Land Use Mapping of the Fitzroy Catchment.

Fitzroy Catchment Implementation Project
Final Report July 2000

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In Brief

The Fitzroy catchment has undergone significant changes over the past few decades. There are major changes in the way water and land resources are being used. Extensive clearing of brigalow has given way to large tracts of grazing and broad acre cropping. Irrigated cropping areas have developed following construction of several large reservoirs. Open cut coal mining has developed with the discovery of the Bowen Basin coal reserves. Associated with these changes are increasing concerns for overall catchment and river health, and concerns for any down-stream impacts from land use practices.

The Fitzroy is critically important to the Queensland economy. The challenge is to foster and manage economic development while minimising any impacts upon the nature environment, also a vital part of the Fitzroy economy and lifestyle.

This project is a precursor for an Australia -wide resource management, monitoring and reporting system, which is investigating land use, land management practises, and the state of our natural resources. Similar projects have been conducted in Victoria, South Australia and Western Australia as part of the Audit.

This project has integrated 3 components designed to assess the state of the catchment and guide improved natural resource management:

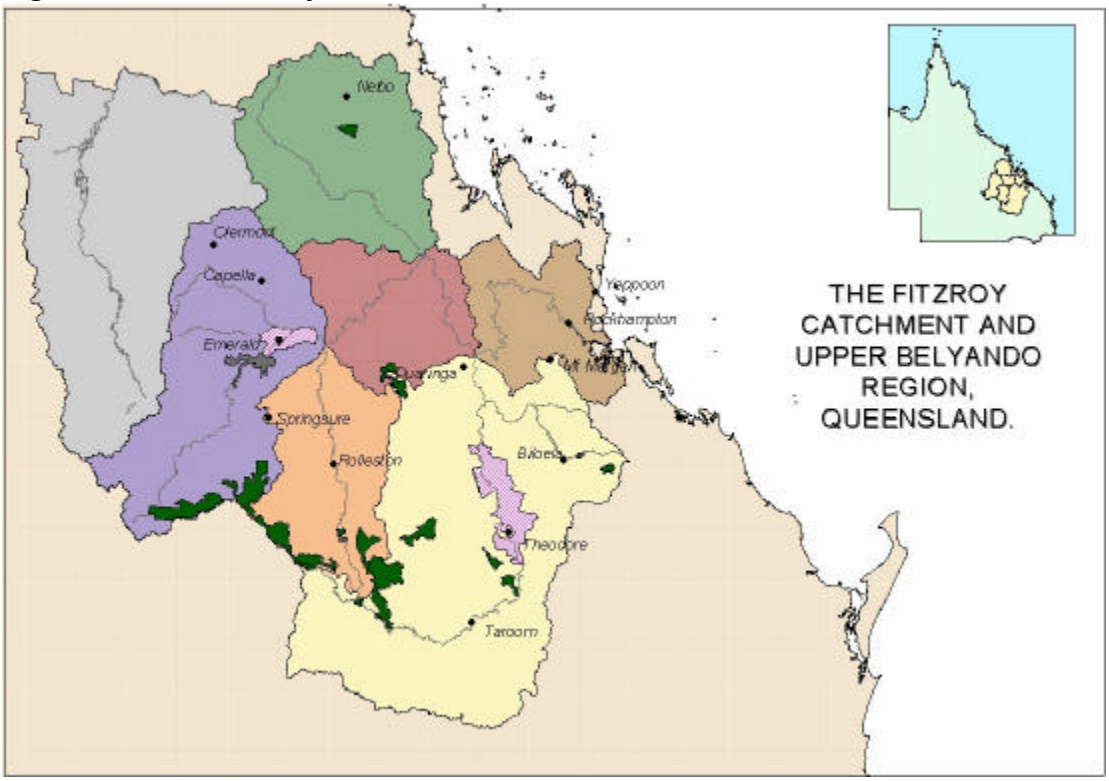
- Land use mapping
- Riverine and estuarine health
- Community capacity for change towards sustainable land management

The main emphasis of this project has been to supply information to support natural resource management and planning processes. The project also explores relationships between the environment and people in the catchment. The project has as a major priority obtaining and making readily available reliable and consistent information, so that overall catchment health can be monitored in an efficient and consistent manner.

The Fitzroy Catchment

The Fitzroy Catchment in Central Queensland covers an area of approximately 14.2645 million hectares or 35.23 million acres. It is the largest river basin draining to the east coast of Australia and flows into the southern end of the Great Barrier Reef.. The catchment comprises six major sub catchments: the Nogoa, Comet, Isaac-Connors, Mackenzie, Dawson and Fitzroy Rivers. The catchment is characterised by a sub-tropical, semi-arid climate with high rainfall variability. This rainfall variability is a key factor in managing land use to minimise impact on catchment resources.
The study area for the project covers the Fitzroy Catchment as well as the western and northern portions of the Central Highlands lying within the upper Belyando catchment adjacent to the western watershed of the Fitzroy Basin. The study area is shown below in Figure 1.

Figure 1 — The Project Area



Base map reproduced by permission of the General Manager, Australian Surveying and Land Information Group, Canberra, ACT (1999). Drainage, coastlines and major rivers data supplied courtesy of Australian Surveying and Land Information Group, Canberra, ACT (1999).

The study area has a population of about 155,000 and contains 10% of the agriculturally productive land in Queensland. Grazing is the major land use in the catchment with livestock sales comprising 57% of the value of the value of agricultural production (OESR, 2000). Other major industry include irrigated agriculture (cotton), dry land cropping and coal mining.

Summary

Project Outputs

This project has produced:

- Fully attributed digital land use datasets and supporting databases for the Fitzroy River Catchment according to nationally agreed specifications at a scale of:
    - 1:100,000 for the whole catchment and
    - 1:25,000 for the Emerald Irrigation Area and the Dawson Valley Irrigation Area.
- Fully attributed digital sub catchment boundary datasets for the Fitzroy River Catchment at a scale of 1:100,000.
- A series of 10 Land Use maps covering the Fitzroy River Catchment.
- A series of 16 Land Use maps covering each shire in the Fitzroy River Catchment.
- Metadata for all input and derived datasets.
- A statistical summary of land use captured within the catchment, each major sub catchment and each shire within the catchment. A statistical analysis of this data is currently under way. Results will be forwarded when available. Results of this analysis are expected in September.
- Progress reports of the project.
- This final report detailing methods, results and conclusions including an assessment of quality and accuracy of the information provided.
- A State of the Catchment report for Land Use in the Fitzroy River Catchment.

Project Findings

Methodology.

The methodology used for the project worked well and is described in detail later in this report. The major area of improvement would be to have the remote sensing officer located with the field officer in the study area.

A standard for project mapping complexity needs to be developed to ensure that all parties have a common understanding of polygon sizes at specific mapping scales and Land Resource mapping standards. This has been discussed with Dr. Rob Leslie and Dr Lucy Randall.

The Baxter Russell classification needs to be updated to include specific local requirements. Teleconferences have been held regarding this issue with Dr. Rob Leslie and Dr Lucy Randall and all other Land Use Mapping projects in Australia.

Data Use to Date.

In discussions, dealings and data exchange with community groups, local government, state government and commonwealth government departments the data has been very well received. The data has been extracted for each Local Government area and maps are currently being created for inclusion into the Local Government planning schemes. Data has been supplied extensively within DNR as well as to three (3) state and two (2) commonwealth government agencies. Data for each shire is being supplied with the map of the shire as they are produced. Six (6) shires have been completed at this stage with a further ten (10) to be completed.

Additional Reports.

A State of the Catchment report has been completed for Land Use and is being distributed with data and maps.

Landholder Concerns.

Throughout the field verification operation, landholders were obliging and extremely helpful in supplying information in relation to land uses on their properties. However, there were serious concerns expressed by the vast majority of landholders who were visited by field officers and it is important these are noted. These concerns may affect future land uses within the catchment. The major concerns were:

- Water allocation.
- Land clearing.
- New forestry regulations.
- New coal mines.

Statistical Analysis.

A statistical summary of land use captured within the catchment is included below. A statistical analysis of land use captured within the catchment, each major sub catchment and each shire within the catchment is currently underway. This analysis will investigate if it is possible to determine if the land use in any of the major sub catchments or shires are indicative of land use in the whole of the catchment to a confidence interval of 95%. Results of this analysis are expected in September.
The implications of the undertaking of producing a dataset of land uses within the Fitzroy River Catchment became apparent during the planning stage of the project when consideration was given to the actual geographical size of the catchment. As already stated previously in this report, the catchment covers approximately 14.2 million hectares and the logistical requirements involved were numerous and far reaching.
Mapping issues for the project include:

- TM satellite scenes: 13.
- 1:100000 map sheets: 83.
- Local Authorities: 16.
- Kilometres traveled during field verification: 36,000.

The following table (on the next page) of quantitative statistics details land use by area within the catchment.

Description	Hectares	Sq. Km	Percentage
Grazing	11,740,587	117,405	82.29%
State forest	806,019	8,060	5.65%
Permanent cropping	670,011	6,700	4.70%
National park	508,108	5,081	3.56%
Crop/pasture rotation	280,002	2,800	1.96%
Irrigated permanent cropping	65,570	655	0.46%
Mining/extractive industry	54,603	546	0.38%
Managed resource protected area	38,984	389	0.27%
Institutional uses	31,944	319	0.22%
Utilities	17,444	174	0.12%
Improved & fertilized pasture	13,744	137	0.10%
Water	11,698	116	0.08%
Urban uses	10,470	104	0.07%
Irrigated crop/pasture rotation	4,831	48	0.03%
Rural residential	4,385	43	0.03%
Irrigated horticulture	3,064	30	0.02%
Transport & communication	1,316	13	0.01%
Unused land	1,078	10	0.01%
Horticulture	999	9	0.01%
Industrial	855	8	0.01%
Irrigated improved & fertilized pasture	512	5	0.00%
Intensive primary production/processing	396	3	0.00%
Waste treatment & disposal	228	2	0.00%
Plantations	12	0	0.00%
Total	**14,266,860**	**142,657**	**100.00%**

It is important for users to note that all land not covered by the other 23 land use classification has been classified as grazing.

Where To For The Fitzroy River Catchment.

Land Use Mapping

To further develop and ensure community and stakeholder use of the database of land use knowledge of the Fitzroy River Catchment it is recommended that three (3) major activities take place:

- Extend the land use mapping data coverage to include the whole of DNR Central West Region. This will assist in gaining a greater understanding of land use in the drier western areas of Queensland.
- Map land use for the Central West Region for the years 1988, 1991, 1995 and 1999 to gain an understanding of the change in land use over the past decade. A statistical analysis of this data should allow a greater understanding of land use over time.
- A further project entitled "Signposts For Agriculture" has been developed and one part of the project will be to map landform and another is to define Land Management techniques in the catchment. These outputs will link to Land Use and Water Quality. These outputs combined with the social inventory will form a significant catchment information database.

