Department of Science, Information Technology, Innovation and the Arts

Land Use Summary 1999–2012

for the Pine catchment within SEQ

Great state. Great opportunity.

Queensland Government

Prepared by: Remote Sensing Centre, Science Division, Department of Science, Information Technology, Innovation and the Arts, GPO Box 5078, BRISBANE QLD 4001

Telephone: (07) 3170 5664

Email: craig.shephard@dsitia.qld.gov.au

Web: www.qld.gov.au/environment/land/vegetation/mapping/qlump/

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To access land use datasets it is recommended that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search after restricting your search to **"cadastral and land planning"** in the topic category field. Metadata is also available from QGIS.

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 DSITIA in Brisbane 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.

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Table of contents

List of tables

List of figures

Introduction

The Queensland Land Use Mapping Program (QLUMP) is a joint initiative of the Department of Science, Information Technology, Innovation and the Arts (DSITIA) 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 regional groups, industry groups, community groups and land managers.

QLUMP has updated land use mapping in the South-East Queensland (SEQ) Natural Resource Management Region to 2011 or later. Mapping has been compiled at the catchment level, with the exception of the Brisbane catchment, which has been divided into its sub-catchments (Brisbane River, Stanley River, Lockyer Creek and Bremer River) due to the size and diversity of the area. Apart from the Maroochy and Noosa catchments (2011) and the Brisbane River sub-catchment (2013), remaining catchments in SEQ were updated to 2012.

This report presents and summarises land use mapping in the Pine catchment (which accounts for 6% of SEQ total area) including:

- revised 1999 and 2006 land use datasets including improvements and corrections to the originals
- 2012 land use dataset
- land use change datasets from 1999–2006, 2006–2012 and 1999–2012
- summary statistics derived from the above spatial datasets
- results of the accuracy assessment of the 2012 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. QLUMP maps each catchment with the most recent suitable imagery available. The updated land use datasets for each catchment within SEQ range from 2011 to 2013.

The Australian Land Use and Management (ALUM) classification (Figure 1, page 5) 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 of 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, (e.g. 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 1999 (or later where available) baseline land use dataset formed the basis for the 2012 land use dataset. The 1999 land use map was revised and improved in addition to compiling an updated land use map for 2012. This was achieved primarily by interpretation of SPOT5 satellite imagery, high-resolution orthophotography, scanned aerial photography and inclusion of expert local knowledge. An ESRI ArcSDE geodatabase replication environment was utilised to overlay land use datasets on imagery and digitise or modify areas previously omitted or incorrectly mapped in the 1999 and 2006 mapping, as well as areas of actual land use change (2012). A land use change mapping product was then derived (at the secondary level of the ALUM classification) between 1999–2006, 2006–2012 and 1999–2012.

Some land uses are difficult to differentiate using satellite imagery and existing databases, for example, dryland and irrigated *agriculture*. To overcome this, local expert knowledge was an important component of the mapping methodology. This was provided by regional staff in state government agencies, natural resource management groups, shires, agricultural industries and landholders. Field survey is also undertaken to verify areas of uncertainty in the land use mapping.

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

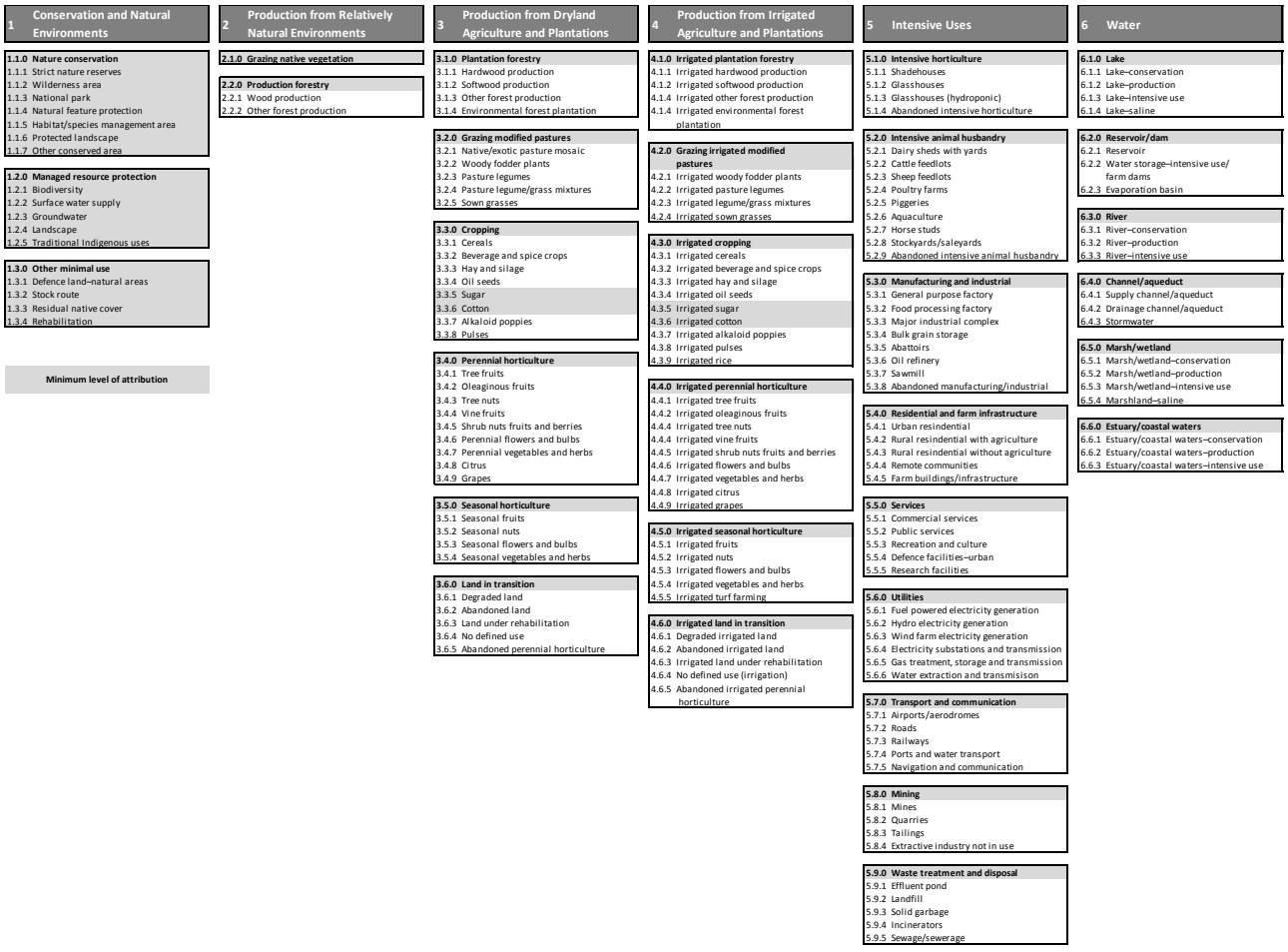

Figure 1: Australian Land Use and Management (ALUM) classification, Version 7

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:

- *transport and communication*
- *utilities*
- *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 *other minimal use* and *grazing native vegetation*, whereby tracks and farm infrastructure, road reserves, drainage lines, cleared and uncleared land adjacent to rivers as well as land immediately adjacent to or between cropped paddocks, are included.

Livestock grazing occurs on a range of pasture types including native and exotic as well as mixtures of both. Identifying and separating these using imagery, aerial photography and field observation is difficult and unreliable. Therefore, the ALUM classification secondary classes of *grazing modified pastures* and *irrigated grazing modified pastures* have not been mapped explicitly by QLUMP. Where possible (for example, with the benefit of field verification), these classes can be mapped (for example, dairy pastures and fodder crops). Areas of pasture which appeared to be harvested for fodder or grazed off were mapped as *cropping*. This may contribute an over-estimation of cropping in the region. The appearance of these can be highly variable and classification may therefore not be consistent.

