Amend code and notify BRS.
3	Field verification complete		Amend code and notify BRS.
4	GIS edits complete		Amend code and notify BRS.
5	Validation complete		Amend code and notify, submit error matrix to BRS.
6	Project outputs for checking		Amend code and notify, submit data to

Code	Description	Date	Action
			BRS, revise to standards
7	Outputs accepted by BRS		Amend code

(ii) INTERPRETATION

6. Interpret data into appropriate land use classes and create land use mask data set with land use code attribute. Open lu_code.lut and enter your land use code against the appropriate description.
7. Enter interpreted data details into metadata table.
8. Check extent of interpreted classes against remotely sensed data.
9. Set tolerances for new features:

	Fuzzy tolerance (m)	Snap distance (m)	Weed (m)	Grain (m)
1:25,000	1.270	12.7	12.7	12.7
1:50,000	2.540	25.4	25.4	25.4
1:100,000	5.080	50.8	50.8	50.8
1:250,000	12.700	127.0	127.0	127.0

10. Capture new features, assigning them land use codes and update lu_code accordingly.
11. Clean and build draft land use data. Amend progress table and e-mail to BRS.

(iii) VERIFICATION

12. Plan field mapping. Contact the appropriate extension officers and organise a meeting as a first pass of field attribution. Overlay roads and plan data collection routes.
13. Create field maps. Plot two sets of field maps; land use with cadastral boundaries and remotely sensed data with cadastral boundaries. The field maps should be at a finer scale (eg for 1:25,000 mapping, use 1:15,000 field maps) and A3 in size. Create and print a look-up table with all land use codes for reference. Print out field manual from Land Use Web site.
14. Meet extension officers and carry out annotate land use maps using their knowledge. Re-plan route for field data collection.
15. Label polygons with appropriate codes and annotate polygons for additional edits or deleting. Capture commodities and land management practices, if you can. Use field manual for classification and if you can't recognise a land use, annotate the map and take a photo of it.

16.If attributing directly into ArcView with Blue Marble Geographic Tracker, connected to a GPS, use field maps as a back-up.

17.Amend progress table and e-mail to BRS.

(iv) GIS EDITING

18.Check all the features are correctly labelled and any problems are sorted out prior to final edits. Update lu_code.lut and metadata document.

19.Clean and build data and project into:

*Projection geographic
Units dd
Datum GDA94
Spheroid GRS1980*

20.Create data structure.

Attribute	Format	Description	Example
Lu_code	C 8 8	Land use code (LUC_V4.dbf)	4.6.1
Lu_description	C 36 36	Description of land use	Irrigated fruits
Source_scale	C 8 8	Scale of source data	1:100,000
Source_date	D 8 10	Date of spatial feature eg image date, air photo date, ancillary data date	xx/xx/xxxx
Reliability	B 4 5	Reliability of attribute	1 = field mapping/local knowledge 2 = ancillary dataset 3 = air photo 4 = SPOT imagery 5 = Landsat ETM/TM 6 = other
Luc_date	D 8 10	Date of land use code	xx/xx/xxxx
xxxxxx	xxxxx	Other attributes as required	

21.Build data and prepare it for validation. Complete metadata statement.
Amend progress table and submit to BRS.

(v) VALIDATION

22.Carry out frequency analysis of mapsheet by land use code.

23.Buffer roads to 300m, clip land use to this (Clipped land use) and carry out frequency analysis.

24. Plan route selecting sufficient points. Try to rationalise travelling. Output points to GPS or map.
25. Independent observer should attribute field maps within 2 weeks of receiving it.
26. Construct error matrix eg:

Classified data	3.4.1	4.6.2	5.1.1.	2.3.0	Row total	Row %
3.4.1	10	1	2	0	13	76.92
4.6.2	1	7	1	0	9	77.77
5.1.1	1	0	3	0	4	75.00
2.3.0	1	0	0	21	22	95.45
Column total	13	8	6	21	48	
Column %	76.92	87.50	50.00	100.00		

$$\text{overall accuracy} = (10+7+3+21)/48 = 85.42\%$$

27. Overall accuracy greater than 80% meets the specification If map fails, check which land uses cause the failure and re-map them. Carry out validation procedure again.
28. Supply BRS with frequency analyses of map sheet and clipped land use, map of sample points and error matrix. DO NOT UPDATE LAND USE MAP WITH VALIDATION RESULTS.

