Summary Report

Land Cover Change in South-East Queensland, 1988 – 1997

Resource Sciences and Knowledge

Queensland Department of Natural Resources

Natural Sciences Precinct

80 Meiers Road, Indooroopilly, 4068

http://www.dnr.qld.gov.au/slats

April 1999

Click here to view the full report.

Background

The Statewide Landcover and Tree Study (SLATS) is a major vegetation monitoring initiative of the Queensland Department of Natural Resources. SLATS is gathering accurate vegetation cover, and vegetation cover change information for vegetation management planning and for greenhouse gas inventory purposes.

Landsat Thematic Mapper (TM) imagery (30m resolution) is being used to compare the vegetation cover between 1988, 1991, 1995 and 1997 over the entire State of Queensland. A detailed baseline landcover survey is being done using 1991 imagery. Some historical Landsat Multi Spectral Scanner (MSS) imagery (1972, 1980, 1984) has been acquired and will be analysed to determine the proportion of clearing to control regrowth, and to provide estimates of historical clearing rates.

To date, the 1991-95 change detection has been completed for the entire State and a detailed 1991 baseline landcover map is 65% complete. The 1995-97 change analysis is nearing completion and will be reported in June 1999. A sample of scenes have been processed for 1988-91 vegetation change.

From the SLATS data, the average annual tree-clearing rate for Queensland (1991-95) has been calculated as 285,000 hectares (ha) per year (Danaher *et al*,1999). The clearing figures are available on the project web site http://www.dnr.qld.gov.au/slats as tables and maps, categorised by tenure, biogeographic region, catchment, local government area and native pasture community type.

This report is based on the standard SLATS landcover change analysis for the periods 1988-91, 1991-95 and 1995-97, and on the 1991 landcover data set. It combines these change data sets with detailed catchment boundaries and local authority boundaries and reports change statistics in table and map form. This report was produced to provide information on vegetation cover change in the Brisbane River catchment to the Brisbane River Management Group. However, to provide some context for this information, the study area was extended to cover:

- All the coastal river catchments from the Queensland / New South Wales border to Double Island Point.
- The area covered by the 22 local authorities which contain part of these catchments. Note that part of the Local Authorities included will fall outside the above catchments.

Figure 1 shows the area covered by this study.

The data used in this study is Landsat Thematic Mapper satellite imagery which has a resolution of 30 metres enabling most areas of vegetation change (one hectare or greater) to be detected. Typically it is used to produce maps at a scale of 1:100,000 or smaller. This study provides a consistent data set covering the entire region at a medium resolution but it is not intended to be a substitute for high resolution remnant bushland studies using aerial photography. It should be used with caution when mapping narrow vegetation corridors such as riparian vegetation as the resolution of the data may be less than the size of the vegetation to be mapped.