Key Findings Of The Study

Organisation and Logistics:

The collection of land use data within the Fitzroy catchment proved to be an invaluable learning experience for the officers involved. The operation, whilst well planned and organized and with a logical and detailed guideline to follow, showed that there are issues which need to be addressed if the mapping is to be extended to cover all of Australia.

The time allowed to complete the project should have been extended. The Fitzroy River Catchment has a very complex mix of land uses at a mapping scale of 1:100,00 with the final dataset having 7,273 polygons. The project's resources were severely stretched to meet the allocated time frame. Considerable work was performed out of hours and after the predicted completion date of the project. A more reasonable time period to complete this project is 18 months. In less complex areas or at a smaller mapping scale this would not be as big a problem. In complex areas with a mapping scale of 1:100,00 such as the Fitzroy Catchment an estimate of 50,000 square kilometres per person per year is more realistic.

Field survey in same seasons as remote sensed data acquisition.

The 1997 imagery, captured during the winter months, June, July and August was quite suitable with clarity of images, helped by the clear winter weather, being a very big factor in being able to identify smaller classification areas. The bonus was that the field verification part of the project was able to happen, mainly through those same months when similar cropping conditions occurred with a similar crop pattern as existed in 1997.

Landholders concerns

Throughout the field verification operation, landholders were very obliging and extremely helpful in supplying information in relation to land uses on their properties. However, there were serious resource management concerns expressed by the vast majority of landholders who were visited by field officers and it is important these are noted. These concerns certainly affect DNR and may well affect future land uses within the catchment.

The major concerns were:

- Water allocation. During the verification process, many landholders greeted the field crew with questions relating to water allocations e.g.:
    - " Are we going to lose water allocations?" or
    - "We want to increase our water allocation" or
    - " Are there further dams/weirs being planned in the immediate future?" or
    - "Is the Nathan dam going ahead ?"

  In the Mackenzie and Isaac rivers junction area, landholders were particularly interested in increased allocation for increased production of irrigated cropping. If allocations are increased, it is expected that land uses will change. Careful design of development and management of practice will be essential. This would then ensure minimal impact on catchment health while still maximising production opportunities. These concerns were also expressed along the Dawson river, south of Duaringa where large tracts of land are currently being prepared for flood irrigation.
- Land clearing – vegetation management. Every where in the catchment, questions were put to the field crews in relation to the proposed land clearing legislation on freehold tenure. Without exception, landholders were frustrated by not knowing when the proposed legislation would become law and did not fully understand how the rules

would affect their property management. This was having an obvious affect on land cover and land uses. Field crews witnessed many areas being extensively cleared, including areas of virgin forests and regrowth.

- New forestry regulations. Field crews were queried in several districts in relation to new forestry regulations and the effect on local economics. Two areas in particular, the Injune district where the milling of native timbers is the biggest employer of locals and east of Taroom where landholders are grazing stock in forestry reserves and were concerned with future clearing regulations.
- Several landholders in the area south of Blackwater were concerned with the possibility of new coal mines coming in to production near or on their land. At least two landholders in this area had been approached by mining companies but others were concerned about the potential of losing grazing land to industry.

Review of Baxter Russell Classification.

The Baxter and Russell Land Use Classification Guidelines provided an excellent source of information with fairly clear definitions for the majority of classes. The guidelines did not however have some of the classifications crucial for the correct portrayal of land use in the Fitzroy catchment. It was also found that some of the classes were ambiguous and open to interpretation and needed clarification. Additional classes have been added to the classification for use within the Fitzroy Catchment.

1.7 Managed Resource Protected Areas.

There was a need to show areas that fell within permanent cropping and crop/pasture rotation polygons that were not actually part of the dominate classification but existed as areas of a different class. For example, often within a cultivated paddock, the landholder has left a strip either side of a water way or gully (riparian vegetation) or left a rocky outcrop that would be impossible or at least very difficult to utilize. These areas have been designated as managed resource protected areas as this classification best suits these areas.

1.8 Unmanaged/Unused Land

It was determined that the term ‘Unmanaged land ‘ was not appropriate as all land within the catchment is either owned on freehold tenure or a custodial relationship existed. Therefore, the land is managed however infrequently and the term ‘Unused land’ is more applicable or correct in this context.

Native and Improved Pastures - 2.1Grazing of native pastures and 3.2 Grazing Improved and Fertilised Pastures

Showing the difference between these classes is difficult and would prove to be contentious and open to vigorous debating from landholders. Given the time frame, it would have been impossible to differentiate between areas of improved pastures and native pasture around. For example in the Springsure Rolleston area the locals and the district officers tell us that “it’s all buffle ‘round here mate“ but areas of native pasture were identified. To delineate between what has been sown or modified and what is native would mean trying to find the extent of these modified areas within each paddock and that is not feasible given the areas involved and the time frame of the project. The classifications are open to interpretation and it was felt that the important issue was land use i.e. grazing and any resulting land degradation. As a consequence, a decision was made during the field verification of the first image, Emerald, that areas shown as “Grazing” on the map sheets and in the final dataset would and do include grazing on native and improved pastures. There is a need for a third

category "Mosaic". Where native or improved pastures are readily discernible and mappable at appropriate scales they should be and all other areas are mapped as a mix or mosaic.

Grazing Improved and Fertilised Pastures
The only *Grazing Improved and Fertilised Pastures* shown as such on map sheets and in the final dataset is that of leucaena. After discussions with district officers, it was decided that this was the only item of this class that could be positively identified.

Crop Pasture Rotation.
The difficulty in this class is that the guidelines are open to interpretation and do not offer a time frame. If once every five, ten or fifteen years, for reasons of need or commodity prices the land holder puts in a crop for maybe two years then lets the paddock revert to pasture, is this to be classified as pasture crop rotation? It is straightforward where the crops are regularly rotated but that is generally the exception not the rule. Sometimes the landholder would assure the field officer that an area has never been cropped yet on previous imagery, the area can be identified as being cultivated or modified in some way. To achieve consistency, it was decided that the areas determined to be crop pasture rotation have been selected from 1991, 1995 and 1997 TM satellite imagery.

How relevant is this classification to a static dataset? It would be logical to show the land use as it was at the time of imagery i.e., cropping or pasture.

Intensive Primary Production/Processing
In the course of field verification, all feedlots, red-claw farms, piggeries, poultry farms, emu and ostrich farms and dairies, have been located and identified and classified as IPP's. To ensure all IPP's were noted, Environmental Management Services (EMS), DPI Toowoomba who hold the geographic location of all registered feedlots in the catchment were contacted and the locations obtained. It was surprising to find the number of feedlots shown which have quite small operating capacities.

In discussions with DNR and DPI personnel from various districts, it would appear that EMS have included feedlots that operate intermittently. Many of the feedlots (using the Clermont district as one example) within the catchment only operate when commodities and conditions make them viable. Many of these feedlots are small with 100 to 250 head processed per week and it is questionable whether they should even be classed as feedlots. This issue needs to be debated. As a consequence, the only feedlots shown in the dataset are those whose size conforms to the standards of 1:100000 mapping.

EMS does not have a register of piggeries or poultry farms. Several piggeries were located but once again, only those whose size conforms to the standards of 1:100,000 mapping standards have been shown.

Several dairy farms were located. The polygon identifying the dairy includes the milking shed and associated yards.

One emu and two ostrich farms were located and shown where the size conformed to the standards of 1:100000 mapping.

Several redclaw aquaculture sites were located although the majority of these farms are far below the required size and have not been shown.

Rural Residential
Because of the ambiguity of this classification, discussions were held with all shires located within the catchment. It was determined that each local authority has their own definition of this class. Shire councils indicated the areas that are, in their bylaws, classified as rural residential. More research needs to be done on this classification. While the local authorities have supplied information according to their guidelines, time did not allow for more intensive investigations into other areas which could be described as Rural Residential.

Classifications not covered in the Baxter Russell Classification that have been added as necessary to give a complete picture in the catchment.
5.9 Industrial. This class is not identified at a secondary level in the Baxter and Russell Guidelines as a class of it's own but falls within 'Urban uses ' as a tertiary level. Because of the size of the industrial areas within the confines of the city of Rockhampton and as the Rockhampton City Council has a definite categorization of Industrial in their strategic plan, this class has been specifically introduced.

Several tertiary classes have also been added. The major crop within the Emerald and Dawson Valley Irrigation Areas is irrigated cotton. Permanent and irrigated forage crops are also a feature of both areas. The new classes introduced are:

- 3.2.7 Leucaena
- 3.5.7 Cotton
- 3.5.8 Forage crops
- 4.2.7 Irrigated leucaena
- 4.5 7 Irrigated cotton and
- 4.5.8 Irrigated forage crops.

Water Bodies
The vast majority of water bodies found in the catchment area are man made water storage features such as the dams on properties. They are used to water stock or enhance crop production, and large reservoirs like Lake Maraboon are used to supply water to populated areas. Lake Nuga Nuga and those stretches of the lower Fitzroy River large enough to be show at the scale of mapping are natural water bodies which should be shown as a different land use. Therefore, all the man made water storage bodies have been designated as:

- 5.5 Utilities for the 1:100000 data and …
- 5.5.2 Water storage/treatment for the dams, reservoirs, water treatment plants for the 1:25000 data.

The natural water bodies are

- 1.9 Water for the secondary data and
- 1.9.1 Natural water bodies for tertiary data.

Mining/Extractive Industry
The large area of the Bajool Saltworks, approximately 45km SE of Rockhampton has been classified as 'Mining/extractive industry'. These salt works are not reliant on tidal influences. Brine is pumped from underground after which evaporative processes take place to leave the mineral salt. The decision to give this classification was determined from the fact that salt is a mineral extracted from the surface of the Earth and this was further reinforced by referring to the publication; 'An Introduction To Economic Geology and It's Environmental Impact' by A.M. Evans, Blackwell Science Ltd, Oxford 1997.

Since 1999 however the use of brine has ceased and only sea water is used. The classification will however remain as 'Mining/Extractive Industry.'

Unused Land

Areas of land within the confines of the lower Fitzroy river and Lake Maraboon have been classified as 'Unused land ' as opposed to "Unmanaged land ' as all land within the Fitzroy catchment is either owned on a freehold tenure or has a custodianship attached which means it is managed, albeit not on a regular basis. There are mangroves and salt marshes and it is suggested that fisheries habitat be used to describe its use.

Methods Used In The Project.