The distinction between (dryland) *cropping* and *irrigated cropping* was not always evident and it is likely there is some misclassification in these classes. Proximity to water sources (watercourse or dam), as well as information from water entitlements (irrigation licences), field survey and local knowledge were used to confirm areas of irrigation as much as possible. Areas mapped as *irrigated cropping* are potentially irrigated on a supplementary basis and may not have actually been irrigated in 1999, 2006 or 2012.

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) (valuation information) 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 o*ther 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 insofar as they may be present in imagery of one date and either absent or of differing extent in imagery of subsequent or previous dates. 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 2012 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 2012 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 paddock would still be *cropping*.

Refer to metadata for details on the mapping of specific classes.

Products

1999, 2006 and 2012 land use datasets

Figure 2 (page 8), Figure 3 (page 9) and Figure 4 (page 10) show the 1999, 2006 and 2012 land use datasets respectively, for the Pine catchment, presented at the secondary level of the ALUM classification (Figure 1, page 5). Table 1 (page 11), Table 2 (page 12) and Table 3 (page 13) provide the summary statistics for each. All statistics presenting the area of land use classes are reported in hectares (ha).

Table 3 (page 13) shows that *residential and farm infrastructure* (32%) and *grazing native vegetation* (19%) are the major land use classes for 2012 in the Pine catchment.

Analysis of the overall change from 1999–2006 shows the primary land use class of *production from relatively natural environments* decreased significantly by 25% or 10,213ha. This is reflected at the secondary level in the *production forestry* land use class which decreased by 93% or 9,016ha. The growth in 1999–2006 was in the *managed resource protection* land use class which increased by 193% or 8,915ha.

From 2006–2012 the secondary land use class of *nature conservation* increased substantially by 269% or 10,564ha whilst *managed resource protection* decreased significantly by 72% or 9,798ha. These changes can be attributed to the SEQ Forest Agreement, whereby state forests have been progressively added to the conservation reserves estates.

The *intensive uses* primary land use class has shown an increase in both eras, increasing by 6% or 3,250ha from 1999–2006 then increasing again by 5% or 3,057ha from 2006–2012. The majority of this growth was observed in the *residential and farm infrastructure* secondary land use class, which increased by 5% or 2,269ha in 1999–2006 and then by 5% or 2,383ha in 2006–2012.

Analysis of the agriculture primary land use classes showed that *production from dryland agriculture* decreased by 18% or 1,082ha in 1999–2006, and decreased again by 20% or 1,005ha in 2006–2012. *Production from irrigated agriculture* showed little change between 1999–2006 (increasing by only 3% or 47ha), however showed a decrease of 29% or 423ha in 2006–2012. The majority of the decrease was in the *irrigated cropping* secondary land use class.

Analysis of the specific land use changes from one secondary class to another for 1999–2006 and 2006–2012 is presented in the section on page 14. Analysis of the land use change from 1999–2012 has been included as Appendix A, on page 21.