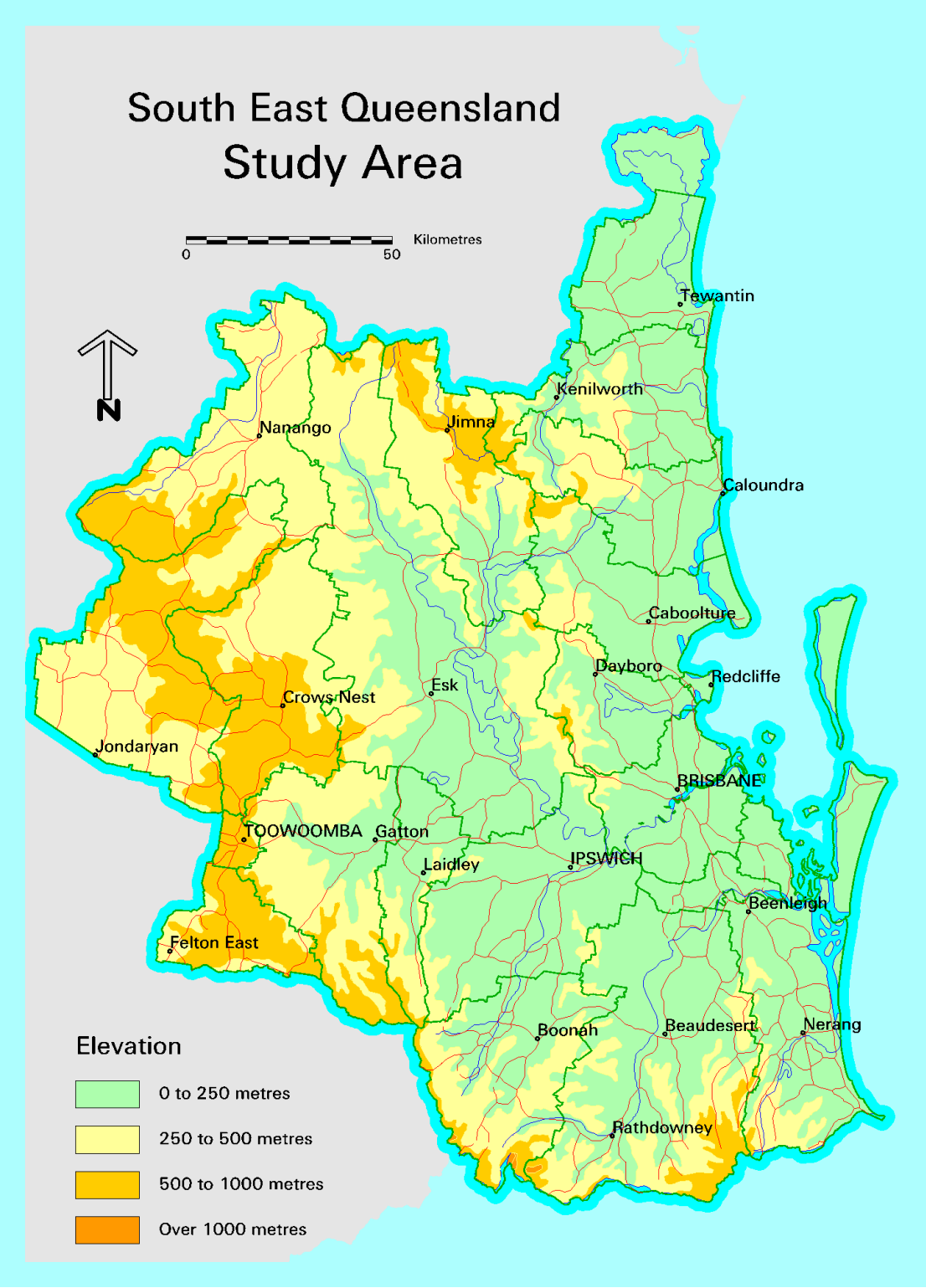

Figure 1: South East Queensland Study area.

Methods

Landsat TM satellite imagery, captured in 1988, 1991, 1995, 1997, was acquired for the SLATS project. Cloud free 1995 imagery was not available for the entire area so 1994 imagery was used in the western part of the study area; this data is referred to throughout the report as 1995 imagery. Winter imagery was chosen to maximise discrimination between grasses and the woody component of the vegetation.

The vegetation change has been mapped for the periods 1988-91, 1991-95 and 1995-97 using classification procedures described in Paudyal *et al.* (1997). A semi-automated computer classification was used to identify areas of change and a sample of these areas were then field checked. Maps of vegetation change were then edited using visual interpretation techniques aided by data gathered in the field. A woody vegetation mask from the 1991 landcover layer was used to isolate changes in woody vegetation and help improve the accuracy of the final change classification. Both clearing and regrowth of woody vegetation were classified. Regrowth is more difficult to measure due to slow rates of change (relative to clearing) and the low initial density of some regrowth stands. All the vegetation change statistics have been represented as annual rates to account for the variation in scene dates.

A 1988-97 change data set was created by combining the 1988-91, 1991-95 and 1995-97 data sets together. Where areas have been cleared but have regrown to woody vegetation within this nine-year period they are not shown as cleared. This mostly occurs in State forest plantation areas.

For the SLATS project a detailed baseline landcover survey was done using 1991 imagery. This involves the development of woody / non-woody masks and foliage projective cover (overstorey and shrub) layers as described by Kuhnell *et al.* (1998). It also includes masks for crop, settlement, bare and water areas. An example of the landcover data is shown in Figure 20.

This landcover information was used to provide statistics on the area of 1991 woody vegetation within the study area. It was combined with the change analysis to provide woody vegetation statistics for 1988 and 1995 so that vegetation change figures could be presented as a proportion of woody vegetation cover at the earlier date of each change period.

Please note that the statistics for vegetation change and woody vegetation cover quoted in this report include all woody vegetation. This includes remaining areas of native vegetation, disturbed areas of native vegetation, plantations of native and exotic species and domestic woody vegetation where the overstory and shrub foliage projective cover is 12% or greater. This primary definition of woody vegetation was used because it can be interpreted from the satellite imagery with a high level of reliability. Conclusions about the status of vegetation types or regional ecosystems requires the combination of this change analysis with the Environment Protection Agency's vegetation mapping data.