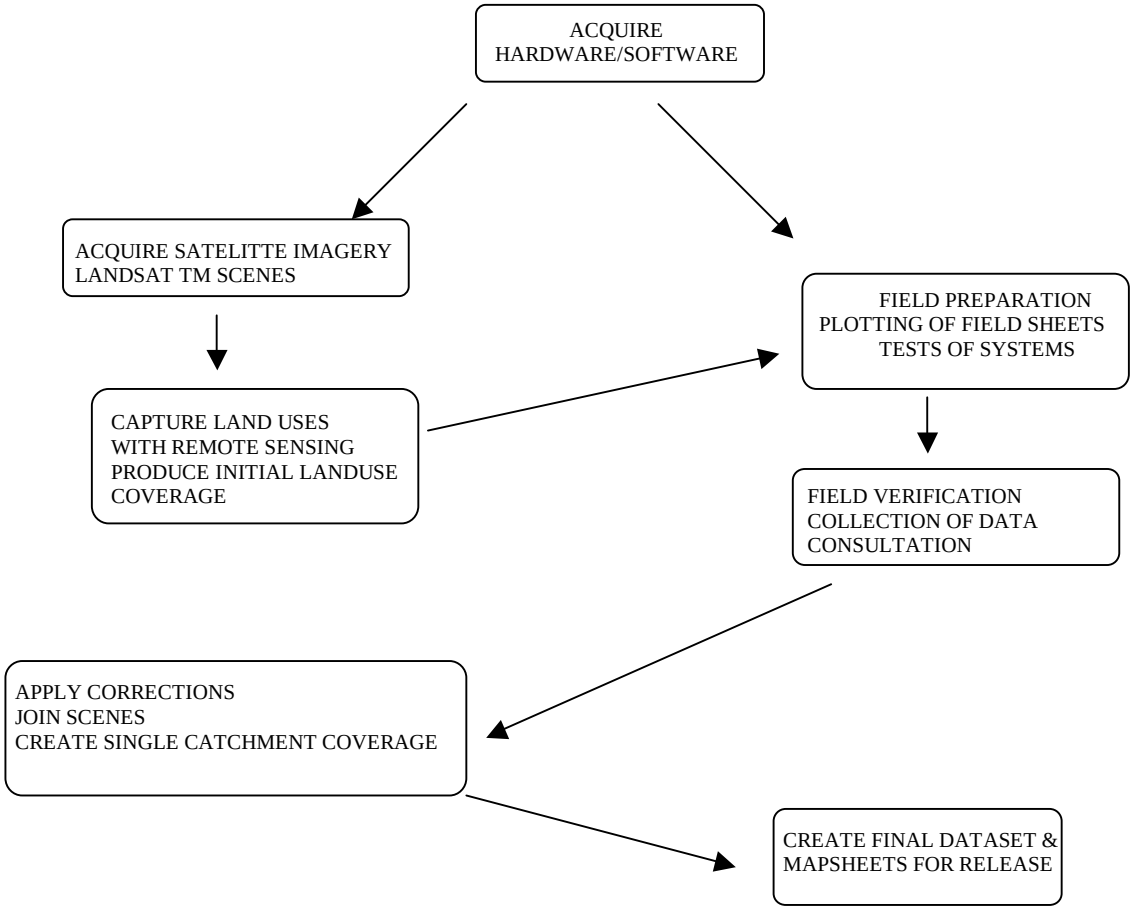
The procedures and methods for the capture and processing of data for land use mapping within the catchment are summarized below.

The land uses in the catchment were mapped from remote sensing coverage for the winter months of 1997 using Landsat TM imagery. Remotely sensed areas and land use classifications obtained from the Queensland Digital Cadastral Data Base (QDCDB) were verified in the field along with consultation with landholders, local authorities and DPI/DNR district officers.

After field verification, corrections and changes were applied during a final edit. The final mask was then manipulated and converted into a classification coverage displaying the fields required by the National Land and Water Resource Audit (Audit) and prepared for release.

The following flow chart also shows progressive steps taken.

LAND USE MAPPING FLOW CHART



Preparation: equipment and software.

Prior to the actual collection and creation of datasets classifying land use in the catchment, dedicated hardware/software and specific equipment was purchased or leased and prepared for service.

Pre-project preparation included:

- A dual-cab Mitsubishi Triton tray back 4WD vehicle was leased from Q Fleet for 12 months/50,000 kilometres for the field verification operation of the project.
- An additional 12 volt battery was installed to allow for two additional electrical ports to be added to prevent unintentional shut-down of positioning and navigational units.
- A Global Positioning System (GPS) receiver and Differential GPS receiver were purchased and mounted in the vehicle for navigation and positioning of features/land uses.
- A laptop with a 5Gb hard drive and 12 volt transformer were purchased with the transformer mounted in the vehicle.
- A mobile phone for communications dedicated to the land use mapping project.
- Specific tracking/logging software, Computerized Information Gathering System (CIGS) was purchased and loaded on the laptop.
- A dedicated PC and ERDAS Imagine imaging software package and license were purchased for the remote sensing applications of the project.
- Landsat TM imagery for 1991, 1995 and 1997 along with crop masks for 1991 were acquired from Statewide land cover and Trees Study (SLATS).

Preparation for field verification.

Various scripts, datasets and mapsheets had to be created and produced, methodologies for the collection of data had to be trialed and testing of equipment had to be carried out before actual field verification could begin. District and field officers from the Department of Natural Resources (DNR) and the Department of Primary Industries (DPI) and representatives from local authorities were contacted and meetings arranged for collection of information in localized areas.

Specific procedures included:

- As a dataset of the Fitzroy Catchment and major sub-catchment boundaries conforming with 1:100000 specifications did not exist, a new dataset was created by firstly defining the boundaries from existing 1:100000 topographical mapsheets. This dataset was digitized into an ArcInfo coverage.
- Use the ArcInfo command : *clip* to create a dataset of cadastral information within the confines of the catchment and use ArcEdit command ; *select area gt 250000* (select area greater than 250000 square meters or 25 hectares) to produce a workable dataset, uncongested within town areas.
- Using the ArcEdit command: *select tenure,* State Forests and National Parks were extracted from the QDCDB and put into separate ArcInfo coverages.
- Satellite images were converted to.tif files using bands 5 4 2 for compatibility with the CIGS software used for navigation and data collection, using ERDAS Imagine version 8.3
- Create ArcInfo coverage of remotely sensed land use mask (in.img format) received from the remote sensing officer by using the Arc commands: *imagegrid* and *gridpoly* to convert the.img file into a coverage.
- To enable ArcInfo coverages of the QDCDB, catchment / sub-catchment boundaries and land use classifications to be compatible with the CIGS software on the laptop,

use the Arc command: *ungenerate* to create a.lin2 file which is peculiar to that particular software.
- Prepare Applied Macro Language (AML) script to create 1:100000 field verification sheets with image, DCDB, catchment/sub-catchment boundaries, classification coverage, national parks and state forest coverages, grid and legend.
- Print all 1:100000 field verification map sheets.
- Become familiar with and amend Baxter and Russell guidelines to suit the region.

Remote sensing preparation and methodologies

Naming conventions
3 basic stages are required using Erdas Imagine software to produce a land use mask for a raster or vector coverage in the Fitzroy Land Use Mapping Project (LUMP). The naming convection should reflect each stage. The first stages are temporary (such as initial raster editing) and are deleted as they are superseded by updated images.
Storing files
Files created or used by remote sensing officer are stored on the local D drive under Fitzroy. Each scene has its own folder and all files relating to that scene are placed in this file. There are several extra folders:
- Coverages: generally vector coverages created in ArcInfo.
- Reports
- SLATS additional data from the slats file store, and updated crop masks using slats methodology.

Files created by remote sensing officer are also stored on a separate drive:
- fera on 'indplly7'/habitat and resource assessment/projects/fitzroy.

SLATS will store the updated crop masks but the classifications will be altered as per SLATS methodology.
Naming structure
I have followed the SLATS file naming structure as being practical and easy to follow.

f	b	l	a	9	7	a	u	_	1	f	0	c	.	i	m	g

The file name is broken into 'f' (c1), unique scene id (c3), scene date (n2, c2), an underscore to visually break scene information from processing information, scene processing stage (n1) and scene coordinate information (c1, n1). Compressed scenes are tagged with a 'c' (final letter). Compression has been applied to the projected scenes to decrease storage space.
fbla97au_1f0.img
To avoid confusion with SLATS, every file generated by myself for the Fitzroy LUMP starts with 'f'.
fbla97au_1f0.img - *unique scene id*
Represents the 1st 3 letters of the scene name, eg bla is for blackwater. The Fitzroy catchment only contains 13 scenes, and there is no duplication of id's.
fbla97au_1f0.img - *scene date*
Obtained from SLATS files, all image data is named according to the year and month of data capture. The 1st 2 numerics are the year of data capture (97 = 1997) and the last 2 characters are the month (ju = june).
Codes for months that conflict are as follows:
June = ju
July = jy
fbla97au_1f0.img - *scene processing steps*

The processes used in the Fitzroy LUMP are fully described in stage 1 methods. There are 3 main steps which are numerically labelled. These are as follows:
Fsssyymm_1f0 - initial raster edit of land use mask.
Fsssyymm_2s5c - projection into zone 55 of initial raster edit
Fsssyymm_3s5c – amended land use mask after field editing
fbla97au_1f0.img - ***scene co-ordinate information***
Lets the user know what co-ordinate system the data is in.
f = file based or 'raw' pixel/row coordinates
s = GPS ground surveyed GCP's in AMG coordinates (Australian National Spheroid, AGD84 Transverse Mercator Projection) to provide the transformation parameters for final re-sampling.
The second numeric field is for AMG zone information. The possible entries for this field are:
0 = not on the AMG
5 = AMG zone 55
6 = AMG zone 56
SLATS naming conventions
Several files are used from SLATS in order to generate these files. Contact SLATS to gain access to the SLATS homepage: http://atrax.dnr.qld.gov.au/ciss/slats for a description of SLATS naming conventions.

Methodology: raster editing land use mask
Raster editing involves modifying the existing 1991 SLATS crop mask to the Baxter and Russell land use classification scheme used by the National Land and Water Resource Audit (NLWRA) and Fitzroy LUMP. The SLATS crop mask classification is as follows:

Table 1: SLATS crop mask classes

Class no.	Class name
3	Miscellaneous crop
4	Sugar
5	Broadacre
6	Horticulture
16	Orchard

The Baxter and Russell (B&R) land use scheme is a more detailed system. 3 tiers of classifications were developed based on mapping scale, and on the level of land use detail. A mapping scale of 1:100,000 was decided for the Fitzroy LUMP, based on catchment size and methodology (particularly Landsat TM with 30m pixel size). Table 2 shows the 1st and 2nd tiers of the B&R land use scheme. Note that industrial urban has been separated from residential urban, which is currently not included in the 2nd tier of the B&R scheme but may be in the future.

- Step 1
  Output name: fsssyymm_1f0.img
  In windows explorer: copy SLATS raster crop mask, named ssss91mm_m0f0.img and rename as fsssyymm_1f0.img
  Define classes
  In Erdas Imagine 8.3.1
  Open 1f0.img in viewer 1. Open AOI tool box and use polygon or box tool to select an AOI in the mask that is currently classed '1'. Under Raster ⇒ Tools select either

Fill Area icon or Recode area icon to reassign a class value of '20'. Save image then close. It will take a few seconds to process statistics.