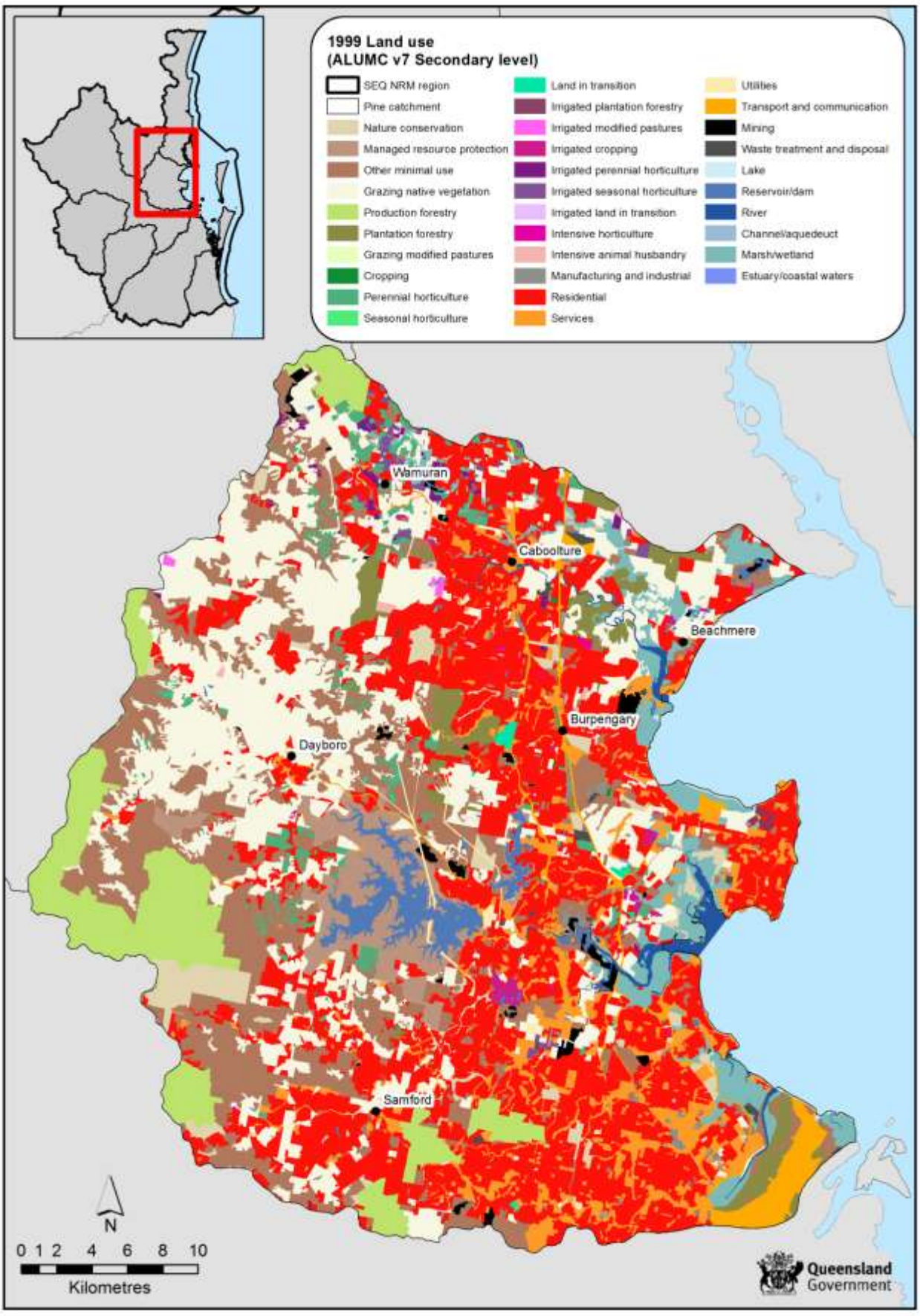

Figure 2: 1999 land use map for the Pine catchment

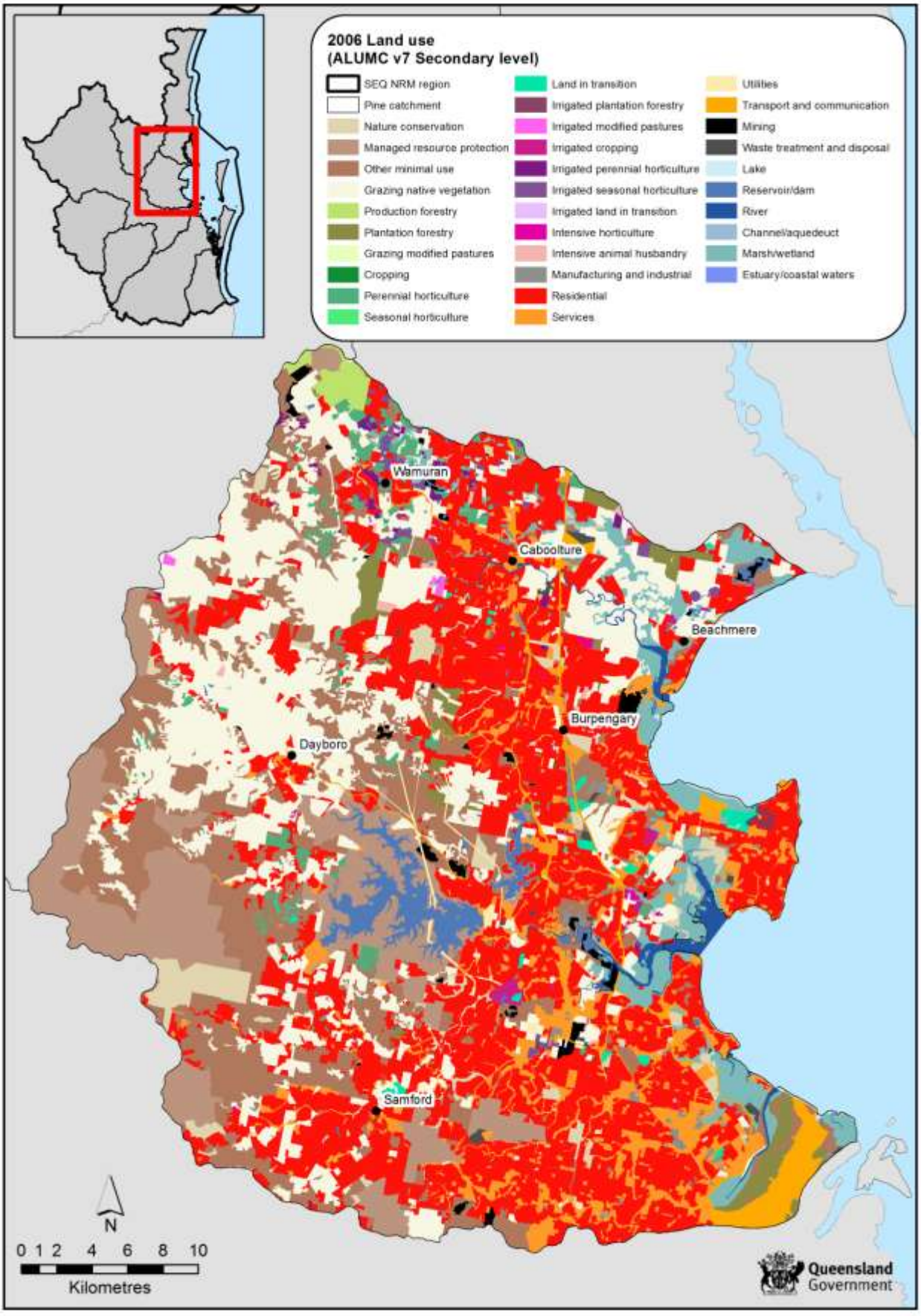

Figure 3: 2006 land use map for the Pine catchment

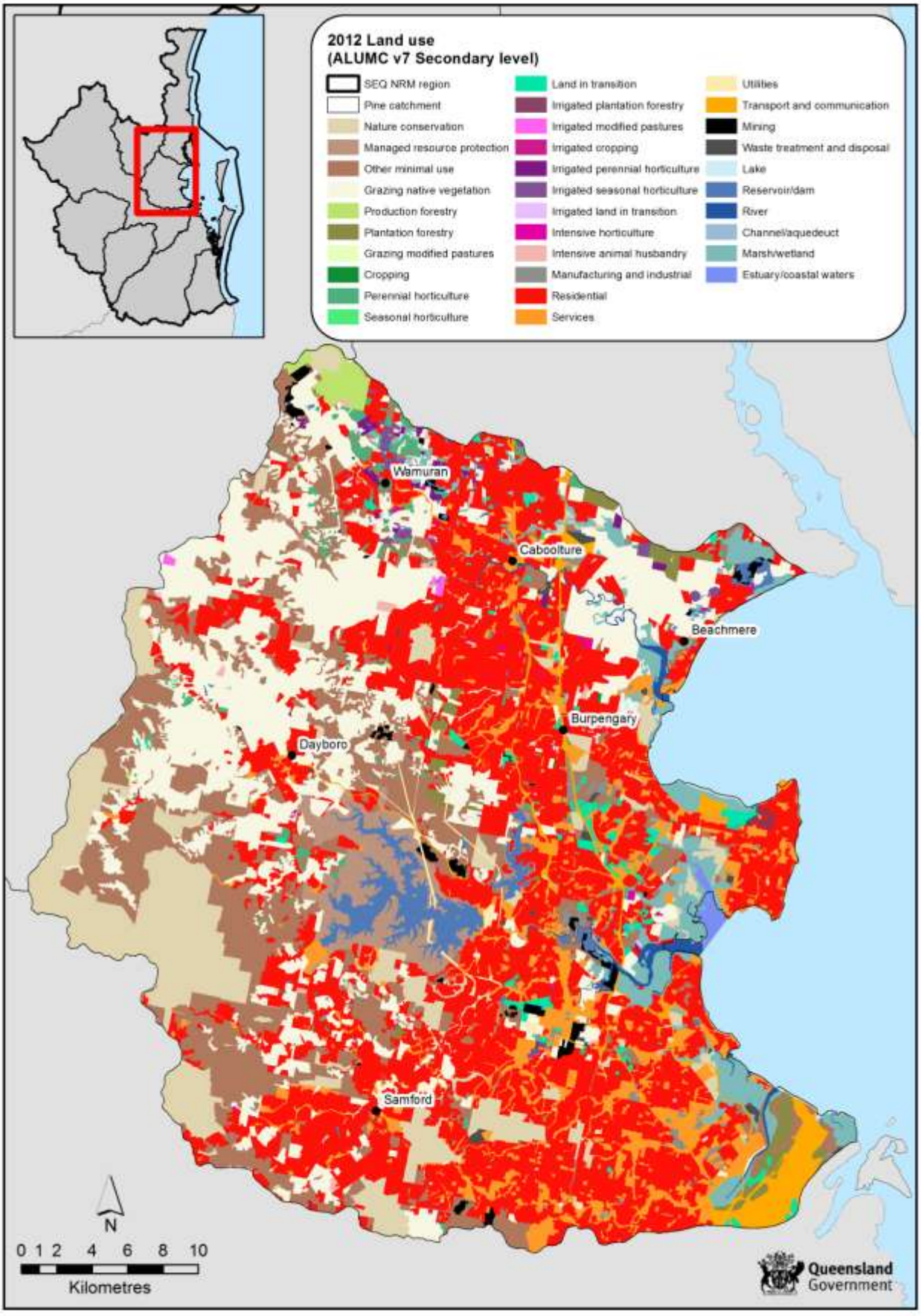

Figure 4: 2012 land use map for the Pine catchment

Table 1: Summary statistics of land use in 1999 in the Pine catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	32,534	21.87
1.1	Nature conservation	3,737	2.51
1.2	Managed resource protection	4,621	3.11
1.3	Other minimal use	24,175	16.25
2	Production from relatively natural environments	40,583	27.28
2.1	Grazing native vegetation[1]	30,840	20.73
2.2	Production forestry	9,742	6.55
3	Production from dryland agriculture and plantations	6,128	4.12
3.1	Plantation forestry	3,478	2.34
3.3	Cropping	27	0.02
3.4	Perennial horticulture	2,361	1.59
3.5	Seasonal horticulture	<0	<0.01
3.6	Land in transition	263	0.18
4	Production from irrigated agriculture and plantations	1,409	0.95
4.2	Irrigated grazing modified pastures[2]	96	0.06
4.3	Irrigated cropping	447	0.30
4.4	Irrigated perennial horticulture	442	0.30
4.5	Irrigated seasonal horticulture	425	0.29
5	Intensive uses	58,111	39.06
5.1	Intensive horticulture	103	0.07
5.2	Intensive animal husbandry	321	0.22
5.3	Manufacturing and industrial	615	0.41
5.4	Residential and farm infrastructure	43,266	29.08
5.5	Services	9,205	6.19
5.6	Utilities	482	0.32
5.7	Transport and communication	2,829	1.90
5.8	Mining	974	0.65
5.9	Waste treatment and disposal	316	0.21
6	Water	10,006	6.73
6.1	Lake	18	0.01
6.2	Reservoir/dam	2,895	1.95
6.3	River	1,333	0.90
6.5	Marsh/wetland	5,758	3.87
6.6	Estuary/coastal waters	1	<0.01
	Grand Total	148,770	**100.00**