(vi) FINAL OUTPUTS

29. Send BRS mapsheet data set as Arc/Info export or TAR file onto BRS FTP site (<ftp.brs.gov.au/incoming/1LW1>) and e-mail BRS. Complete metadata and send as accompanying Text file.
30. BRS will carry out a data quality assessment and send to the State agencies for corrections.
31. Complete final edits as per data quality statement. Complete metadata. BRS will carry out a final check and notify State agencies of data set acceptance.

H. Data specifications

Final data format	Arc/Info polygon and raster coverage			
Coordinate system	Geographic with GDA94 datum Spheroid GRS1980 Projection geographic Units dd Datum GDA94			
Data processing	no greater than original pixel size			
Maximum scale	1:100,000			
Vector tolerances	<i>Fuzzy tolerance (m)</i>	<i>Snap distance (m)</i>	<i>Weed (m)</i>	<i>Grain (m)</i>
At 1:100,000 scale:	5.080	50.8	50.8	50.8
At 1:50,000 scale:	2.540	25.4	25.4	25.4
At 1:25,000 scale:	1.270	12.7	12.7	12.7
Output extent	extent of mapsheets covering project area plus 1 km on all sides for edge-matching			
Positional accuracy	Image rectification at 0.5 pixel root mean square, absolute image displacement at 4 pixels			
Attribute accuracy	>80% accuracy			

Data structure

Attribute	Format	Description	Example
Lu_code	C 8 8	Land use code (LUC_V4.dbf)	4.6.1
Lu_description	C 36 36	Description of land use	Irrigated fruits
Source_scale	C 8 8	Scale of source data	1:100,000
Source_date	D 8 10	Date of spatial feature eg image date, air photo date, ancillary data date	xx/xx/xxxx
Reliability	B 4 5	Reliability of attribute	1 = field mapping/local knowledge 2 = ancillary dataset 3 = air photo 4 = SPOT imagery 5 = Landsat ETM/TM 6 = other
Luc_date	D 8 10	Date of land use code	xx/xx/xxxx
xxxxxx	xxxxx	Other attributes as required	

I. Metadata specifications (after ANZLIC metadata standards)

Metadata is a structured summary of information that describes the data. Metadata includes, but is not restricted to, characteristics such as the content, quality, currency, access and availability of the data. The following specifications derive from the ANZLIC set of core metadata elements (version 2, February 2001). Further details are available at the ANZLIC web page: www.anzlic.org.au/asdi/metaelem.htm