Re-open 1f0.img. Under Raster ⇒ Attributes add another column (column icon ⇒ choose 'new', click 'editable, title = class; type = string, display width = 15. OK.

To copy colours from one mask to another, open viewer ⇒ 1f0.img (a mask previously assigned these colours) ⇒ Raster ⇒ Raster Attribute box. Right click on head of column, copy. Right click on head of column of new mask, paste; colours should be copied from old to new file. Class names can be copied the same way (ensure that column attributes are the same for old and new).

Assign an opacity value of 0.5 for all colours except class 0 and 1 (assign zero for these 2 classes).

Save Raster Attribute Editor then close.

Raster Editing

- Display

  Open 3 or 4 viewers.

  In viewer 1, open slats ssssyymm_l0f0.img (or q1f0.img if 1997 or later): file ⇒ open ⇒ raster layer. Go to raster options, select bands 2, 4, and 5 OR bands 3, 4 and 5. OK. These bands distinguish between cropping and grazing better than any other combination. You can change bands during raster editing by selecting View ⇒ arrange layers, right click on file layer to be changed ⇒ band combinations. Overlay with 1f0.img: file ⇒ open ⇒ raster layer: go to raster options and de-activate 'clear display', OK.

  Open viewers 2, 3 and 4 with 91, 95 and 97 l0f0/q1f0.imgs from SLATS (to enable a temporal comparison between land uses, which is important for distinguishing between rotation and permanent cropping). Geo link all viewers (right click on viewer ⇒ geo link/unlink, click on image to be linked). Increase scale to see detail clearly (view ⇒ scale ⇒ scale tool, enter ~ 1500 to 2000, whatever; but always work in the same scale).

  Scan image by working across scene (use hand icon to move scene), keep a tab on coordinates, and overlap each scan to avoid missing any areas.

- Digitising

  Select AOI ⇒ tools. Polygon AOI is the most useful tool, also Rectangle AOI and Polyline AOI. Digitise area to be changed. Go to Raster ⇒ tools ⇒ select recode area icon, change new value to the preferred class (eg for an airstrip, change class 1 to class 13). Note: AOI must be selected. If you apply recode values and an AOI is not selected, the entire scene will be recoded (you can cancel this operation by pressing the cancel button that appears at the bottom of the viewer). Several AOI's can be selected at the same time by selecting the Box select AOI icon. You can also use 'fill area' tool in the raster tools to change class values, but the 'recode area' icon allows you to change several values at once.

- Region grow tool

Water can be selected using the region grow tool; it is quicker and more accurate than digitising. Go to AOI ⇒ seed properties. De-select area and distance. Set spectral euclidean distance at 50 (you may need to experiment with this number). Close. Go to View, change layering so that l0f0.img or q1f0.img is the top layer. Select 'region grow AOI' icon in AOI tool box, and click inside a water area. The AOI will take a few seconds to form. Go back to View and change layering so that 1f0.img is on top. Recode AOI.

- Step 2

Output name = fsssyymm_2s5.img
The raw coordinate mask is projected into zone 55 of the Australian Geodetic Datum (AGD 84), to enable field checking.

  - Zone 55

    In the Fitzroy catchment, the Landsat TM scenes mackay, moranbah, st lawrence, alpha, emerald, blackwater, carnarvon, injune, roma and yeppoon are in zone 55.

- In Imagine 8.3.1

Go to Data Prep ⇒ Image Geometric correction, select 'From Image File', click 'Open File' icon and find 1f0.img file to be projected, OK.
In Set Geometric Model box select "Polynomial', OK. In Polynomial Model Properties box select Projection ⇒ Add/Change Projection. In Projection Chooser box select Custom. Enter following (check this coz geocentric datum gets changed in 2000):

  - Projection type = Transverse Mercator
  - Spheroid name = Australian National
  - Datum name = AGD 84
  - Scale factor at central meridian = 0.9996
  - Longitude = 147.0 E (zone 55 – for *)
  - Latitude = 0 N
  - False Easting = 500,000 meters
  - False northing = 10,000,000 meters
  - OK, close.

- In GCP Tool Reference Setup box: select Keyboard only, OK. A 'GCP Tool : (input : file name (Reference : No File)' box will appear. Highlight X Input Y Input X Ref Y Ref columns (click and drag), right click, select Import. In Import Column Data box, click 'open file' icon and select l3s5.dat file for scene. (l3s5.dat files are SLATS files of differential GPS control points collected in the field – 5 represents zone 55, hence 6 represents zone 56).
  Select Options. In Import Column Options, change Separator Character to comma, and change column / field table (table 2).

Table 2

X Input	2
Y Input	3
X Ref	4
Y Ref	5

  OK

- Check that GCP's are accurate (total RMS Error should be < 0.7. If RMS error is large, delete any rows that have zero coordinates. If RMS error is still > 0.7, delete rows with largest RMS error, ie >1. BUT: 1st check that GCP is not essential by referring to image and proximity of other GCP's. If GCP is an isolated point, best to leave it. To delete, highlight entire row, right click – choose delete).
  In Geo Correction Tools box, select 'resample' (coloured squares) icon. In Resample box, enter output file name (fsssyymm_2s5.img); in resample method, choose 'cubic convolution' if resampling a satellite image; choose 'nearest neighbor' for a mask ('cubic convolution' takes a lot longer to process). Adjust Output Corners to nearest multiple of 25 (eg, 745 887 ⇒ 745 875), adjust Output Cell Sizes to 25, activate 'ignore zero in stats', OK.

Processing will take a few minutes to complete.

- Zone 56
  3 Landsat TM scenes (chinchilla, monto and gladstone) are positioned in zone 56 by SLATS, and need to be re-projected to zone 55 in order to be used in the Fitzroy LUMP.
  Follow the same procedure as above but with the following differences:
  In Projection Chooser box, Custom, enter Longitude = 153.0 E (instead of 147.0 E).
  In Import Column Data box, file is called ssss91mm_ l3s6.dat instead of l3s5.dat
  Go to Session ⇒ Tools ⇒ Coordinate calculator. Co-0ordinate Calculator box will appear. In GCP Tool box, highlight X ref and Y ref columns (click and drag). Right click then click 'copy'. In Coordinate calculator box, highlight input X and input Y. Right click then click 'paste'. Check that input numbers have been copied correctly and ignore output numbers. Go to 'projection' ⇒ 'set input projection', change projection parameters to zone 56. Go to 'projection' ⇒ 'set output projection', change projection parameters to zone 55. Copy and paste output X and output Y columns into X ref and Y ref columns in CCP Tool box.
  Check RMS error. It will probably be > 2. If it is < 0.7 it is ok, but anything bigger than that needs to be corrected. To correct RMS error, go to 'Display Model Properties' in Geo Correction Tools box. Under 'Parameters', change polynomial order to 2, then apply. This should reduce RMS error to < 0.7.

Mask size compression
Projected mask size is ~80Mb but can be compressed to ~1Mb by running through the modeller. Open Modeller ⇒ model maker. Create a simple model as shown in figure 2. Double click on input raster, enter input file, OK. Double click on function circle, Function definition box opens, double click on available input (your file name), OK. Double click on output raster, call output file fsssyydd_2s5c (remember that 5 represent zone 55). Ensure output layer is thematic and 'ignore zero in stats' is activated. Hit lightening bolt icon in top tool box, model takes a little time to run. Colour values and descriptions will need to be re-assigned (see figure 1), as they revert to grey scale and descriptions get dropped (for some reason).

- Step 3
  Output name = fsssyymm_3s5c.img
  The mask is then ready for field editing.

Field Verification : data collection.
After printing the 1:100000 field verification sheets, images of particular areas had to be loaded onto the laptop in a.tif format along with the.lin2 files of the classifications, DCDB and catchment boundaries. Zonal changes occur within the catchment and particular care needs to be taken to ensure the images are projected in their particular zone.
Thirteen (13) scenes covering eighty three (83) 1:100000 map sheets were covered during the field verification stage.

The procedures for field verification are :

- Convert the raster mask (in.img format) into an ArcInfo coverage using the Arc commands : *imagegrid* and *gridpoly*.
- Use the Arc command : *ungenerate* to create a.lin2 file of the DCDB, catchment /sub-catchment boundaries and the land use coverage and load on the laptop. Satellite images, in.tif format were also written to CD as backup and as a space saving measure.

CIGS software accepts.tif and.lin files. The following files (table 3) are converted for field editing:

Table 3

Input file/Coverage	Output file	Description
chin97ju_q3s6.img	rgb_chin97_55.tif	Satellite image
97/98_2s5.img	97/98_2s5.tif	Land use mask (raster)
refitcat (Coverage)	refitcat.lin2	Land parcels > 25ha (vector)
chincov	chin.lin2	Land use mask (vector)
subcatbdy	catch.lin2	Catchment/sub catchment boundary

- District officers and local authorities were contacted at least one week prior to the field work commencing in their area and arrangements made for data gathering meetings. Local authorities supplied information on waste disposal, rural residential areas and the general infrastructure of their shires.
- All land use classifications were visited excepting for those noted on the field sheets, where it was not possible to gain access to acquire a visual sighting or confirmation from landholders. The laptop, GPS and DGPS were connected and input data into , the CIGS software.
- Two methods of confirming/logging data were utilized. The codes allocated to the Baxter& Russell classifications for this project were marked/verified on the hard copy field sheets & the information was also logged in the CIGS software.

Configuring.txt files (also refer to CIGS User Guide)

The CIGs User Guide gives a detailed explanation of configuring.txt files in notepad. The following is an example of field definition information used to capture data for the Fitzroy LUMP. It is a very basic set of function commands to enable data to be entered into the laptop software.

- In notepad, enter on 1st line: $f1,Landuse,2,5
  on 2nd line: Types,L,16, 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18
  On 3rd line: Description,A,200
  $f1,Landuse,,2,5
  - $f1 = configuring data for F1 key
  - Landuse = type of information gathered
  - ,, = (2 commas) indicates that anyone can enter information; alternately enter MC, - initials and comma – to signature personalized entry
  - 2 = marker colour
  - 5 = marker size (1 – 10)
  - Types,L,16, 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18
  - Types = types of landuse
  - L = list
  - 16 = number of fields/classes
  - 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18 = number assigned to each land use class (eg 2 represents improved pasture, 16 represents water).
  - Description,A,200
  - Description = additional information you may wish to add
  - A = alphabetical characters (N = numerics)
  - 200 = limit to number of characters that can be entered.

Refer to CIGs user guide for general use of CIGs software.
Field data entered into the CIGs software is recorded as.log files.