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

[2] *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Table 2: Summary statistics of land use in 2006 in the Pine catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	40,530	27.24
1.1	Nature conservation	3,926	2.64
1.2	Managed resource protection	13,536	9.10
1.3	Other minimal use	23,067	15.51
2	Production from relatively natural environments	30,370	20.41
2.1	Grazing native vegetation[1]	29,643	19.93
2.2	Production forestry	727	0.49
3	Production from dryland agriculture and plantations	5,046	3.39
3.1	Plantation forestry	2,299	1.55
3.3	Cropping	8	0.01
3.4	Perennial horticulture	1,989	1.34
3.6	Land in transition	750	0.50
4	Production from irrigated agriculture and plantations	1,456	0.98
4.2	Irrigated grazing modified pastures[2]	96	0.06
4.3	Irrigated cropping	380	0.26
4.4	Irrigated perennial horticulture	440	0.30
4.5	Irrigated seasonal horticulture	532	0.36
4.6	Irrigated land in transition	8	0.01
5	Intensive uses	61,361	41.25
5.1	Intensive horticulture	116	0.08
5.2	Intensive animal husbandry	341	0.23
5.3	Manufacturing and industrial	714	0.48
5.4	Residential and farm infrastructure	45,535	30.61
5.5	Services	9,966	6.70
5.6	Utilities	502	0.34
5.7	Transport and communication	2,863	1.92
5.8	Mining	983	0.66
5.9	Waste treatment and disposal	339	0.23
6	Water	10,007	6.73
6.1	Lake	18	0.01
6.2	Reservoir/dam	2,927	1.97
6.3	River	1,341	0.90
6.5	Marsh/wetland	5,719	3.84
6.6	Estuary/coastal waters	1	<0.01
	Grand Total	**148,770**	**100.00**

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

[2] *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Table 3: Summary statistics of land use in 2012 in the Pine catchment

Land use code	Land use class	Area (ha)	Area %
1	Conservation and natural environments	40,625	27.31
1.1	Nature conservation	14,490	9.74
1.2	Managed resource protection	3,738	2.51
1.3	Other minimal use	22,397	15.05
2	Production from relatively natural environments	28,641	19.25
2.1	Grazing native vegetation[1]	27,914	18.76
2.2	Production forestry	727	0.49
3	Production from dryland agriculture and plantations	4,041	2.72
3.1	Plantation forestry	1,460	0.98
3.3	Cropping	15	0.01
3.4	Perennial horticulture	1,195	0.80
3.6	Land in transition	1,371	0.92
4	Production from irrigated agriculture and plantations	1,033	0.69
4.2	Irrigated grazing modified pastures[2]	96	0.06
4.3	Irrigated cropping	90	0.06
4.4	Irrigated perennial horticulture	418	0.28
4.5	Irrigated seasonal horticulture	411	0.28
4.6	Irrigated land in transition	19	0.01
5	Intensive uses	64,418	43.30
5.1	Intensive horticulture	121	0.08
5.2	Intensive animal husbandry	360	0.24
5.3	Manufacturing and industrial	776	0.52
5.4	Residential and farm infrastructure	47,919	32.21
5.5	Services	10,456	7.03
5.6	Utilities	508	0.34
5.7	Transport and communication	3,004	2.02
5.8	Mining	935	0.63
5.9	Waste treatment and disposal	339	0.23
6	Water	10,011	6.73
6.1	Lake	55	0.04
6.2	Reservoir/dam	3,055	2.05
6.3	River	1,340	0.90
6.5	Marsh/wetland	5,560	3.74
	Grand Total	**148,770**	**100.00**

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

[2] *irrigated grazing modified pastures* are not mapped explicitly. In this case the areas mapped are generally dairy pastures.

Land use change datasets (1999–2006, 2006–2012 and 1999–2012)

Figure 5, 6 and 7 (pages 16, 17 and 22), show the land use change datasets for the Pine catchment. 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 2.2.0 (*production forestry*) 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 5). 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 for this catchment has been compiled for three epochs (1999, 2006 and 2012). At the secondary level of the ALUM classification, the total area of land use change is:

- 1999–2006: 15,569ha (10% of the catchment). Of this 4,493ha (29% of the total change) is mapped as an increase in land use intensity, whilst 11,076ha (71%) is a decrease.
- 2006–2012: 17,954ha (12% of the catchment). Of this 4,902ha (27% of the total change) is mapped as an increase in land use intensity, whilst 13,052ha (73%) is a decrease.
- 1999–2012: 23,853ha (16% of the catchment). Of this 8,880ha (37% of the total change) is mapped as an increase in land use intensity, whilst 14,973ha (63%) is a decrease.

The land use change totals between the two eras (1999–2006 and 2006–2012) will not add up to match those compiled for the 1999–2012 era. This is because land use change mapping only accounts for land use at a specific moment in time; some change will result from rotation, whilst some may be the result of more than one change event. An example of this scenario is an area that was mapped as *grazing native vegetation* in 1999 may have been mapped as *land in transition* in 2006 before finally becoming *residential* in 2012. These changes would be reflected in each of the land use change mapping products as change from *grazing native vegetation* to *land in transition* in the 1999–2006, and change from *land in transition* to *residential* in 2006–2012, and lastly change from *grazing native vegetation* to *residential* in 1999–2012.

Summary statistics presenting the land use change at the secondary level for 1999–2006 and 2006–2012 are shown in Tables 4 and 5 (pages 17 and 18). The change from 1999–2012 is presented in Appendix A (page 20).

The 1999–2006 land use change shows that change from *production forestry* to *managed resource protection* accounted for 9,029ha or 58% of all the total change mapped, followed by 1,093ha (7%) of *grazing native vegetation* changing to *residential and farm infrastructure*. Collectively, all the land use change to *residential and farm infrastructure* accounts for 2,496ha or 16% of the total for 1999–2006.

For 2006–2012, the largest land use changes were observed from *managed resource protection* to *nature conservation* (9,871ha or 55%). Collectively, for 2006–2012 the land use change to *residential and farm infrastructure* accounts for 2,642ha or 15% of the total. This change has come from a variety of land uses including: *grazing native vegetation* (1,580ha), *other minimal use* (336ha), *land in transition* (297ha), *perennial horticulture* (211ha) and *irrigated cropping* (100ha).

The pattern of change from *production forestry* in 1999 to *managed resource protection* in *2006* and then to *nature conservation* in 2012*,* can be attributed to the SEQ Forest Agreement, as State forests in SEQ have been progressively added to the protected area estates.