Category	Element	Definition of Element	Obln	Max Occ	Field
Dataset	Title	The ordinary name of the dataset.	M	1	Text(160)
Custodian	Custodian	The business name of the custodial organisation or responsible party associated with the dataset.	M	1	Text(120)
	Jurisdiction	The state or country in which the Custodian of the dataset is domiciled.	M	1	Text(30)
Description	Abstract	A brief narrative summary of the content of the dataset.	M	1	Text(2000)
	Search Word	Words likely to be used by a non-expert to find the dataset.	M	N	Text(60)
	Geographic Extent Name	The ordinary name of one or more pre-defined, known geographic objects that reasonably show the extent of geographic coverage of the dataset. This element is usually implemented as three discrete elements as listed below	O	N	
	GEN Category	Category to which the Geographic Extent Name belongs including map series, local government area, and drainage divisions and major river basins.	C	1 ¹	Text(80)
	GEN Custodial Jurisdiction	Country, state or territory that is responsible for maintaining the detail of the geographic object	C	1 ¹	Text(30)
	GEN Name	Name of the geographic object.	C	1 ¹	Text(80)
	Geographic Extent Polygon	Boundary enclosing the dataset expressed as a closed set of geographic coordinates (latitude, longitude) of the polygon referenced to GDA94. This is an alternate way of describing geographic extent of the dataset if no pre-defined area is satisfactory.	O	N	Text(1000)
	Geographic Bounding Box	A rectangle defining the minimum and maximum coordinates of the entire data. This element is implemented as four discrete elements as listed below.	M	1	
	North Bounding Latitude	Northern-most coordinate of the limit of the dataset expressed in latitude, in decimal degrees.	M	1	Signed Real Number
	South Bounding Latitude	Southern-most coordinate of the limit of the dataset expressed in latitude, in decimal degrees.	M	1	Signed Real Number
	East Bounding Longitude	Eastern-most coordinate of the limit of the dataset expressed in longitude, in decimal degrees	M	1	Signed Real Number
	West Bounding Longitude	Western-most coordinate of the limit of the dataset expressed in longitude, in decimal degrees.	M	1	Signed Real Number
Data Currency	Beginning date	Earliest date at which the phenomena in the dataset actually occurred.	M	1	Text(10)
	Ending date	Latest date at which the phenomena in the dataset actually occurred.	M	1	Text(10)
Dataset Status	Progress	The status of the process of creation of the dataset.	M	1	Text(20)

Category	Element	Definition of Element	Obln	Max Occ	Field
	Maintenance and Update Frequency	Frequency of changes or additions that are made to the dataset after its initial completion.	M	1	Text(20)
Access	Stored Data Format	The format in which the dataset is stored by the custodian.	M	1	Text(500)
	Available Format Type	The format in which the dataset is available.	O	N	Text(240)
	Access Constraint	Any restrictions or legal prerequisites that may apply to the access and use of the dataset including licensing, liability and copyright.	M	1	Text(500)
Data Quality	Lineage	A brief history of the source and processing steps used to produce the dataset.	M	1	Text(4000)
	Positional Accuracy	A brief assessment of the closeness of the location of spatial objects in the dataset in relation to their true position on the Earth.	M	1	Text(4000)
	Attribute Accuracy	A brief assessment of the reliability assigned to features in the dataset in relation to their real world values.	M	1	Text(4000)
	Logical Consistency	A brief assessment of the degree of adherence of logical rules of data structure, attribution and relationships. Data structure can be conceptual, logical or physical.	M	1	Text(4000)
	Completeness	A brief assessment of the extent and range in regard to completeness of coverage, completeness of classification and completeness of verification.	M	1	Text(4000)
Contact Information	Contact Organisation	Name of the organisation from which the dataset may be obtained.	M	1 ²	Text(120)
	Contact Position	The position in the Contact Organisation that will answer questions about the dataset.	M	1 ²	Text(40)
	Mail Address	Postal address or delivery point of the Contact Position.	M	2 ²	Text(40)
	Locality	Locality associated with the Mail Address.	M	1 ²	Text(60)
	State	State associated with the Mail Address	M	1 ²	Text(40)
	Country	Country associated with the Mail Address.	M	1 ²	Text(40)
	Postcode	Postcode associated the Mail Address.	M	1 ²	Text(10)
	Telephone	Telephone number of the Contact Position.	O	1 ²	Text(25)
	Facsimile	Facsimile number of the Contact Position.	O	1 ²	Text(25)
	Electronic Mail Address	Electronic Mail Address of the Contact Position.	O	1 ²	Text(80)
Metadata Date	Metadata Date	Date on which the metadata record was created or modified.	M	1	Text(10)
Additional Metadata	Additional Metadata	Any additional metadata the supports documentation of the dataset including a reference to another directory or report.	O	1	Text(4000)

¹ Dependent upon the repeatability of the parent element.

² Number of occurrences associated with each contact – a dataset may have many contacts

M mandatory

O optional

C conditional

- **Dataset, Custodian** and **Description** categories provide essential information about the content of the data, the agency responsible for its collection and maintenance, and the geographic area it covers.
- **Data Currency** and **Dataset Status** categories establish the time frame of the data described.