- Logged data showed but was not restricted to the following information :
    - Year
    - Month
    - Day
    - Hour
    - Minute
    - Second
    - Easting
    - Northing
    - Number of satellites
    - Field (Classification code)
    - Operator

  The two methods were used in case of hardware/software failure and for the ease of in-field editing and final product editing. Each days' data log was downloaded onto floppy disks as a further back-up precaution.
- On completion of each satellite scene, editing of the log file and hard copies was carried out in office before dispatching the data on disk for conversion into vector coverages, able to be manipulated by imaging software. This process was repeated until all land use classifications on all scenes (7,273 polygons) had been verified/checked in the field.

Amendments to land use mask using field data
After field editing, hard copy maps and.log files are used to amend 2s5c.img files.

- In Arc/Info,.log files are converted to vector coverage:
    - Open log file in excel and delete 1st column plus any others that are blank or meaningless. Save as text file.
    - In Arcview go to Project Window ⇨ Table ⇨ Add, to open text file.
    - New view: View ⇨ Add Event Theme and select text file, easting and northing.
    - Theme ⇨ Convert to Shapefile
- In Arcinfo, convert shapefile to point coverage.
- In Imagine 8.3.1, project SLATS q1f0.img into zone 55 (see Step 2), and rename fsssyymm_q1s5.img.
- In Windows explorer, copy 2s5c.img and re-name 3s5c.img.
- Open viewer and load q1s5.img, overlaid by 3s5c.img. Raster edit using hard copy maps and converted.log files (arc coverages). (Note: overlay 1 arc coverage at a time).
  Reverting to raw pixel co-ordinates
  Output name = fsssyymm_4f0.img
  3s5c.img files can be reverted back to raw pixel coordinates.
  Check that overlapping land use mask edges match, ie that overlapping areas have the same classification value.
  In Imagine 8.3.1: Go to Data Preparation ⇒ Image Geometric Correction
  Select file to be de-projected, OK, select polynomial, OK. Under projection, Current reference map projection should be unknown, map units = other. Select 'set projection from GCP Tool' ⇒ keyboard only, OK, OK. GCP Tool box appears. Highlight X input, Y input, X ref and Y ref columns, right click, select import, select relevant.dat file (either l3s5.dat or l3s6.dat for Fitzroy – from SLATS), OK, select options in Import column data. In separator character, select comma, change fields to

2,3,4,5. OK, OK. Get coordinate calculator from Imagine 8.3.1 session ⇒ tools. In GCP box, highlight X input and Y input columns, right click, copy. In coordinate calculator highlight X input and Y input columns, right click, paste. In GCP box copy and paste X & Y ref columns to X & Y input columns, then copy and paste X & Y input columns for coordinate calculator to X & Y ref columns in GCP box. RMS is shown in meters: total RMS shouldn't be larger that 2/3 pixel (~ 18m). Individual GCP's shouldn't be greater that one pixel (~25m). Select Resample icon in Geo Correction Tools box, name file (this is only a temporary file), nearest neighbour for a mask, in output corners select 1 6920 5728 1. Output cell sizes = 1, ignore zero in stats, OK. Resampling should take a couple of minutes.
De-projected file will not be compressed and file size will still be a lot bigger than necessary. To compress file, go to Modeller in Imagine 8.3.1⇒ model maker. Place 2 raster objects in window with a function circle between them and a connecting arrow from raster to function to raster. Double click top raster object, select file name (temp file), OK. Double click function circle, highlight the 1 and only available input, OK. Double click the bottom raster object, nominate a new name, data type: unsigned 8-bit, file type: thematic, ignore zero in stats calculation, OK. Hit lightning bolt icon in model box to run model. Should take a few seconds. New file size should be vastly reduced.

Open de-projected file in new viewer. Colours and attributes should be lost. In a new view, open the original unprojected file. Open raster attribute editor for both files and copy/paste colours across. Create a new column for class names in the new image (same size and attributes as original), then copy across class names. Save new values and close all files. Check that de-projected scene is ok by overlaying onto relevant q1f0 or l0f0 scene or whatever. C'est finis!
Note: Both 1f0.img's and 2s5c.img's should be deleted when 3s5c.img's and 4f0.img's are complete, as they contain incomplete and incorrect data.

Stitching together scene masks
Output file name f_final_97.img

- Go to modeler ⇨ model maker.
  In New Model box, go to file ⇨ open, and open file named moya.gmd. This model contains 2 raster inputs connecting to a function as follows:
  CONDITIONAL { ($n2_*input2*== 0) $n1_*input1*, ($n1_*input1*==0) $n2_*input2*, ($n1_input1 == 1)$n2_*input2*, ($n2_*input2*)$n1_*input1* }
  Input 1 and input 2 are the 2 scene masks to be stitched together.
  The function is connected to a raster output.
  To use model, double click on raster inputs and find appropriate file ⇨ OK. Function will be automatically entered. Double click on raster output and enter new file name (temp file), change file type to thematic & ignore zero in stats ⇨ OK. Press lightning bolt icon from tool menu, model should take a while to run. The last file to be added will create the final mask; name this output file f_final_*yy*.img.
  Colours and descriptions will be lost when run through the modeller, so, they need to be re-added. Open final mask in Imagine viewer. Open a mask (pre-stitched) in another viewer. Open attributes under raster for both. Copy colours and descriptions across from original mask to final mask (see figure 1).
  Note: all scene masks must be projected into the same zone.
  To reproject zone 66 to 55, de-project file to raw co-ordinates 1st, then reproject into zone 55. It doesn't seem to fall in the right spot if its projected straight from 56 to 55 (for some strange reason).

Generation of final dataset, database integration and production of map sheets.
Upon completion of corrections to the mask, imaging software was utilized for the creation of one raster mask covering the catchment. This final mask (in.img format) was converted into an ArcInfo coverage, edited, manipulated and converted into a final dataset in Geographic projection ready for distribution to clients. Eight (8) 1:250000 sub catchment map sheets using 1:100000 data and two (2) 1:50000 irrigation area map sheets using 1:25000 data were produced.

Procedures for database integration and production of map sheets are :

- Convert the final mask (in.img format) into an ArcInfo coverage using the Arc commands : *imagegrid* and *gridpoly*.
- De-pixelize the coverage using the Arc command : *generalize* ensuring the weed tolerance is 50.
- Editing of the final coverage to check each individual poly for correctness was carried out in ArcEdit.
- A look-up table was created for the master dataset to show the fields to secondary classifications. Using the Arc command : *info*, a tabular data file ; **LUMP.INFO** was defined with four fields, GRID-CODE, PRIMARY, SECONDARY and DESCRIPTION using the following specifications for the parameters.

Parameters	***Description***
Item name	Any name (up to 16 alphanumeric characters – must begin with an alpha character)
Item width	Number of spaces (or bytes) used to store the item values.
Item output width	Number of spaces used to display item values.
Item type	Data type of the item. The most common item types are :
C	Character-any combination of alphanumeric characters
I	Integer-any characters that make up a valid integer
B	Binary integer-an integer number stored in binary format
N	Number-any characters that make up a valid decimal number
F	Binary floating point-a decimal number stored in binary format
D	Date-stored as 8 bytes : displayed as 8 or 10 spaces

The parameters used are demonstrated below.

GRID-CODE

- Item name > GRID-CODE
- Item width > 4
- Item output width > 8
- Item type > B

PRIMARY

- Item name > PRIMARY
- Item width > 4
- Item output width > 8
- Item type > B

SECONDARY

- Item name > SECONDARY
- Item width > 2
- Item output width > 4
- Item type > B

DESCRIPTION

- Item name > DESCRIPTION
- Item width > 50
- Item output width > 50
- Item type > C

- Once the LUMP.INFO table had been defined, the fields related to the 24 grid-codes as per the Baxter & Russell guidelines were entered in Arc : *info* using the *add* command as per the example below.

Enter command > add

- Grid-code > 4
- Primary > 3
- Secondary > 5
- Description > Permanent cropping

Continue entering the classifications

The LUMP.INFO table for the 1:25000 dataset has been formatted the same way and shows 43 grid-code features at a tertiary level.

- To allow user access to the fields determined by the.info table, an association had to be made between the actual polygon coverage.pat file and the LUMP.INFO table. The table and the coverage were joined by using the Arc command : *joinitem.*
- Because map sheets are to be produced using the final dataset, a colour table was created using a colour scheme related to the GRID-CODE to depict the different classifications. Using the Arc command : *info*, a colour look-up table, **COLOR.LUT** was defined to reference the grid-code with a colour symbol. The parameter specifications were determined as with the LUMP.INFO table and are demonstrated below.

GRID-CODE

- Item name > GRID-CODE
- Item width > 4
- Item output width > 8
- Item type > B

SYMBOL

- Item name > SYMBOL
- Item width > 3
- Item output width > 3
- Item type > I

- Once the COLOR.LUT table had been defined, the 24 colours were entered in ARC : *info* using the *add* command.

Enter command > add
- Grid-code > 4
- Symbol > 180

Continue entering the symbols.

The COLOR.LUT table for the 1:25000 dataset has been formatted the same way and shows 43 colours.

- To produce the 1:250000 and 1:50000 map sheets, a script was written using AML which combined the following information/datasets.

  - A DCDB base showing polygons greater than 25 hectares
  - The land use classification coverage
  - Drainage patterns showing major streams and rivers
  - A road center line coverage showing highways and major roads
  - Reference and legend
  - Australian Map Grid in specific zones
  - Internal text
  - North point
  - Title
  - Scale bar
  - Projection information
  - Appropriate logos
  - Locality map
  - Relevant notes pertaining to each map sheet
  - Disclaimer
  - Unique map number and associated text

Local Authority or Shire boundaries have also been added to map sheets to assist local government officers in determining infrastructure needs.

- Draft copies of each sheet are created for editing prior to a final copy being produced.
- The final datasets and metadata produced are :
  - The Fitzroy catchment and major sub catchment 1:100000 boundary in Geographic projection.
  - The final Land Use cover of the catchment, in Geographic projection.
  - The Emerald Irrigation Area 1:25000 Land Use coverage in Geographic projection.
  - The Dawson valley Irrigation Area 1:25000 Land Use coverage in Geographic
  - Projection.

  All 100000 coverages used in the creation of the final dataset will have these tolerances.
  - Fuzzy : 3.28
  - Dangle 0.0
  - Edit : 50.0

- Node : 50.0
- Snap : 50.0
- Weed 50.0
- Grain 50.0

All 25k coverages used in the creation of the final dataset will have these tolerances.

- Fuzzy : 1.27
- Dangle 0.0
- Edit : 12.0
- Node : 12.0
- Snap : 12.0
- Weed 12.0
- Grain 12.0

It is important for users of the land use datasets to use this information in conjunction with the Baxter and Russell guidelines and not to use individual interpretations of classifications.

Amendments To The Baxter Russell Classifications.

