

Development of Integrated Products for Tree Management Planning

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Abstract

The Statewide Landcover and Trees Study (SLATS) of the Queensland Department of Natural Resources (QDNR) provides mapping to government bodies, landholders and the wider community to aid in developing on-farm and larger area tree management plans. Eighty percent of the State has been covered at some scales and demand is strong for the products. The mapping incorporates base raster data derived from Landsat TM imagery and vector reference data together with geo-location information. The products have a uniform format achieved through the use of standard templates and standard map creation procedures. Three Series are produced: 1995 Landsat Thematic Mapper (TM) Satellite Image Series, 1991 Landcover Series and 1991-95 Vegetation Change Series. The Satellite Image Series is available at 1:50,000, 1:100,000 and 1:250,000 scales with the Landcover and Vegetation Change Series available at smaller scales.

The Product

The Queensland Statewide Landcover and Trees Study (SLATS) (Danaher, *et al.*, 1998) of the Queensland Department of Natural Resources (QDNR) has been initiated to map vegetation change, baseline landcover and to calculate greenhouse gas emissions resulting from land clearing, woodland regrowth and thickening. Semi-automated techniques using band reflectance and Normalised Difference Vegetation Index (NDVI) temporal differences have been developed to produce classifications indicating the direction and magnitude of vegetation changes (Paudyal *et al.*, 1997). Land cover and baseline woody vegetation mapping is the result of further techniques applied to the data in combination with field data measured at selected sites. (Kuhnel *et al.*, 1998).

The project is delivering mapping products to assist in the development of on-farm and larger area tree management plans. Products are available to practitioners within government, landholders and the wider community. Landholders developing tree management plans have provided strong demand for these mapping products. These products are increasingly being locally coordinated for group landholder workshops. Landholders are also independently requesting the products for accurate property mapping. Further demand has been experienced through use by some of the larger pastoral companies for farm management plan development. State and Local Government also request the standard series products for State infrastructure and resource development projects.

This mapping incorporates base raster data derived from Landsat TM imagery and vector reference data together with geo-location information. The products have a uniform presentation format achieved by using standard templates and standard map creation procedures.

There are three series of hard-copy series produced. They are:

- 1995 Landsat TM Satellite Image Series
- 1991 Landcover Series
- 1991-95 Vegetation Change Series

Recently acquired 1997 Landsat TM imagery will progressively replace the 1995 imagery in the Satellite Image Series. The Satellite Image Series is available at 1:50,000, 1:100,000 and 1:250,000 scales, the Landcover Series at 1:100,000 and 1:250,000 and the Vegetation Change Series at 1:250,000 (QDNR, 1997). The standard series adhere to the standard national map sheet extent and nomenclature.

For property planning and development of tree management plans, the standard scale mapping is produced on-demand and off-format although standard scales and template information are still applied. The 1:50,000 scale is most preferred for property and tree management planning, being able to represent properties as large as 625 square kilometres on a single sheet. The resolution of the imagery does not produce adequate quality products at scales larger than 1:50,000.

Data Selection and Representation

Development of a standard data set for the three series types was incremental with features added to the product templates as their need was identified. The three raster data backdrops used (one for each Series type) are:

- Three band Landsat TM false-colour composite (bands 5,4 and 2)
- Land cover thematic with woody vegetation cover thematic (2 layer)
- One band Landsat TM grey-scale (band 3) with change detection thematic (2 layer)

The first raster data consists of a standard selection of three Landsat TM bands 5 (mid-infrared), 4 (near infra-red), and 2 (green) in red, green and blue respectively. This allows vegetation type and health as well as some soil and water discrimination. Anecdotal responses from land-holders, valuation staff and pasture scientists suggests that this band combination provides adequate information for them to discern various vegetation and pasture types.

The other two essentially thematic raster sets are the product of extensive algorithm development and application, thresholds, field data collection and visual editing. The colour selections for thematic data most nearly equate with similar historical products.

The primary vector data sets used are:

- Cadastral boundaries from the Digital Cadastral Data Base (DCDB)
- Road networks from the Australian Surveying and Land Information Group (AUSLIG) 1:250,000 Geodata
- Placenames from the AUSLIG 1:250,000 Geodata.

The 1:250,000 scale geodata is also useable at larger scales (1:100,000 and 1:50,000) although the road data is not presented on 1:50,000 series mapping. The specifications for the DCDB are such that it has been captured at the best available mapping scale. Whilst in some cases there is slight mis-registration between the image and DCDB, the ability to identify features and properties has greater importance and is indeed enhanced by the presence of these layers. The DCDB is a primary layer applied to all series regardless of scale.

Production Tools and Methodology

The mapping is produced using the Mosaic and Mapsheet modules of ERDAS Imagine Version 8.2. Raster data is mosaiced in native Imagine format (.img files) and vector data is in Arc/Info coverages. All data is georeferenced to the appropriate AMG zone for the maps to be produced.

The mapsheet tool uses a spreadsheet format (cell array) listing map numbers and names, extent and corners of mapping as exemplified in Figure 1.