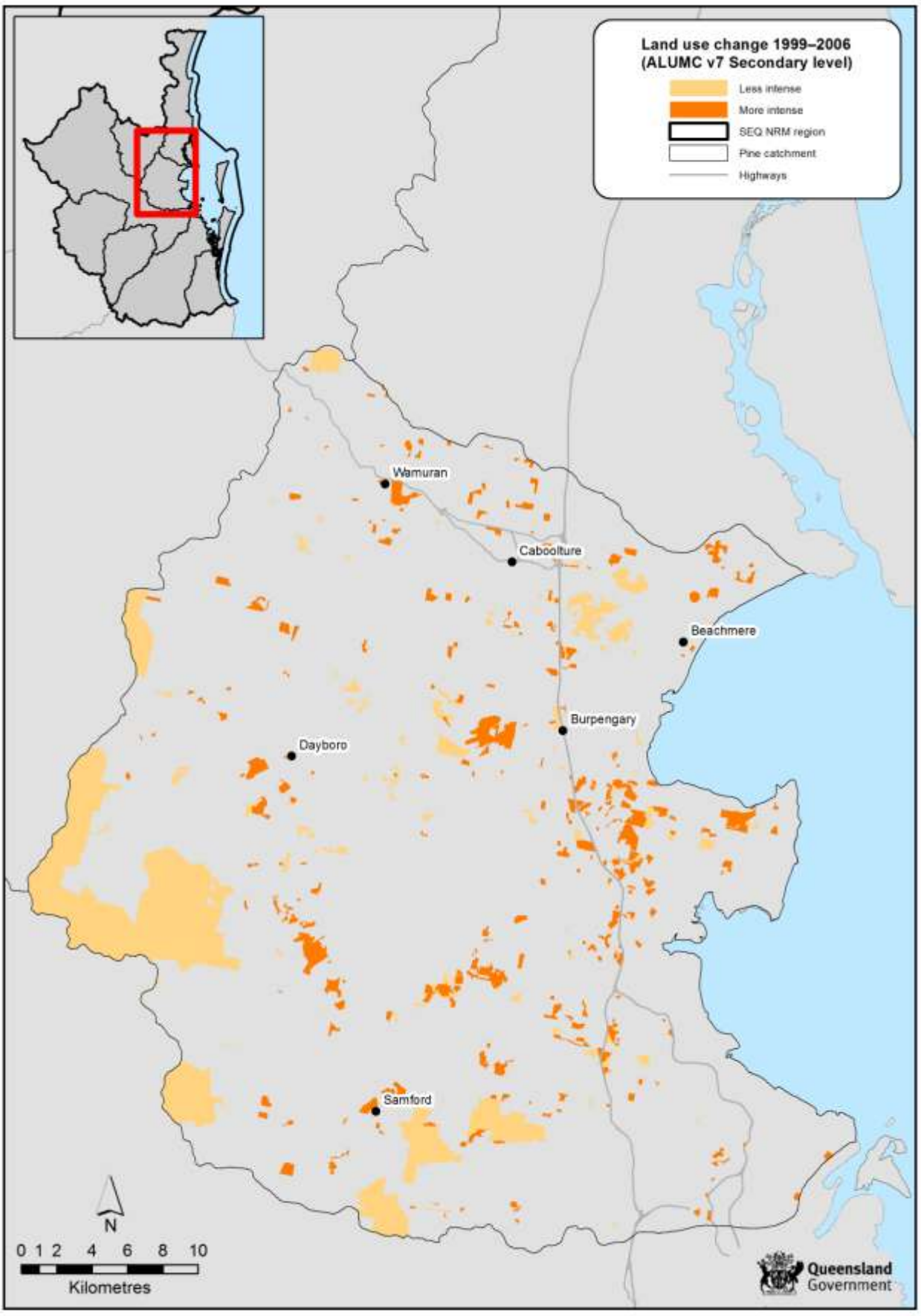

Figure 5: 1999–2006 land use change map at secondary level for the Pine catchment

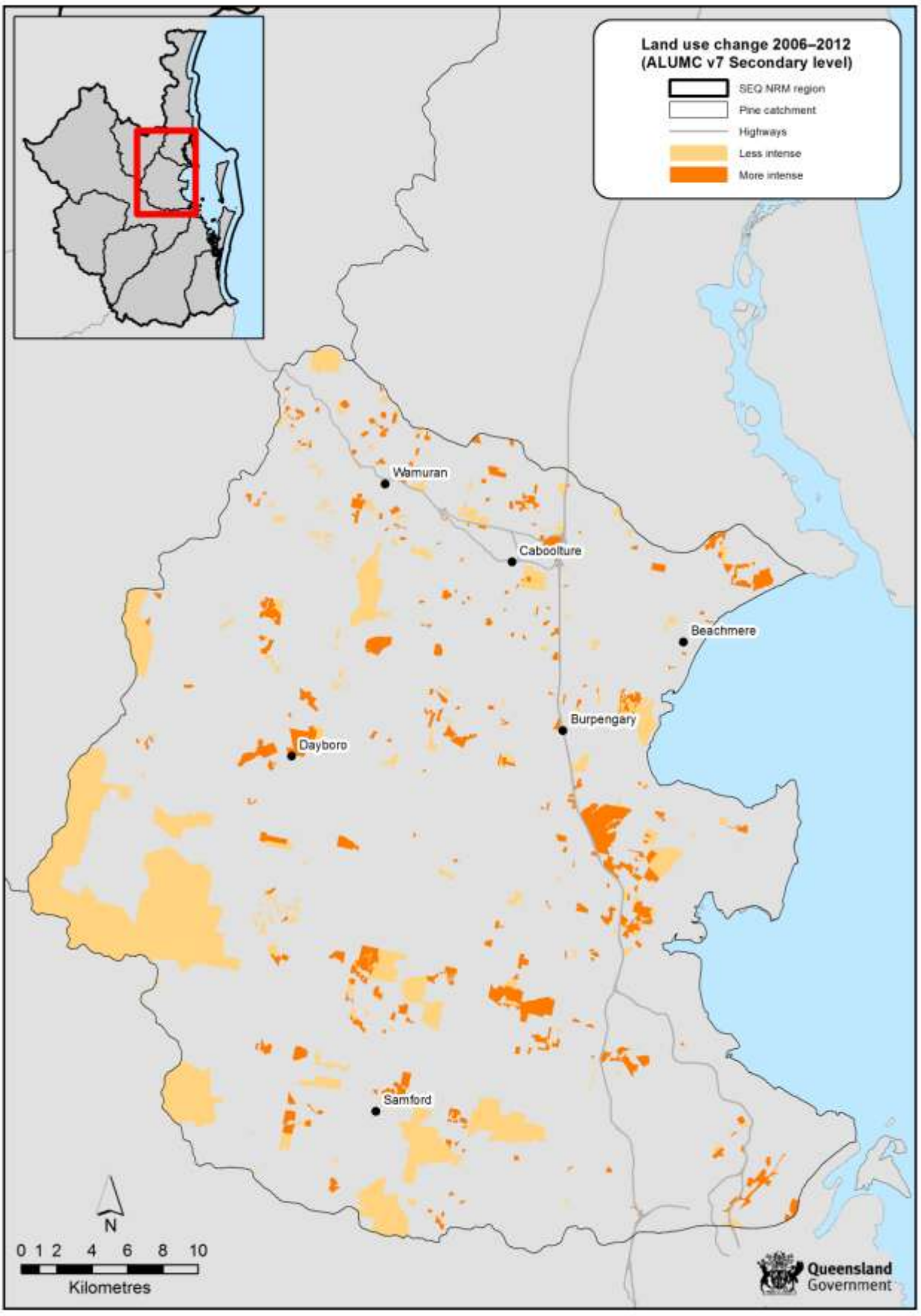

Figure 6: 2006–2012 land use change map at secondary level for the Pine catchment

Table 4: Summary statistics for land use change at secondary level for 1999–2006 in the Pine catchment (showing only the land use changes > 20ha)