Draft land use classification
6th May 1999
Definitions and descriptions

INTRODUCTION

Land use has the single biggest impact on the state of Australia's natural resource base. It is increasingly likely that land use changes and changes to land management practices will be required if we are to move towards sustainable agricultural systems, reduce rates of environmental degradation and effectively manage land based greenhouse gas emissions. The National Land and Water Resources Audit have recognised the importance of land use management information in underpinning an integrated approach to the management of natural resource problems. The Audit has provided funds for detailed land use management mapping in Key Implementation Areas in several States and to develop a land use management classification suitable for detailed mapping at scales ranging from 1:25 000 to 1:1 000 across the Australian continent.

Baxter and Russell's (1994) review of land use mapping requirements for natural resource management in the Murray-Darling Basin identified the land use mapping needs for a broad range of natural resources and environmental management purposes. The common factor that emerged was the necessity for information on land use management regimes, ie information on the "How" of land-use; such as the nature of cultivation practices, logging techniques, fertiliser application. It is at this level of management that many of the changes in or modification of land use practices can be effected. The approach to land-use mapping developed was based on the concept of 'Level of Intervention', with land-use classes being structured in terms of their degree of modification and potential impact on a putative 'natural state' (defined as essentially unmodified native vegetation cover).

Commonwealth and State agency staff, at a workshop held by the Bureau of Rural Sciences in February 1999, extensively discussed the scheme proposed by Baxter and Russell. This document contains the revised classification. Issues that have been taken into account in expanding the classification for continental use include the need to produce a nationally consistent, but not necessarily uniform data set which will meet the majority of user needs, the availability of existing data suitable for classification and the level of resources required.

DATASETS

The land use management data will comprise four datasets:

- Land use
- Natural vegetation
- Commodities
- Management practices

The land use dataset will be collected and compiled by the State agencies, using ancillary and remotely sensed data and field mapping.

Natural vegetation has been collected by State agencies at a range of scales, which will be compiled for the National Vegetation Inventory.
Commodities and management practices have been collected as part of the Australian Bureau of Statistics agricultural census, and these will be linked to geocoded land parcels.

STRUCTURE OF THE LAND USE CLASSIFICATION

The classification is based on the identification of levels of intervention in the landscape and is hierarchical, comprising:

- Primary classes
- Secondary classes
- Tertiary classes

It should be appreciated that land is rarely under single use and the concurrent uses each have their own suite of impacts and consequences. This classification is based on the identification of the prime use of the land. For example, cross-country skiing may take place within a National Park, where the prime use is conservation. Access to the ski fields may be via a ski lift, which would fall under Intensive use, recreation facility.
Tertiary classes will usually include commodities or vegetation data, unless users wish to have an intermediate class. For example, under Permanent crops (Class 3.5), the tertiary classes could include all the crops found in the area or the ABS Level 2 classes, such as cereals, oil seeds etc. ABARE commodities or the WASLUC codes may be more suitable for forest products.

PROPOSED LAND USE CLASSIFICATION

PRIMARY CLASSES

Five Primary Classes are recognised, listed in general increasing level of intervention and potential level of impact on the natural landscape. It was found necessary to adopt some variations to this general principle in order to arrive at a logical and functional grouping of land uses. These are:

1. Conservation
2. Production from relatively natural environments
3. Primary production for dryland agriculture and plantations
4. Primary production from irrigated agriculture and plantations
5. Intensive uses

Each of the classes established is, for the sake of convenience, given a brief title. This title is intended to be indicative only of the range of land use and management systems included. The accompanying definitions and descriptions should be consulted where the allocation of a particular land use is in question or where apparent discrepancies or anomalies in grouping emerge. The classification is intended to be flexible such that new land uses or management systems can be accommodated so long as there is no conflict with other existing items.
The secondary classes are the broad land uses, such plantations or permanent cropping, whilst the tertiary classes are those derived by vegetation or commodity data or by field mapping.

1. CONSERVATION

The land is used primarily for conservation purposes, based on the maintenance of the essentially natural ecosystems present.

There is generally a relatively low level of intervention in such land, with the anticipated consequence that there will be little land or water degradation as a result of the use of such land. This must be qualified by recognition that much of the land subject to these uses is quite incapable of supporting more intensive activities. There may also be change in the condition of the land in response to natural process in isolation from any imposed use.

The land may be reserved by government specifically for such purposes, with the form of reservation reflecting the degree of protection afforded to the natural ecosystems — ranging from Wilderness Areas to National Parks, where the prime objective is the maintenance of essentially natural ecosystems.

Many of these areas will have multiple uses, for example conservation and recreation including hiking, orienteering, cross-country skiing in landbased conservation areas and scuba-diving, fishing and sailing in waterbased conservation areas. However, is conservation the principle or prime use.

Some land may be simply unused by either a conscious decision of government or by the landowner, or by circumstance. Such land has been included in the Conservation category as it would be subject to a low level of intervention under current circumstances. Naturally, the use of such land may change over time, as may the use of any other land.

The IUCN classification system has been adopted and data have already been collected by State agencies.

1.1 Strict Nature Reserve: protected area managed mainly for science

Area of land or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, which is available primarily for scientific research and/or environmental monitoring.

1.1.1 Marine and estuarine reserves

1.1.2 Land reserves

1.2 Wilderness Area: protected area managed mainly for wilderness protection

Large area of unmodified or slightly modified land and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

1.3 National Park: protected area managed mainly for ecosystem conservation and recreation

Natural area of land and/or sea, designated to:

a) protect the ecological integrity of one or more ecosystems for this and future generations;

b) exclude exploitation or occupation detrimentall 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.

1.4 Natural Monument: 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.

1.5 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.

1.6 Protected Landscape/Seascape: protected areas managed mainly for landscape/seascape conservation and recreation

Area of land, with coast and seas as appropriate, 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. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

1.6.1 Marine landscape

1.6.2 Landscape

1.7 Managed Resource Protected Areas: protected area managed mainly for the sustainable use of natural ecosystems

Area containing predominantly unmodified natural systems managed to ensure long-term protection and maintenance of biological diversity, water supply, aquifer or landscape while providing at the same time a sustainable flow of natural products and services to meet community needs.

1.7.1 Managed for biodiversity

1.7.2 Managed for water supply

1.7.3 Managed for groundwater

1.7.4 Managed for landscape integrity

1.8 Unmanaged/Unused Land

This class of uses is based on recognition that there are areas of land that are largely unused (in the context of the Prime Use) but may be subject to ancillary uses.

The status of the land may be the result of a deliberate policy decision by the managing agency or simply the result of circumstances. In the latter case, the land is usually available for use but for various reasons, remains 'unused'. The status of this land could change readily.

1.8.1 Vacant Crown lands

1.8.2 Aboriginal land

1.8.3 Defence lands

1.8.4 Rehabilitated lands

1.8.5 Stock routes

1.9 Water

This classification of natural water bodies yet to be added to B/R.

1.9.1 Natural Water bodies

2. PRODUCTION FROM RELATIVELY NATURAL ENVIRONMENTS

This land is used primarily for primary production based on limited change to the native vegetation structure.

Such land is generally subjected to definite but relatively low levels of intervention. As described for the previous class, relatively low levels of land or water degradation would be expected on such land, tempered by the recognition that, in many cases, the reason this land is not used more intensively is its limited capability for such uses.

The structure of the native vegetation generally remains intact despite some deliberate modification, however the floristics of the vegetation may change markedly. Where the native vegetation structure was savanna, 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 as Primary Production.
As in the previous class, multiple uses are likely in these areas, for example hiking in State forests; the prime use will predominate in allocating land to these classes.

2.1 Grazing of native pastures

This class provides for recognition of land uses based on grazing by domestic stock on native vegetation with limited or no attempt at pasture improvement.
This is based on grazing by domestic stock on native or naturalised vegetation. There has been little or no attempt at pasture improvement. Some changes in species composition and even structure will have occurred, however, the basic vegetation type is generally still evident.
Tertiary classes will be based on existing vegetation data or the National Vegetation Inventory and include classes such as:
2.1.1 Rangeland
2.1.2 Shrubland
2.1.3 Grassland
2.1.4 Grassy woodlands
2.1.5 Tablelands
2.1.6 Alpine
2.1.7 Riverine forest
2.1.8 Montane forests

2.2 Production Forests

This land is managed for production from relatively natural forests.
This is based on commercial wood production and related activities from native forests. Multiple uses are highly prevalent with areas being used for forest activities, such as production for both sawlogs and chips, as well as non-forest activities such as recreation and agriculture. Forest nurseries as well as forestry buildings fall under 2.2.2.
2.2.1 Commercial native forest production
2.2.2 Native forest nurseries and services

3. PRIMARY PRODUCTION FROM DRYLAND AGRICULTURE AND PLANTATIONS

Land in this class is used primarily for primary production, based on dryland farming systems.
The level of intervention has increased to the extent where native vegetation has largely been replaced by introduced species through clearing, sowing of the new species, the application of fertilisers or the dominance of volunteer species. Stock is also likely to have had a strong influence by the preferential removal of more palatable native species.
The range of activities in this category includes pasture production for stock, cropping and fodder production, and a wide range of horticultural production.

3.1 Plantations

This class provides for recognition of land where plantations of trees or shrubs have been established to provide for forest products.
3.1.1 Plantation forest production
3.1.2 Plantation nurseries and services

3.2 Grazing Improved and Fertilised Pastures

This class covers the various forms of pasture production, both annual and perennial, based on a significant degree of modification or replacement of the initial native vegetation.

The tertiary categories could be based on vegetation data or on ABS categories as detailed below:

3.2.1 Pure lucerne
3.2.2 Lucerne/pasture mixtures
3.2.3 Pasture legumes
3.2.4 Perennial grasses/lucerne mixture
3.2.5 Annual grasses/lucerne mixture
3.2.6 Sown grasses
3.2.7 Leucaena

3.3 Farm Forestry

This class covers the various combinations of trees growing in conjunction with pasture, fodder or crop production.

The National Farm Forestry Inventory recommends the following tertiary classes:

3.3.1 Windbreaks
3.3.2 Woodlots for firewood or poles
3.3.3 Production of trees and crops – this could include pastures as well as crops

3.4 Crop/Pasture Rotations

This class includes land managed by farming systems comprising pasture and cropping enterprises in rotation.

These rotations, which generally include a pasture component, may vary markedly over relatively short distances in response to both changes in the nature of the land and on preferences of the land manager. They may also change over time in response to market conditions.

No tertiary classes have been allocated yet due to the multitude of possible combinations, however, State agencies may wish to create intermediate classes.

3.5 Permanent Cropping

This class includes land used solely for cropping (including fodder) without the use of stock.