Map	>	<Title>	<Region>	<State>	LR (Lat)	LR (Long)	Composition File	Plot File
1	>	8945-2	WONGONGERA		26 30 00 S	150 30 00 E		
2		8945-3	GULUGUBA		26 30 00 S	150 15 00 E		
3		8845-2	LAWTON		26 30 00 S	150 00 00 E		
4		8845-3	NOONGA		26 30 00 S	149 45 00 E		
5		8745-2	COMBABULA		26 30 00 S	149 30 00 E		
6		8745-3	MUGGLETON		26 30 00 S	149 15 00 E		
7		8645-2	BASSETT		26 30 00 S	149 00 00 E		
8		8645-3	ORALLO		26 30 00 S	148 45 00 E		
9		8545-2	BINDANGO		26 30 00 S	148 30 00 E		
10		8545-3	MARBANGO		26 30 00 S	148 15 00 E		
11		8445-2	MITCHELL		26 30 00 S	148 00 00 E		
12		8945-1	WARRANNA		26 15 00 S	150 30 00 E		
13		8945-4	BURUNGA		26 15 00 S	150 15 00 E		
14		8845-1	WANDOAN		26 15 00 S	150 00 00 E		
15		8845-4	MOUNT ORGAN		26 15 00 S	149 45 00 E		
16		8745-1	CLIFFORD		26 15 00 S	149 30 00 E		
17		8745-4	THE LIGHTHOUSE		26 15 00 S	149 15 00 E		
18		8645-1	PARMAROO		26 15 00 S	149 00 00 E		
19		8645-4	EUMAMURRIN		26 15 00 S	148 45 00 E		

Figure 1: Example 1:50 000 Map Sheet Application

Standard map templates have been developed to be applied to these sheets. This applies grid and graticule data, scale bars, logos, copyright notices and keys (Figure 2 shows an example).

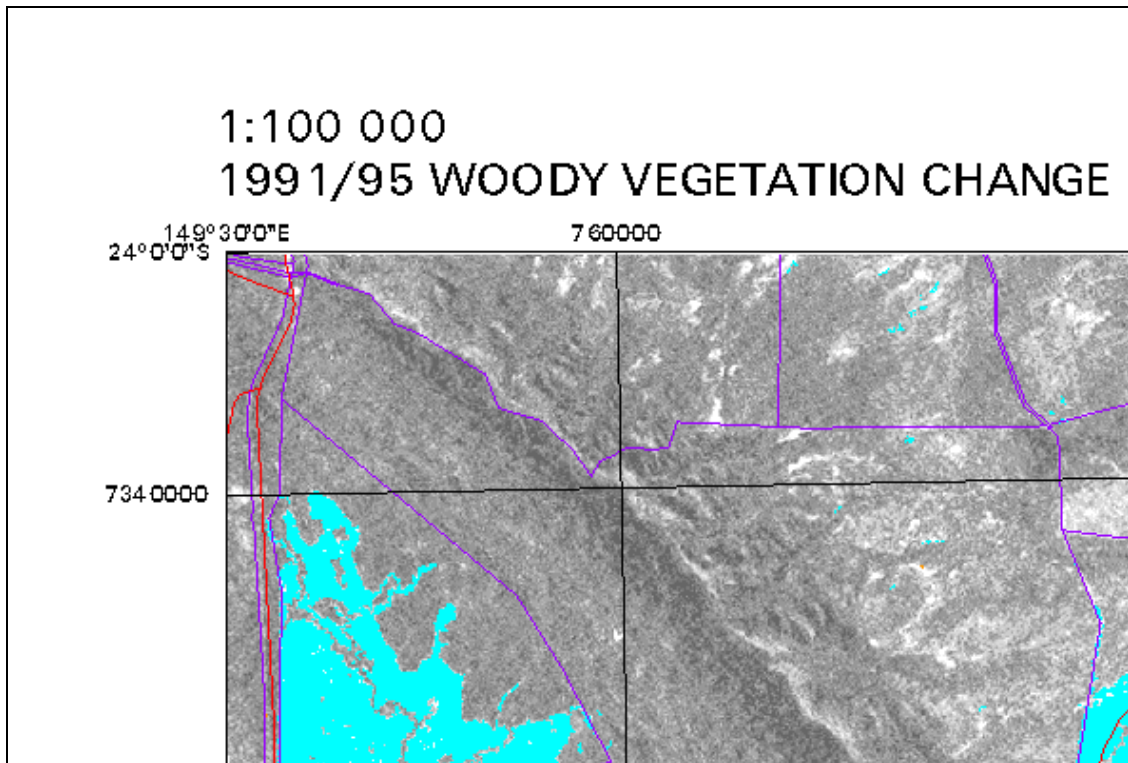


Figure 2: Top left corner of map showing graticule and some surrounding template text

Postscript plot files are created, compressed and saved to a StorageTek 4400 tape silo to be recalled at need and printed on a Hewlett-Packard HP755CM plotter or other printers as the map is requested.

Series Progress and Pricing

The 1:100,000 and 1:250,000 1995 Landsat TM satellite standard image map series is available over the entire State. Approximately 80% of these maps have already been generated and the remainder are generated on request. Current delivery times based on demand and resources is a maximum of 10 working days. All of the 1:50,000 mapping is being processed as requests are submitted. The 1991 Landcover and 1991-95 Vegetation Change Series is due for release in July 1998 with approximately 45% of the State available initially.

Pricing is aligned with similar DNR products and cost structures, and products available through official satellite imagery distributorships. Discounts are given to property owners who use the products for property or tree management planning. Details of the project and product range, pricing and contacts can be viewed at: <http://www.dnr.qld.gov.au/slats>.

Conclusion

The SLATS map series provide a tangible product that leads to better understanding of the information generated by the project, and yet fulfil a primary purpose as tools adding valuable information to on-farm management and tree management planning.

The current increasing growth in demand for the base products will be monitored as the new thematic products become available. It is possible that the Department of Natural Resources will consider building a wider range of land management products.

References

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