Summary of Results

- The average annual clearing rate (1988-97) for the South East Queensland catchments covered in this report is 6000 hectares per year.
- Clearing in this South East Queensland study area accounts for approximately 2% of the 1991-95 State total clearing rate of 285,000 ha / year.
- The annual average clearing rate (1988-97) for the South East Queensland study area is equivalent to clearing 0.47% of the remaining (1988) woody vegetation each year.
- In 1988, 55% of the study area was covered by some type of woody vegetation.
- By 1997 the proportion of the study area covered by woody vegetation had declined to 52.7%.
- Within the Brisbane River catchment an average of 1,960 hectares per year was cleared within the 1988-97 period. This is approximately one third of the total annual clearing in the study area. The Brisbane River catchment covers about half the study area.
- For South East Queensland the most recent 1994/95-97 clearing rate is approximately 7% higher than the 1988-91 and 1991-94/5 figures. See figure 2.
- For the Brisbane River catchment the most recent 1995-97 clearing rate is 19% higher than the 1991-95 rate but less than the 1988-91 rate. See figure 3.
- Regrowth is occurring at a rate equal to approximately 15% of the clearing rate. The majority of this regrowth is replanting of plantations or regrowth following harvesting within State forests.
- The catchment with most clearing over the 1988-97 period is the Pumicestone Passage Creeks catchment. This is partly due to abnormal clearing of plantations following extensive fires in November 1994.
- If clearing within State forests is excluded, the catchments with the most clearing over the 1988-97 period are the Caboolture and Logan River catchments.
- The catchment with the greatest decline in the proportion of woody vegetation cover is Burpengary Creek, where 35% of the 1988 woody vegetation was cleared in the 1988-97 period.

The vegetation clearing figures for the entire study area and for the Brisbane River catchment are summarised in figures 2 and 3, and in tables 1, 2, 3 and 4.

Overview maps showing clearing by 5x5km grid cells have been produced for both the total1988-97 period (figure 4) and the most recent 1995-97 period (figure 5). More detailed maps of vegetation change covering the entire study area at 1:250,000 scale and full resolution digital data sets are also available. See the products section in this report for details.

Land Cover Change in the South East Queensland Study Area

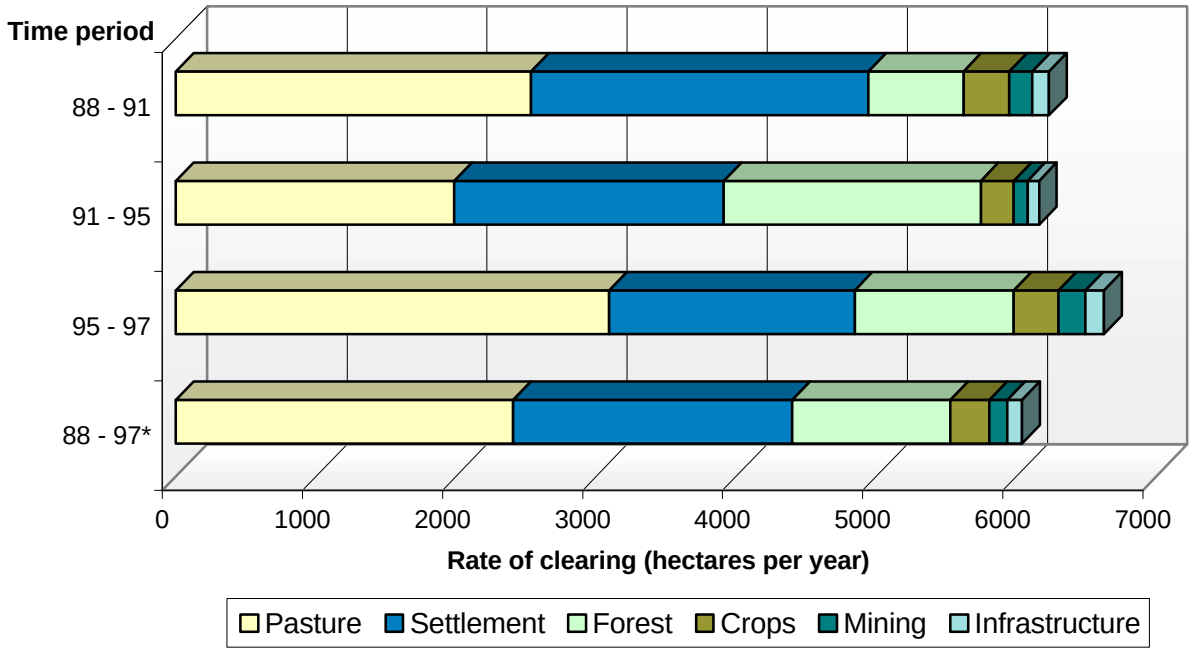

Figure 2: Bar graph showing rate of vegetation clearance per time period and replacement classes for the South East Queensland study area.