Some areas of land are used exclusively for cropping, either because the land is able to accommodate such an intensive use because of its intrinsic nature, or because the pasture phase is not economic or not relevant to the land manager. Fodder production (such as lucerne hay) is treated as a crop - there is no harvesting by stock involved. This category provides for a range of mixes of enterprises, for example, these classes are based on the ABS level 2 categories:

3.5.1 Cereals
3.5.2 Beverage and spice crops
3.5.3 Hay and silage
3.5.4 Oil seeds
3.5.5 Sugar cane
3.5.6 Tobacco
3.5.7 Cotton
3.5.8 Forage

3.6 Horticulture

This class covers the wide range of enterprises that fall into horticulture.
The following lists identifies the major groups based on the ABS commodities Level 2 categories that fall under horticultural commodities:
3.6.1 Vegetables
3.6.2 Fruit
3.6.3 Nuts
3.6.4 Oleaginous fruits
3.6.5 Flowers and bulbs

4. PRIMARY PRODUCTION FROM IRRIGATED AGRICULTURE AND PLANTATIONS

Land in this category includes those agricultural uses that depend on irrigation at some stage. It includes those uses that receive only one or two irrigations per year, through to those uses that are totally dependent on irrigation water for much of the growing season.
As in the previous primary class, native vegetation has largely been replaced with introduced species. Intervention includes the application of water to encourage additional growth over normally dry periods, discretionary upon the season, water availability and commodity prices. Baxter and Russell (1994) argue that the degree of intervention and its potential impacts on the hydrology and geohydrology by irrigation are sufficient to create this primary class.

4.1 Irrigated Plantations

This class provides for recognition of land where plantations of trees or shrubs have been established to provide for forest products.
It is not known whether irrigated plantations exist, however, tertiary classes similar to the forestry and dryland plantations are provided:
4.1.1 Irrigated plantations
4.1.2 Irrigated plantation nurseries

4.2 Irrigated Improved and Fertilised Pastures

These classes cover the various forms of pasture production, based on a significant degree of modification of the initial native vegetation and the application of irrigation water at some stage of the year.
4.2.1 Irrigated lucerne
4.2.2 Irrigated lucerne/pasture mixtures
4.2.3 Irrigated pasture legumes
4.2.4 Irrigated perennial grasses/lucerne mixture
4.2.5 Irrigated annual grasses/lucerne mixture
4.2.6 Irrigated sown grasses
4.2.7 Irrigated leucaena

4.3 Irrigated Farm Forestry

This class covers the various combinations of tree growing in conjunction with pasture, fodder or crop production.
Irrigated windbreaks and woodlots appears unlikely, so only one tertiary class is provided:

4.3.1 Irrigated production of trees and crops

4.4 Irrigated Crop/Pasture Rotations

This covers land subject to various farming systems comprising a mixture of pasture production and cropping enterprises, with an irrigation component in either the cropping or the pasture phase.
These rotations may vary markedly over relatively short distances in response to both changes in the nature of the land and on preferences of the land

manager. They may also change over time in response to market conditions. No tertiary classes have been allocated due to the multitude of possible combinations, however, State agencies may wish to create intermediate classes.

4.5 Irrigated Permanent Cropping

Some areas of land are used exclusively for cropping supported by irrigation, either because the land is able to accommodate such an intensive use by its intrinsic nature, or because the pasture phase is not economic or not relevant to the land manager. Fodder production (such as lucerne hay) is treated as a crop — there is no harvesting by stock involved.

4.5.1 Irrigated cereals
4.5.2 Irrigated beverage and spice crops
4.5.3 Irrigated hay and silage
4.5.4 Irrigated oil seeds
4.5.5 Irrigated sugar cane
4.5.6 Irrigated tobacco
4.5 7 Irrigated cotton
4.5.8 Irrigated Forage

4.6 Irrigated Horticulture

There is a wide range of enterprises that fall into the horticulture category, each with its own set of management practices. However, the application of irrigation, the relatively high use of fertiliser and cultivation for weed and moisture control as well as sowing or harvesting is common to many.

The following list endeavours to identify the major horticultural crops. The categories used may require recording as multiple uses to fairly reflect the complexity of actual land use.

4.6.1 Irrigated vegetables
4.6.2 Irrigated fruit
4.6.3 Irrigated nuts
4.6.4 Irrigated oleaginous fruits
4.6.4 Irrigated flowers and bulbs

5. INTENSIVE USES

Land in this class is likely to be subject to extensive modification, generally in association with closer residential settlement.

The level of intervention may be sufficiently high as to completely remodel the natural landscape — the vegetation, the surface and groundwater systems and the land surface. The Baxter and Russel (1994) tertiary codes as modified at the workshop have been retained for the present. States may wish to consult planning agencies with regard to these codes.

5.1 Intensive Primary Production/Processing

This class covers a variety of uses, based on either intensive forms of primary production or processing of primary produce, these may be point or areal data.

5.1.1 Intensive animal production — feedlots, dairies, piggeries, poultry sheds, aquaculture ponds etc
5.1.2 Processing plants — sawmills, pulp mills, abattoirs, etc

5.2 Rural Residential Living

This is a difficult class to define but clearly contains:

- the elements of agriculture in a peri-urban area

- the size of the allotment
- where the land does not provide the primary source of income

According to the Agricultural Census the income from farming is less than $500/year. However, genuine farming enterprises may well fall into one or more of these criteria and Rural Residential Living may take place outside of these criteria.
If the land is known to be managed as a hobby farm, then it should allocated as such, if not, it should allocated elsewhere.

5.3 Urban Uses

There is a wide range of activities in an urban setting. While the potential for complete modification of the landscape is common, the potential to generate polluted run-off is also common.

5.3.1 Residential – houses, flats, hotels, etc
5.3.2 Manufacturing and industrial - factories, workshops, foundries, construction sites etc
5.3.3 Commercial services - shops, markets, financial services, etc
5.3.4 Public services - education, community services, etc
5.3.5 Recreation and culture – parks, sports grounds, camping grounds, swimming pools, museums, places of worship, etc

5.4 Institutional Uses

5.4.1 Defence facilities - significant areas of land devoted to defence purposes, such as tank ranges, testing areas, firing ranges, etc
5.4.2 Research facilities -- government and non-government research and development areas

5.5 Utilities

5.5.1 Electricity generation/transmission — coal-fired, gas-fired, solar-powered, wind-powered or hydroelectric power stations, sub-stations, powerlines, etc
5.5.2 Water storage/treatment — dams, reservoirs, water treatment plants
5.5.3 Gas treatment/storage/transmission — facilities associated with the gas production and supply

5.6 Transport and Communications

5.6.1 Airports/aerodromes
5.6.2 Roads/freeways/parking
5.6.3 Railyards/railways
5.6.4 Ports and associated facilities
5.6.5 Navigation/communication facilities — radar stations, beacons, etc

5.7 Mining/Extractive Industry

The mining and extractive activities, while occupying a relatively small area, may have a major impact on a much wider sphere. Discretion will be required to ensure that significant areas only are recorded.

5.7.1 Mines
5.7.2 Quarries
5.7.3 Tailings

5.8 Waste Treatment and Disposal

Industrial, urban and some agricultural activities lead to a need to treat and dispose of wastes. This may have a major impact on the landscape and any such land use merits identification in its own right.

5.8.1 Stormwater
5.8.2 Landfill — disposal of solid inert wastes (but not including over-burden)
5.8.3 Solid garbage — disposal of putrescible wastes including waste from processing plants
5.8.4 Incinerators
5.8.5 Sewage and associated wates
5.8.6 Evaporation basins — disposal of irrigation drainage waters.

5.9 Industrial

This class was not identified at a secondary level in B/R. It is crucial to properly portray the make up of Rockhampton as the Rockhampton City Council have shown specific areas in their strategic plan.

ANZLIC Core Meta data Elements - Directory Item F

Title: **Fitzroy River Catchment Land Use Study**

Local title: LUMP

Custodian Details

Name: Department of Natural Resources

Jurisdiction: Queensland

Description

Abstract This dataset represents the survey of 1997 land use in the Fitzroy Catchment. The data is classified to the Baxter Russell classification. The data is 1:100,000 scale for the whole o the catchment. The data was collected by satellite imagery interpretation and extensive fieldwork. This data is accompanied by a detailed technical report and a series of 8 hardcopy maps at a scale of 1:250,000. This information would be used for strategic planning purposes.

Search Words:
AGRICULTURE Mapping
LAND Use Surveys
AGRICULTURE Distribution
LAND Use Mapping
LAND Use Distribution

Geographic Extent Names:

Name	Category	Code/Number	Jurisdiction
FITZROY RIVER - NORTH-EAST COAST	Catchments		Queensland

Geographic Extent Polygons:

Currency and Status

Beginning Date:	1-Apr-1997	**Progress:**	Complete
Ending Date:	31-Mar-1997	**Maintenance and Update Frequency:**	As required
Meta data Date:	28-Aug-2000		

Access

Stored Data Format:
ArcInfo

Available Format Types:

DIGITAL Published map - Land Use Comet River Catchment - 1:250,000 - Map Reference 00-LUMP-R-A0-4169

DIGITAL Published map - Land Use Dawson River Catchment North- 1:250,000 - Map Reference 00-LUMP-R-A0-4166

DIGITAL Published map - Land Use Dawson River Catchment South- 1:250,000 - Map Reference 00-LUMP-R-A0-4167

DIGITAL Published map - Land Use Fitzroy River Catchment - 1:250,000 - Map Reference 00-LUMP-R-A0-4165

DIGITAL Published map - Land Use Mackenzie River Catchment - 1:250,000 - Map Reference 00 LUMP-R-A0-4168

DIGITAL Published map - Land Use Nogoa River Catchment North - 1:250,000 - Map Reference 00-LUMP-R-A0-4170

DIGITAL Published map - Land Use Nogoa River Catchment South - 1:250,000 - Map Reference 00-LUMP-R-A0-4171

DIGITAL ArcInfo, ArcView and Mapinfo

DIGITAL Published map - Land Use Isaac River Catchment North - 1:250,000 - Map Reference 0

LUMP-R-A0-4172

Access Constraints: Conditions of use, copyright and charges apply.

Data Quality

Lineage: This dataset represents a survey of land use in 1997 in the Fitzroy Catchment. This project was funded by the National Land and Water Resources Audit and performed by the Queensland Department of Natural Resources in 1999/2000.

Positional Accuracy: Data is 1:100,000 scale for the whole of the catchment. Polygon boundaries have been interpreted from Landsat TM imagery and fieldchecked by extensive fieldwork.

Attribute Accuracy: Data is 1:100,000 scale for the whole of the catchment. Polygon boundaries have been interpreted from Landsat TM imagery and fieldchecked by extensive fieldwork.

Logical Consistency: ArcInfo has been used to perform topological consistency checks. Thes checks ensure that that polygons are closed, nodes are formed at the intersection of arcs and that there is only one label per polygon.

Completeness: Spatial and attribute data is complete.