- **Access** category is intended to provide potential users of datasets with sufficient information to determine if the data is in a suitable format or able to be transformed for their purpose. Access to some data is restricted for a variety of reasons. However, it is important that the existence of these datasets and the constraints on their use for other purposes are clearly identified in directory systems.
- **Data Quality** information is critical to determining the usefulness of a dataset for a particular application. While lineage, positional accuracy, attribute accuracy, logical consistency and completeness have not always been well documented in the past, the national directory system must provide relevant information about data quality at the highest level – at least a summary or overview.
- **Contact Information** provides address details for the contact person in the contact organisation that is responsible for delivery of the dataset to other users.
- **Metadata Date** establishes the currency of the directory entry.
- **Additional Metadata** provides additional information that supports documentation of the dataset. This additional information may include a link to the source of more detailed information about a dataset. It may also include references to any relevant reports or other documentation.

J. Data quality statement



DATA QUALITY STATEMENT

Data set details

Coverage name:	Type:
Stored on:	Size:
Date:	Custodian:
Contact officer:	Contact telephone:
Contact address:	E-mail:

Compliance with specifications

(see www.brs.gov.au/land&water/landuse/techspecs.html for more detail)

		Details of Compliance	✓/✗
Metadata	ANZLIC Page 0		
	ANZLIC Page 1		
	Report		
	Map		
Spatial data standards	Topology		
	Attributes		
	Labelling		
	Errors		
	Lookup tables		
	Tolerances		
	Unique IDs		
Classification (see page 3)	Classes		
Spatial referencing systems	Projection		
	Position		
	Overlap		
Data transfer standards	Transfer file		
	Media		
Validation	Data		
	Currency		

Assessment of data formats and structure:

K. Australian Bureau of Statistics Agricultural Commodity Levels

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment	
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1		
		grain sorghum	3.4.1	4.4.1		
		oats	3.4.1	4.4.1		
		rice	3.4.1	4.4.1		
		wheat	3.4.1	4.4.1		
		maize	3.4.1	4.4.1		
		canary seed	3.4.1	4.4.1		
		millet	3.4.1	4.4.1		
		buckwheat	3.4.1	4.4.1		
		triticale	3.4.1	4.4.1		
		vegetables	artichokes	3.5.7	4.5.7	
			asparagus	3.5.7	4.5.7	
			beans, broad	3.6.4	4.6.4	cf faba bean
	beans, French		3.6.4	4.6.4	cf snap, kidney, string, haricot, common bean	
	beetroot		3.5.5	4.5.7	cf sugar, silver, spinach, chard and fodder beet	
	bitter melon		3.6.4	4.6.4	cf gourd	
	broccoli		3.6.4	4.6.4		
	brussel sprouts		3.6.4	4.6.4		
	cabbages		3.6.4	4.6.4		
	cabbages, Chinese		?			
	capsicums		3.6.4	4.6.4	cf sweet pepper	
	carrots		3.6.4	4.6.4		
	cauliflowers		3.6.4	4.6.4		
	celery		3.5.7	4.5.7		
	chicory	3.5.7	4.5.7			
	chokos	3.5.4	4.5.4			