Land use code 1999	Land use class 1999	Land use code 2006	Land use class 2006	Area (ha)	Area Change (%)	Total change (%)
2.2.0	Production forestry	1.2.0	Managed resource protection	9,029	6.07	57.99
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	1,093	0.73	7.02
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	906	0.61	5.82
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	784	0.53	5.04
2.1.0	Grazing native vegetation	3.6.0	Land in transition	349	0.23	2.24
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	344	0.23	2.21
2.1.0	Grazing native vegetation	5.5.0	Services	226	0.15	1.45
1.3.0	Other minimal use	5.5.0	Services	190	0.13	1.22
3.1.0	Plantation forestry	5.4.0	Residential & farm infrastructure	170	0.11	1.09
1.3.0	Other minimal use	1.1.0	Nature conservation	162	0.11	1.04
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	158	0.11	1.01
1.2.0	Managed resource protection	5.5.0	Services	153	0.10	0.98
3.1.0	Plantation forestry	1.3.0	Other minimal use	134	0.09	0.86
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	129	0.09	0.83
1.3.0	Other minimal use	3.6.0	Land in transition	129	0.09	0.83
3.4.0	Perennial horticulture	3.6.0	Land in transition	119	0.08	0.77
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	116	0.08	0.74
2.1.0	Grazing native vegetation	4.5.0	Irrigated seasonal horticulture	96	0.06	0.62
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	96	0.06	0.62
5.4.0	Residential & farm infrastructure	5.5.0	Services	84	0.06	0.54
3.4.0	Perennial horticulture	1.3.0	Other minimal use	59	0.04	0.38
3.6.0	Land in transition	1.3.0	Other minimal use	59	0.04	0.38
1.3.0	Other minimal use	5.8.0	Mining	58	0.04	0.37
3.1.0	Plantation forestry	5.5.0	Services	51	0.03	0.33
3.6.0	Land in transition	5.5.0	Services	51	0.03	0.33
1.3.0	Other minimal use	5.3.0	Manufacturing and industrial	48	0.03	0.31
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	44	0.03	0.28
5.4.0	Residential & farm infrastructure	3.6.0	Land in transition	43	0.03	0.28
5.4.0	Residential & farm infrastructure	5.3.0	Manufacturing and industrial	41	0.03	0.26
4.3.0	Irrigated cropping	5.4.0	Residential & farm infrastructure	38	0.03	0.24
1.3.0	Other minimal use	3.4.0	Perennial horticulture	38	0.03	0.24
1.3.0	Other minimal use	1.2.0	Managed resource protection	37	0.02	0.24
6.5.0	Marsh/wetland	5.5.0	Services	32	0.02	0.21
5.8.0	Mining	3.6.0	Land in transition	32	0.02	0.21
5.5.0	Services	5.4.0	Residential & farm infrastructure	29	0.02	0.19
5.4.0	Residential & farm infrastructure	5.9.0	Waste treatment and disposal	28	0.02	0.18
3.1.0	Plantation forestry	3.6.0	Land in transition	24	0.02	0.15
1.3.0	Other minimal use	6.2.0	Reservoir/dam	21	0.01	0.13
5.8.0	Mining	6.2.0	Reservoir/dam	21	0.01	0.13
5.9.0	Waste treatment and disposal	1.3.0	Other minimal use	20	0.01	0.13
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	20	0.01	0.13
Total				**15,569**	**10.46**	**100**

Table 5: Summary statistics for land use change at secondary level for 2006–2012 in the Pine catchment (showing only the land use changes > 35ha)

Land use code 2006	Land use class 2006	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
1.2.0	Managed resource protection	1.1.0	Nature conservation	9,871	6.64	54.98
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	1,580	1.06	8.80
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	590	0.40	3.29
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	577	0.39	3.21
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	443	0.30	2.47
2.1.0	Grazing native vegetation	3.6.0	Land in transition	359	0.24	2.00
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	336	0.23	1.87
1.3.0	Other minimal use	1.1.0	Nature conservation	322	0.22	1.80
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	297	0.20	1.66
1.3.0	Other minimal use	3.6.0	Land in transition	268	0.18	1.49
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	211	0.14	1.18
6.5.0	Marsh/wetland	1.1.0	Nature conservation	196	0.13	1.09
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	166	0.11	0.93
2.1.0	Grazing native vegetation	5.5.0	Services	145	0.10	0.81
5.4.0	Residential & farm infrastructure	5.5.0	Services	113	0.08	0.63
3.1.0	Plantation forestry	3.6.0	Land in transition	112	0.08	0.62
4.3.0	Irrigated cropping	5.4.0	Residential & farm infrastructure	100	0.07	0.55
1.3.0	Other minimal use	6.2.0	Reservoir/dam	99	0.07	0.55
1.3.0	Other minimal use	5.8.0	Mining	98	0.07	0.54
3.6.0	Land in transition	5.5.0	Services	97	0.07	0.54
3.1.0	Plantation forestry	5.7.0	Transport and communication	92	0.06	0.51
4.3.0	Irrigated cropping	3.6.0	Land in transition	87	0.06	0.49
1.3.0	Other minimal use	5.5.0	Services	85	0.06	0.48
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	83	0.06	0.46
3.4.0	Perennial horticulture	3.6.0	Land in transition	76	0.05	0.42
5.4.0	Residential & farm infrastructure	3.6.0	Land in transition	71	0.05	0.40
1.3.0	Other minimal use	1.2.0	Managed resource protection	71	0.05	0.39
5.8.0	Mining	2.1.0	Grazing native vegetation	71	0.05	0.39
4.3.0	Irrigated cropping	2.1.0	Grazing native vegetation	59	0.04	0.33
4.4.0	Irrigated perennial horticulture	2.1.0	Grazing native vegetation	59	0.04	0.33
3.6.0	Land in transition	1.3.0	Other minimal use	58	0.04	0.32
3.1.0	Plantation forestry	5.4.0	Residential & farm infrastructure	58	0.04	0.32
2.1.0	Grazing native vegetation	4.4.0	Irrigated perennial horticulture	55	0.04	0.31
5.8.0	Mining	6.5.0	Marsh/wetland	49	0.03	0.27
4.3.0	Irrigated cropping	5.5.0	Services	48	0.03	0.27
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	45	0.03	0.25
2.1.0	Grazing native vegetation	5.7.0	Transport and communication	43	0.03	0.24
3.4.0	Perennial horticulture	5.5.0	Services	43	0.03	0.24
2.1.0	Grazing native vegetation	5.2.0	Intensive animal production	39	0.03	0.22
5.4.0	Residential & farm infrastructure	1.3.0	Other minimal use	35	0.02	0.19
Total				**17,954**	**12.07**	**100**

Data format and availability

Download land use datasets

To access land use datasets it is recommended that the Queensland Government Information Service (QGIS) be used. Search for **"land use mapping"** in the type of data search after restricting your search to **"cadastral and land planning"** in the topic category field. Metadata is also available from QGIS.

The dataset comprises an ESRI vector geodatabase at a nominal scale of 1:50,000. Within this are six feature classes: 1999 improved land use, 2006 improved land use, 2012 updated land use, 1999–2006 land use change layer, 2006–2012 land use change layer and 1999–2012 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 that a representation showing land use at secondary level is available when working within a geodatabase.

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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Request a land use map

Available from the QLUMP website, it is possible to request a land use map based upon a specific location (Lot on Plan, Street address or Central latitude/longitude coordinates) in Queensland. The land use maps are emailed upon request in portable document format (PDF).The maps present the most recent land use information available at the secondary level of the Australian Land Use and Management (ALUM) Classification.

View land use on the Queensland Globe

The most recent land use information available state-wide in Queensland is available for viewing on the Queensland Globe. This application allows browsing of Queensland spatial data including land use, maps and up-to-date satellite imagery.