Standards: Land Resource Mapping Procedures and Mapping Complexity Standarc

Contact Information

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2.	**Organisation:**	Department of Natural Resources		
	Position:	Regional Information Co-Ordinator - CW		
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	Suburb or Locality:	Rockhampton	**Post Code:**	4700
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	Email Address:	ken.adsett@dnr.qld.gov.au		

Additional Meta data

Map Data

Projection:	Transverse Mercator
Scale:	250000
Map No.:	
Horizontal datum:	GDA94 - Unspecified
Vertical datum:	Unknown

ANZLIC Core Meta data Elements - Directory Item F

Title: **Emerald Irrigation Area Land Use Study**

Local title: LUMP - Emerald Irrigation Area

Custodian Details

Name: Department of Natural Resources

Jurisdiction: Queensland

Description

Abstract This dataset represents the survey of 1997 land use in the Emerald Irrigation Area. The is classified to the Baxter Russell classification. The data is 1:25,000 scale. The data was collected by satellite imagery interpretation and extensive fieldwork. This data is accompanied by a detailed technical report.

This information would be used for strategic planning purposes.

Search Words:
AGRICULTURE Mapping
LAND Use Mapping
LAND Use Surveys
AGRICULTURE Distribution
LAND Use Distribution

Geographic Extent Names:

Name	Category	Code/Number	Jurisdiction

Geographic Extent Polygons:

148.48 -23.41, 149.49 -23.58 , 148.29 -23.63, 148.05 -23.7, 147.96 -23.57, 147.97 -23.42

Currency and Status

Beginning Date:	1-Apr-1997	**Progress:**	Complete
Ending Date:	31-Mar-1997	**Maintenance and Update Frequency:**	As required
Meta data Date:	29-Aug-2000		

Access

Stored Data Format:
ArcInfo

Available Format Types:

DIGITAL ArcInfo, ArcView and Mapinfo

DIGITAL DIGITAL Published map - Land Use Emerald Irrigation Area - 1:25,000 - Map Reference 00-LUMP-R-A0-4180

Access Constraints: Conditions of use, copyright and charges apply.

Data Quality

Lineage: This dataset represents a survey of land use in 1997 in the Fitzroy Catchment. This project was funded by the National Land and Water Resources Audit and performed by the Queensland Department of Natural Resources in 1999/2000.

Positional Accuracy: Data is 1:25,000 scale for the whole of the catchment. Polygon boundar have been interpreted from Landsat TM imagery and fieldchecked by extensive fieldwork.

Attribute Accuracy: Data is 1:25,000 scale for the whole of the catchment. Polygon boundar have been interpreted from Landsat TM imagery and fieldchecked by extensive fieldwork.

Logical Consistency: ArcInfo has been used to perform topological consistency checks. Thes checks ensure that that polygons are closed, nodes are formed at the intersection of arcs and that there is only one label per polygon.

Completeness: Spatial and attribute data is complete.

Standards: Land Resource Mapping Procedures and Mapping Complexity Standarc

Contact Information

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2.	**Organisation:**	Department of Natural Resources		

Position:	Regional Information Co-Ordinator - CW		
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Additional Meta data

Map Data

Projection:	Transverse Mercator
Scale:	50000
Map No.:	00-LUMP-R-A0-4180
Horizontal datum:	GDA94 - Unspecified
Vertical datum:	Unknown

ANZLIC Core Meta data Elements - Directory Item F

Title: **Dawson Valley Irrigation Area Land Use Mapping**

Local title: LUMP - Dawson Valley Irrigation Area

Custodian Details

Name: Department of Natural Resources

Jurisdiction: Queensland

Description

Abstract This dataset represents the survey of 1997 land use in the Dawson Valley Irrigation Area The data is classified to the Baxter Russell classification. The data is 1:25,000 scale. The data was collected by satellite imagery interpretation and extensive fieldwork. This data accompanied by a detailed technical report. This information would be used for strategic planning purposes.

Search Words:
AGRICULTURE Distribution
AGRICULTURE Mapping
LAND Use Distribution
LAND Use Mapping
LAND Use Surveys

Geographic Extent Names:

Name	Category	Code/Number	Jurisdiction

Geographic Extent Polygons:

150.08 -24.88, 150.13 -24.95, 150.08 -25, 150.0 -25.0, 149.95 -24.94, 149.97 -24.91

Currency and Status

Beginning Date:	1-Apr-1997	**Progress:**	Complete
Ending Date:	31-Mar-1997	**Maintenance and Update Frequency:**	As required
Meta data Date:	29-Aug-2000		

Access

Stored Data Format:
ArcInfo

Available Format Types:

DIGITAL ArcInfo, ArcView and Mapinfo

DIGITAL Published map - Land Use Dawson Valley Irrigation Area - 1:25,000 - Map Reference 0(

LUMP-R-A0-4173

Access Constraints: Conditions of use, copyright and charges apply.

Data Quality

Lineage: This dataset represents a survey of land use in 1997 in the Fitzroy Catchment. This project was funded by the National Land and Water Resources Audit and performed by the Queensland Department of Natural Resources in 1999/2000.

Positional Accuracy: Data is 1:25,000 scale for the whole of the catchment. Polygon boundar have been interpreted from Landsat TM imagery and fieldchecked by extensive fieldwork.

Attribute Accuracy: Data is 1:25,000 scale for the whole of the catchment. Polygon boundar have been interpreted from Landsat TM imagery and fieldchecked by

extensive fieldwork.

Logical Consistency: ArcInfo has been used to perform topological consistency checks. Thes checks ensure that that polygons are closed, nodes are formed at the intersection of arcs and that there is only one label per polygon.

Completeness: Spatial and attribute data is complete.

Standards: Land Resource Mapping Procedures and Mapping Complexity Standarc

Contact Information

1.	**Organisation:**	Department of Natural Resources		
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Mail Address 2:	PO Box 1762	**Country**	Australia
Suburb or Locality:	Rockhampton	**Post Code:**	4700
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Additional Meta data

Map Data

Projection:	Transverse Mercator
Scale:	50000
Map No.:	00-LUMP-R-A0-4173
Horizontal datum:	GDA94 - Unspecified
Vertical datum:	Unknown

ANZLIC Core Meta data Elements - Directory Item F

Title: **Fitzroy River Subcatchments**

Local title: Fitzroy River Subcatchments

Custodian Details

Name: Department of Natural Resources

Jurisdiction: Queensland

Description

Abstract This dataset represents the extents of the Fitzroy River Catchment. The data is 1:100,000 scale for the whole of the catchment. The data was collected from 1:100,000 topographic maps. This information would be used for a range of uses including strategic planning purposes and Land Planning.

Search Words:
LAND Models
LAND Topography

Geographic Extent Names:

Name	Category	Code/Number	Jurisdiction
FITZROY RIVER - NORTH-EAST COAST	Catchments		Queensland

Geographic Extent Polygons:

Currency and Status

Beginning Date: Not known **Progress:** Complete

Ending Date:	Not known	**Maintenance and Update Frequency:**	Not Planned
Meta data Date:	29-Aug-2000		

Access

Stored Data Format:
ArcInfo

Available Format Types:

DIGITAL ArcInfo, ArcView and Mapinfo

Access Constraints: Conditions of use, copyright and charges apply.

Data Quality

Lineage: This dataset was captured as part of a survey of land use in of the Fitzroy Catchment. This project was funded by the National Land and Water Resources Audit and performed by the Queensland Department of Natural Resources in 1999/2000.

Positional Accuracy: Data is 1:100,000 scale for the whole of the catchment. Polygon boundaries have been interpreted from 1:100,000 topographic maps.

Attribute Accuracy: Data is 1:100,000 scale for the whole of the catchment. Polygon boundaries have been interpreted from 1:100,000 topographic maps.

Logical Consistency: ArcInfo has been used to perform topological consistency checks. Thes checks ensure that that polygons are closed, nodes are formed at the

intersection of arcs and that there is only one label per polygon.

Completeness: Spatial and attribute data is complete.

Standards: Land Resource Mapping Procedures and Mapping Complexity Standard

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Additional Meta data

John Payne of AUSLIG was contacted on Monday 28 August regarding Intellectual Property for th dataset.

John advised that AUSLIG had no interest in this dataset other than having the AUSLIG 1:100,00 topographic maps that the boundaries were derived from acknowledged in the metadata and a lin to the AUSLIG site made on any site this data was made available from.

Map Data

Projection: Unknown

Scale:

Map No.:

Horizontal datum: Unknown

Vertical datum: Unknown

References

Baxter, J. T. and Russell, L. D. (1994). Land Use Mapping Requirements For Natural Resource Management In The Murray-Darling Basin, Project M305: Task 6, Department of Conservation and Natural Resources, Victoria.

Evans, A.M., (1997), An Introduction To Economic Geology and It's Environmental Impact, Blackwell Science Ltd, Oxford.

Explanatory Note:

This technical report serves to detail the methods and findings of the Theme 6 project component of the National Land and Water Resources Audit's Fitzroy Implementation Projects.

The document *TOWARDS SUSTAINABLE LAND USE IN THE FITZROY* (final combined report) summarises the main integrated findings of the Theme 5 (Land Use Mapping), Theme 6 (Capacity for Change) and Theme 7 (Ecosystem Health) project components.

Technical reports of a similar nature to this document are also available for the Theme 6 and Theme 7 project components.

For further information on these reports contact:

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Department of Natural Resources (QLD)
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Email: Ken.Adsett@dnr.qld.gov.au

Or visit the National Land and Water Resources Audit's Web site at:
http://www.nlwra.gov.au/

Maps:

This project produced a series of ten (10) maps. Eight (8) maps are sub catchment based and cover the catchment at a scale of 1:250,000 and two (2) maps cover the Emerald Irrigation Area and the Dawson valley irrigation Area. The map titles are:

- Land Use Comet River Catchment - 1:250,000 - Map Reference 00-LUMP-R-A0-4169
- Land Use Dawson River Catchment North- 1:250,000 - Map Reference 00-LUMP-R-A0-4166
- Land Use Dawson River Catchment South- 1:250,000 - Map Reference 00-LUMP-R-A0-4167
- Land Use Fitzroy River Catchment - 1:250,000 - Map Reference 00-LUMP-R-A0-4165
- Land Use Mackenzie River Catchment - 1:250,000 - Map Reference 00-LUMP-R-A0-4168
- Land Use Nogoa River Catchment North - 1:250,000 - Map Reference 00-LUMP-R-A0-4170
- Land Use Nogoa River Catchment South - 1:250,000 - Map Reference 00-LUMP-R-A0-4171
- Land Use Isaac River Catchment North - 1:250,000 - Map Reference 00-LUMP-R-A0-4172
- Land Use Emerald Irrigation Area - 1:25,000 - Map Reference 00-LUMP-R-A0-4180
- Land Use Dawson Valley Irrigation Area - 1:25,000 - Map Reference 00-LUMP-R-A0-4173

The maps are attached to the hard copy reports and available at the National Land and Water Resources Audit website www.nlwra.gov.au as postscript files and from:

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