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1	
		cucumbers	3.5.4	4.5.4	
		eggplants	3.6.4	4.6.4	cf aubergine
		fennel	3.5.7	4.5.7	cf aniseed, dill
		garlic	3.6.4	4.6.4	
		gherkins	3.5.4	4.5.4	
		herbs	3.6.4	4.6.4	
		leeks	3.6.4	4.6.4	
		lettuces	3.6.4	4.6.4	
		marrows and squashes	3.6.4	4.6.4	
		melons	3.5.4	4.5.4	cf rock melon, cantaloupe, musk and honeydew melon
		melons, water	3.5.4	4.5.4	cf jam, camel melon
		mushrooms	5.1.1		
		okra	3.5.5	4.5.5	
		onions	3.6.4	4.6.4	cf spring onions, shallots
		parsley	3.6.4	4.6.4	
		parsnips	3.6.4	4.6.4	
		peas	3.6.4	4.6.4	cf garden pea
		potatoes	3.6.4	4.6.4	
		pumpkins	3.6.4	4.6.4	cf squash, cattle pumpkin
		radishes	3.6.4	4.6.4	cf Rapanus sativus
		rhubarb	3.5.7	4.5.7	
		silverbeet and spinach	3.5.7	4.5.7	
		snowpeas	3.6.4	4.6.4	cf garden, mangetout
		springonions and shallots	3.6.4	4.6.4	
		swedes	3.6.4	4.6.4	cf rapeseed, canola
		sweetcorn	3.6.4	4.6.4	cf maize, corn
sweet potatoes	3.5.4	4.5.4			
tomatoes	5.1.2				
turnips	3.6.4	4.6.4			

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1	
	fruit and nuts	zucchini	3.6.4	4.6.4	cf courgette, Cucurbita pepo
grapefruit		3.5.1	4.5.1		
lemons and limes		3.5.1	4.5.1		
mandarins		3.5.1	4.5.1		
oranges		3.5.1	4.5.1		
tangelos		3.5.1	4.5.1		
grapes, red		3.5.4	4.5.4		
grapes, white		3.5.4	4.5.4		
apples		3.5.1	4.5.1		
pears		3.5.1	4.5.1		
Nashi pears		3.5.1	4.5.1		
quinces		3.5.1	4.5.1		
apricots		3.5.1	4.5.1		
cherries		3.5.1	4.5.1		
nectarines		3.5.1	4.5.1		
peacharines		3.5.1	4.5.1		
peaches		3.5.1	4.5.1		
plums and prunes		3.5.1	4.5.1		
avocadoes		3.5.1	4.5.1		
carambolas		3.5.1	4.5.1		
custard apples	3.5.1	4.5.1			
dates	3.5.1	4.5.1			
figs	3.5.1	4.5.1			
guavas	3.5.1	4.5.1			
jackfruit	3.5.1	4.5.1			
loquats	3.5.1	4.5.1			
longans	3.5.1	4.5.1			
lychees	3.5.1	4.5.1			
mangoes	3.5.1	4.5.1			

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1	
		persimmons	3.5.1	4.5.1	
		rambutans	3.5.1	4.5.1	
		babacos	?		
		bananas	3.5.1	4.5.1	
		blackcurrants	3.5.5	4.5.5	
		blueberries	3.5.5	4.5.5	
		gooseberries	3.5.5	4.5.5	
		kiwifruit	3.5.5	4.5.5	
		loganberries	3.5.5	4.5.5	
		papaws	3.5.1	4.5.1	
		passionfruit	3.5.4	4.5.4	
		pepinos	3.5.1	4.5.1	
		pineapples	3.5.5	4.5.5	
		raspberries	3.5.5	4.5.5	
		rosella	3.5.5	4.5.5	
		strawberries	3.5.7	4.5.7	
		nuts	almonds	3.5.3	4.5.3
	cashews		3.5.3	4.5.3	
	chestnuts		3.5.3	4.5.3	
	hazelnuts, filberts and cobnuts		3.5.3	4.5.3	
	macadamia		3.5.3	4.5.3	
	pecan nuts		3.5.3	4.5.3	
	pistachio		3.5.3	4.5.3	
	walnuts		3.5.3	4.5.3	
	oil seeds and oleaginous fruits	canola/rapeseed	3.4.4	4.4.4	
		cotton seed	3.4.4	4.4.4	
		linseed/linola	3.4.4	4.4.4	
		mustard seed	3.4.4	4.4.4	