Land use is available for viewing within the Planning and Cadastre category globe.

Appendix A 1999–2012 Land Use Change

For 1999–2012, the largest land use changes were observed from *production forestry* to *nature conservation* (9,029ha or 38%) and *grazing native vegetation* to *residential and farm infrastructure* (2,841ha or 12%). Collectively, for 1999–2012 the land use change to *residential and farm infrastructure* accounts for 5,099ha or 21% of the total.

Table 6: Summary statistics for land use change at secondary level for 1999–2012 in the Pine catchment (showing only the land use changes > 70ha)

Land use code 1999	Land use class 1999	Land use code 2012	Land use class 2012	Area (ha)	Area Change (%)	Total change (%)
2.2.0	Production forestry	1.1.0	Nature conservation	9,029	6.07	37.85
2.1.0	Grazing native vegetation	5.4.0	Residential & farm infrastructure	2,841	1.91	11.91
3.1.0	Plantation forestry	2.1.0	Grazing native vegetation	1,336	0.90	5.60
1.3.0	Other minimal use	5.4.0	Residential & farm infrastructure	1,296	0.87	5.43
2.1.0	Grazing native vegetation	1.3.0	Other minimal use	922	0.62	3.87
1.2.0	Managed resource protection	1.1.0	Nature conservation	842	0.57	3.53
3.4.0	Perennial horticulture	2.1.0	Grazing native vegetation	600	0.40	2.52
1.3.0	Other minimal use	1.1.0	Nature conservation	485	0.33	2.03
2.1.0	Grazing native vegetation	3.6.0	Land in transition	476	0.32	1.99
2.1.0	Grazing native vegetation	5.5.0	Services	396	0.27	1.66
1.3.0	Other minimal use	3.6.0	Land in transition	334	0.22	1.40
3.4.0	Perennial horticulture	5.4.0	Residential & farm infrastructure	316	0.21	1.32
1.3.0	Other minimal use	5.5.0	Services	294	0.20	1.23
3.1.0	Plantation forestry	5.4.0	Residential & farm infrastructure	238	0.16	1.00
6.5.0	Marsh/wetland	1.1.0	Nature conservation	196	0.13	0.82
5.4.0	Residential & farm infrastructure	5.5.0	Services	195	0.13	0.82
2.1.0	Grazing native vegetation	1.1.0	Nature conservation	186	0.13	0.78
1.3.0	Other minimal use	2.1.0	Grazing native vegetation	166	0.11	0.70
1.3.0	Other minimal use	5.8.0	Mining	159	0.11	0.67
4.3.0	Irrigated cropping	5.4.0	Residential & farm infrastructure	153	0.10	0.64
1.2.0	Managed resource protection	5.5.0	Services	153	0.10	0.64
3.1.0	Plantation forestry	3.6.0	Land in transition	141	0.09	0.59
3.1.0	Plantation forestry	1.3.0	Other minimal use	134	0.09	0.56
3.4.0	Perennial horticulture	1.3.0	Other minimal use	134	0.09	0.56
3.6.0	Land in transition	5.4.0	Residential & farm infrastructure	129	0.09	0.54
3.4.0	Perennial horticulture	3.6.0	Land in transition	127	0.09	0.53
1.3.0	Other minimal use	6.2.0	Reservoir/dam	114	0.08	0.48
1.3.0	Other minimal use	1.2.0	Managed resource protection	108	0.07	0.45
3.1.0	Plantation forestry	5.7.0	Transport and communication	104	0.07	0.43
2.1.0	Grazing native vegetation	3.4.0	Perennial horticulture	91	0.06	0.38
4.3.0	Irrigated cropping	3.6.0	Land in transition	87	0.06	0.37
2.1.0	Grazing native vegetation	4.5.0	Irrigated seasonal horticulture	85	0.06	0.36
5.4.0	Residential & farm infrastructure	3.6.0	Land in transition	83	0.06	0.35
5.8.0	Mining	2.1.0	Grazing native vegetation	71	0.05	0.30
Total				**23,853**	**16.03**	**100**

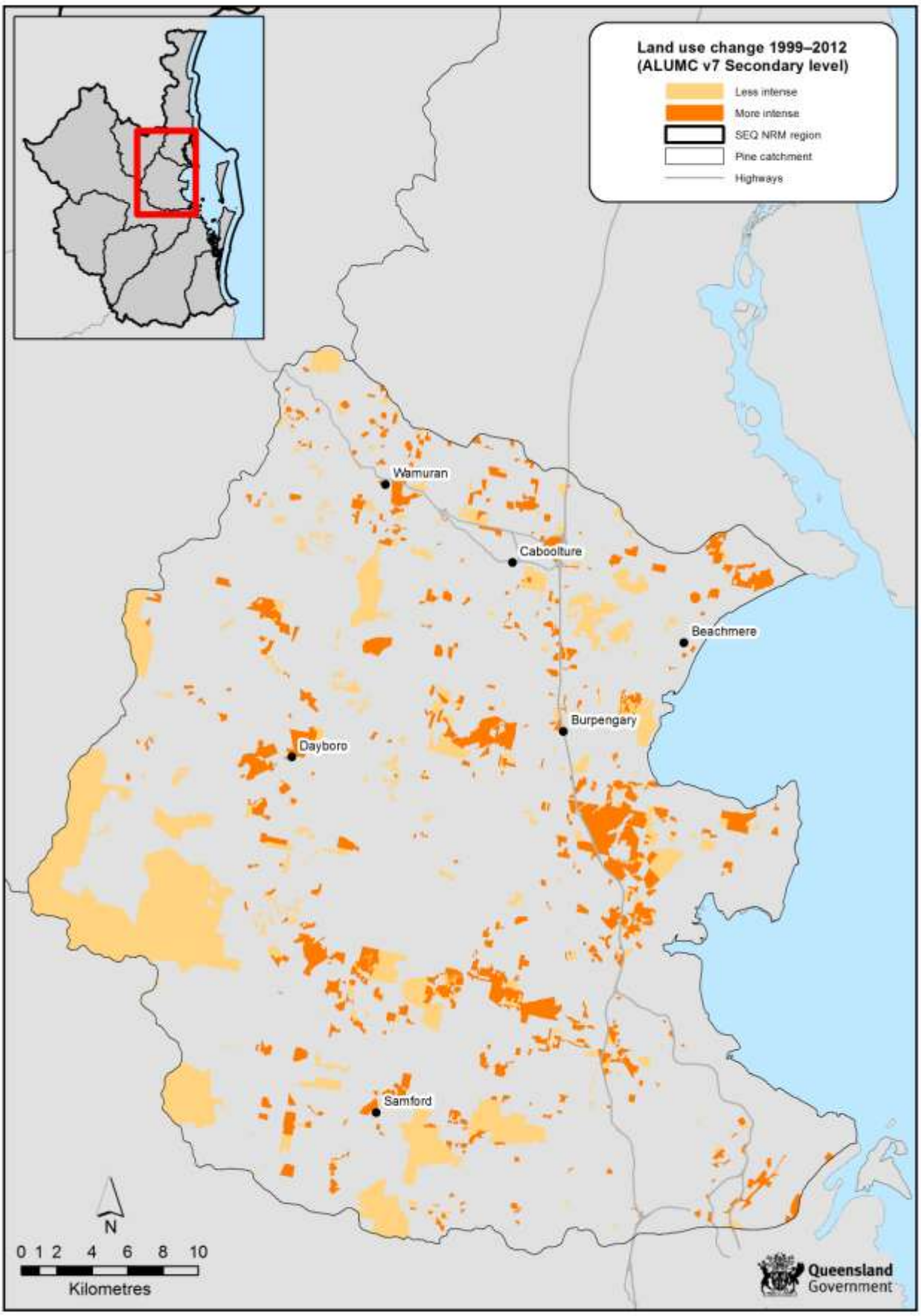

Figure 7: 1999–2012 land use change map at secondary level for the Pine catchment

Appendix B Accuracy assessment

The accuracy assessment provided reference data suitable for assessing the 2012 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, it should be kept in mind that total accuracy can 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, since 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 can indicate a true misclassification problem, rather than one due to 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. 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. Spatial errors influence thematic accuracy. The purpose here is to assess the thematic accuracy of land use data. However, as described above, the separation of spatial and thematic errors can be difficult and was not undertaken. As a result, the accuracy assessment reflects properties of the land use data as a whole.