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1	
		oil poppies	3.4.4	4.4.4	
		peanuts	3.4.4	4.4.4	
		safflower	3.4.4	4.4.4	
		sesame	3.4.4	4.4.4	
		soybeans	3.4.4	4.4.4	
		sunflower	3.4.4	4.4.4	
	flowers and bulbs	cut flowers	3.5.6,3.6.3	4.5.6,4.6.3	
		mushroom spawn	5.1.1		
		nursery stock	5.1.0		
		orchard trees	3.5.1	4.5.1	
		nut trees	3.5.3	4.5.3	
		turf	3.3.5	4.3.5	
		beverage and spice crops	cocoa	3.4.2	4.4.2
	coffee		3.4.2	4.4.2	
	tea		3.4.2	4.4.2	
	ginger		3.4.2	4.4.2	
	pepper		3.4.2	4.4.2	
	Unmanufactured tobacco	tobacco	3.4.7	4.4.7	
	Sugar manufacturing	sugarcane	3.4.5	4.4.5	
		sugarbeet	?		
	raw vegetatable materials	seed cotton	3.4.6	4.4.6	
		cotton lint	3.4.6	4.4.6	
		cotton, raw	3.4.6	4.4.6	
	crops for seed	lupins	3.4.8	4.4.8	
		vetches	3.4.8	4.4.8	
	hay and silage	hay	3.4.3	4.4.3	
		cereal legume mixtures	3.4.3	4.4.3	
		cereal crops cut for hay	3.4.3	4.4.3	
		pastures cut for hay	3.4.3	4.4.3	

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment	
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1		
		other crops cut for hay	3.4.3	4.4.3		
	other crops	lucerne	3.4.3	4.4.3		
		aloe vera	3.4.0	4.4.0		
		essential oil crops	3.4.4	4.4.4		
		chickpeas	3.4.8	4.4.8		
		Field beans	3.4.8	4.4.8		
		Olives	3.5.2	4.5.2		
		field peas	3.4.8	4.4.8		
		hops	3.4.0	4.4.0		
		lupins	3.4.8	4.4.8		
		tea tree	3.5.5	4.5.5		
		sown pastures	pure lucerne	3.3.3	4.3.3	
			lucerne/pasture mixtures	3.3.4	4.3.4	
			pasture legumes	3.3.3	4.3.3	
			perennial grasses/lucerne mixture	3.3.4	4.3.4	
	annual grasses/lucerne mixture		3.3.4	4.3.4		
	sown grasses		3.3.5	4.3.5		
	native pastures	native pastures	2.1.2			
	pasture seed	pasture seed	3.3.5	4.3.5		
	livestock numbers	cattle/calves	2.1.9, 3.3.0, 5.2.1, 5.2.2	4.3.0		
		sheep/lambs	2.1.0, 3.3.0, 5.2.3	4.3.0		
		pigs	5.2.5			
		horses	2.1.0, 3.3.0, 5.2.0	4.3.0		
		beehives	5.2.0			
		chickens	5.2.4			
		ducks	5.2.4			
turkeys		5.2.4				
Forestry		Forest type	Native forests	2.2.0		

ABS level 1	ABS level 2	Commodities	ALUM Code (dryland)	ALUM Code (irrigated)	Comment
Products of agriculture, horticulture and market gardening	cereals	barley	3.4.1	4.4.1	
		Softwood plantations	3.1.2	4.1.2	
		Hardwood plantations	3.1.1	4.1.1	
		Agroforestry	3.2.3	4.2.3	

References

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Bureau of Rural Sciences (2000) *Unpubl. report of proceedings of a Commonwealth-State Land Use Mapping Workshop, 3-5 October 2000*. Bureau of Rural Sciences, Canberra.

Further Information

This document will be updated from time to time. The current version is available via

Bureau of Rural Sciences www.affa.gov.au/docs/rural_science/land_water/land_use.html
National Land and Water Resources Audit www.nlwra.gov.au

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Additional information about State and Territory mapping programs is also available at

New South Wales

Department of Land and Water Conservation	www.dlwc.nsw.gov.au
New South Wales Agriculture	www.ag.nsw.gov.au

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South Australia

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Tasmania

Department of Primary Industries, Water and Environment	www.dpiwe.tas.gov.au
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Northern Territory

Department of Lands, Planning and Environment	www.lpe.nt.gov.au
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