Note that the revised 1999 and 2006 land use and the 1999–2006, 2006–2012 and 1999–2012 land use change datasets were not accuracy assessed.

2012 land use dataset

The 2012 land use dataset was accuracy assessed with 297 points based on a random sampling strategy, using the map classes (area and frequency) as the strata. The stratified estimate of total accuracy is 0.87 (0.81, 0.91) and Kappa is 0.84 (0.77, 0.89). 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 24) shows the error matrix for the accuracy assessment of the 2012 land use data. For the majority of classes, the reference data agreed with the map data. For example, *grazing native vegetation* had 15 sample points identified. For 12 of those points, the map data was also *grazing native vegetation* and therefore correct. For three points the map data was incorrect, as the area was found to be *residential and farm infrastructure*. The misclassification in this case is likely to be related to the size of the property, as lot areas greater than 16ha are not mapped as residential. If a property is close to this threshold, misclassification is more likely.

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, *grazing modified pastures*, are removed from the total area before the proportions are calculated. This column will thus sum to 100%.

Table 8 (page 25) provides the user's and producer's accuracy for the 2012 Pine catchment land use dataset. This demonstrates that the majority of land use classes in the catchment have been mapped accurately. The largest assessable land use class in this catchment is *residential and farm infrastructure* which has been mapped with very high user's and producer's accuracies of 0.978 and 0.887 respectively. The next largest class by area is *grazing native vegetation* which also returned a high user's and producer's accuracy. The error matrix (Table 7, page 24) 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. Examples of this are *cropping* and *irrigated land in transition*.

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 *production forestry* is 0.702, however, from the 95% interval (0.242, 0.957) it can be seen that more sample points would be required to confidently determine class accuracy. The other classes with a relatively low accuracy and very large confidence intervals constitute a small proportion of the area assessed.

Table 7: Error matrix for the Pine catchment 2012 land use dataset

		Reference data																												
	2012 land use class	Nature conservation	Other conserved area	Managed resource protect.	Other minimal use	Grazing native vegetation	Production forestry	Plantation forestry	Cropping	Perennial horticulture	Land in transition	Irrigated cropping	Irrigated perennial hort.	Irrigated seasonal hort.	Irrigated land in transition	Intensive horticulture	Intensive animal husbandry	Manufacturing and industrial	Residential & farm infrastructure	Services	Utilities	Transport & communications	Mining	Waste treatment & disposal	Lake	Reservoir/dam	River	Marsh/wetland	Estuary/coastal waters	**Total**	**Proportion (%)**
Map data	Nature conservation	**13**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**13**	**8.14**
	Other conserved area	0	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**	**1.6**
	Managed resource protection	0	0	**8**	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**2.51**
	Other minimal use	0	0	0	**14**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**15**	**15.06**
	Grazing native vegetation	0	0	0	0	**12**	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	**15**	**19.11**
	Production forestry	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.49**
	Plantation forestry	0	0	0	0	1	1	**6**	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	**10**	**0.98**
	Cropping	0	0	0	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.01**
	Perennial horticulture	0	0	0	0	0	0	0	1	**7**	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**9**	**0.8**
	Land in transition	0	0	0	2	0	0	0	0	0	**8**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.92**
	Irrigated cropping	0	0	0	0	0	0	0	1	0	0	**8**	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**10**	**0.06**
	Irrigated perennial horticulture	0	0	0	0	0	0	0	0	2	0	0	**4**	1	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	**10**	**0.28**
	Irrigated seasonal horticulture	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.28**
	Irrigated land in transition	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**	**0.01**
	Intensive horticulture	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.08**
	Intensive animal husbandry	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	**8**	0	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.24**
	Manufacturing and industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	0	0	0	0	0	0	**10**	**0.52**
	Residential & farm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**30**	0	0	0	0	0	0	0	0	0	0	**30**	**32.21**
	Services	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	**25**	2	0	0	0	0	0	0	0	0	**30**	**7.03**
	Utilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**8**	0	1	0	0	0	0	0	0	**10**	**0.34**
	Transport and communications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**9**	0	0	0	0	0	0	0	**10**	**2.02**
	Mining	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**7**	0	0	0	0	2	0	**10**	**0.63**
	Waste treatment and disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	0	0	0	**10**	**0.23**
	Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**	0	0	1	0	**10**	**0.04**
	Reservoir/dam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**9**	0	0	0	**10**	**2.05**
	River	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	0	**10**	**0.68**
	Marsh/wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**10**	0	**10**	**3.46**
	Estuary/coastal waters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	**1**	**1**	**0.22**
	Total	**13**	**2**	**8**	**17**	**16**	**11**	**6**	**3**	**9**	**8**	**8**	**4**	**11**	**0**	**10**	**8**	**15**	**40**	**25**	**10**	**9**	**11**	**10**	**9**	**9**	**10**	**14**	**1**	**297**	**100**

Table 8: User's and producer's accuracy for the Pine catchment 2012 land use dataset

Class	User's			Producer's		
	Estimate	95% interval		Estimate	95% interval	
Nature conservation	0.951	0.758	0.998	0.991	0.865	1.000
Other conserved area	0.730	0.178	0.991	0.935	0.405	0.998
Managed resource protection	0.745	0.438	0.937	0.959	0.563	0.999
Other minimal use	0.893	0.676	0.984	0.965	0.890	0.990
Grazing native vegetation	0.765	0.520	0.924	0.970	0.902	0.992
Production forestry	0.936	0.705	0.998	0.702	0.242	0.957
Plantation forestry	0.557	0.266	0.822	0.862	0.268	0.997
Cropping	NA	NA	NA	NA	NA	NA
Perennial horticulture	0.716	0.415	0.931	0.801	0.285	0.957
Land in transition	0.748	0.443	0.934	0.891	0.326	0.998
Irrigated cropping	0.743	0.453	0.931	0.331	0.032	0.960
Irrigated perennial horticulture	0.356	0.126	0.647	0.531	0.059	0.982
Irrigated seasonal horticulture	0.936	0.696	0.998	0.694	0.151	0.957
Irrigated land in transition	NA	NA	NA	NA	NA	NA
Intensive horticulture	0.936	0.701	0.998	0.469	0.055	0.975
Intensive Animal Husbandry	0.748	0.456	0.935	0.689	0.119	0.993
Manufacturing and industrial	0.937	0.700	0.998	0.348	0.170	0.619
Residential & farm infrastructure	0.978	0.887	0.999	0.887	0.785	0.958
Services	0.811	0.649	0.924	0.987	0.822	1.000
Utilities	0.748	0.452	0.935	0.304	0.109	0.691
Transport and communications	0.840	0.550	0.978	0.954	0.563	0.999
Mining	0.642	0.342	0.880	0.511	0.186	0.806
Waste treatment and disposal	0.936	0.695	0.997	0.706	0.143	0.992
Lake	0.843	0.557	0.997	0.260	0.023	0.938
Reservoir/dam	0.847	0.566	0.976	0.955	0.552	0.999
River	0.938	0.698	0.998	0.882	0.313	0.997
Marsh/wetland	0.938	0.701	0.998	0.754	0.456	0.949
Estuary/coastal waters	NA	NA	NA	NA	NA	NA