Table 1: Rate of clearing by replacement classes (% of total cleared area per time period)

Time period	Pasture (includes rural residential)	Settlement	Forest	Crops	Mining	Infra-structure
88 - 91	41	38.5	11	5	2.5	2
91 - 95	32	31	30	4	2	1
95 - 97	47	26	17	5	3	2
88 - 97*	40	33	19	5	2	2

Table 2: Rate of woody vegetation change (hectares per year)

Time period	Re-growth	Clearing **						
		Pasture (includes rural residential)	Settle-ment	Forest	Crops	Mining	Infra-structure	Total cleared
88 - 91	765	2537	2407	680	328	163	118	6233
91 - 95	1333	1988	1924	1836	235	98	82	6163
95 - 97	766	3095	1752	1137	318	194	132	6628
88 – 97*	944	2408	1992	1131	277	130	103	6041

* 1988 – 97 change is a net figure including regrowth

** Refer to table 6 for a description of the replacement land cover or land use classes

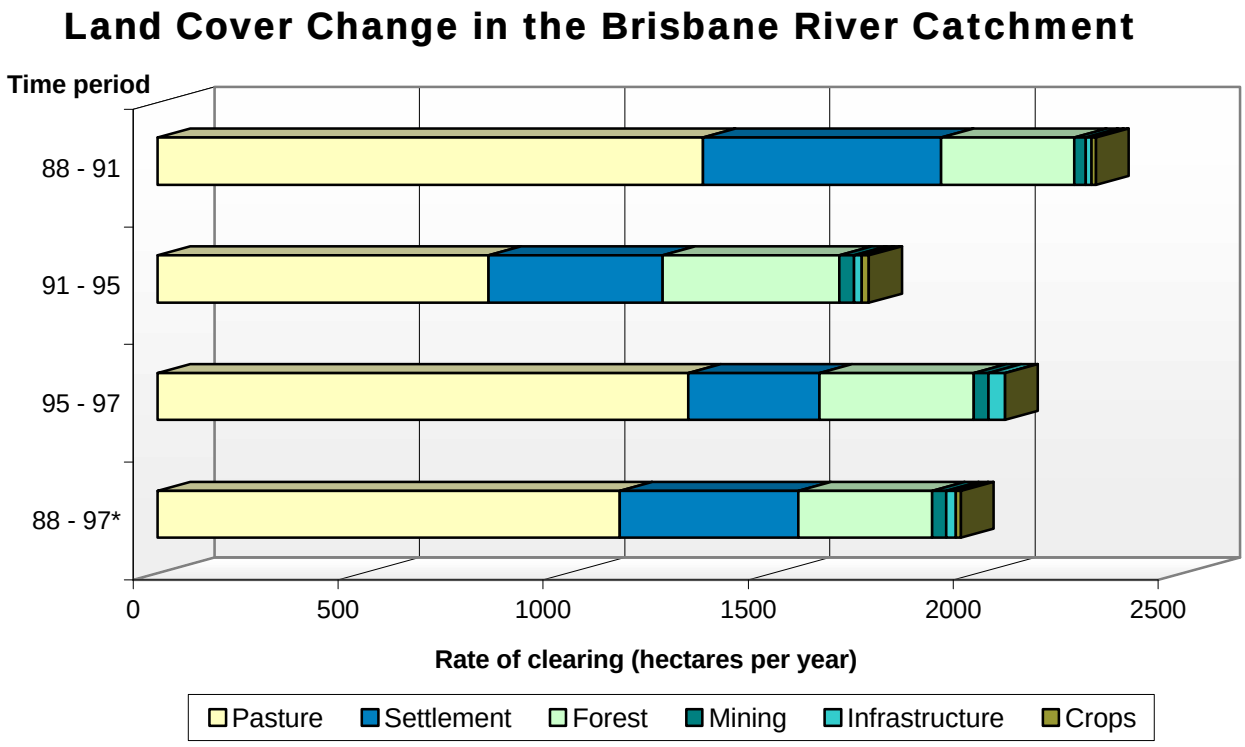

Figure 3: Bar graph showing rate of vegetation clearance per time period and replacement classes for the Brisbane River Catchment.

Table 3: Rate of clearing by replacement classes (% of total cleared area per time period).

Time Period	Pasture (includes rural residential)	Settlement	Forest	Mining	Infra-structure	Crops
88 - 91	58	25	14	1	1	0
91 - 95	47	24	25	2	1	1
95 - 97	63	15	18	2	2	0
88 - 97*	58	22	17	2	1	1

Table 4: Average rate of woody vegetation change by replacement class (hectare per time period)

Time period	Re-growth	Clearing**						
		Pasture (includes rural residential)	Settle-ment	Forest	Mining	Infra-structure	Crop	Total cleared
88 - 91	195	1330	580	325	29	14	11	2289
91 - 95	479	807	425	430	37	18	18	1735
95 - 97	249	1294	320	376	36	40	1	2067
88 – 97*	299	1127	435	327	34	24	12	1959

* 1988 – 97 change is a net figure including regrowth.

** Refer to table 6 for a description of the replacement land cover or land use classes.

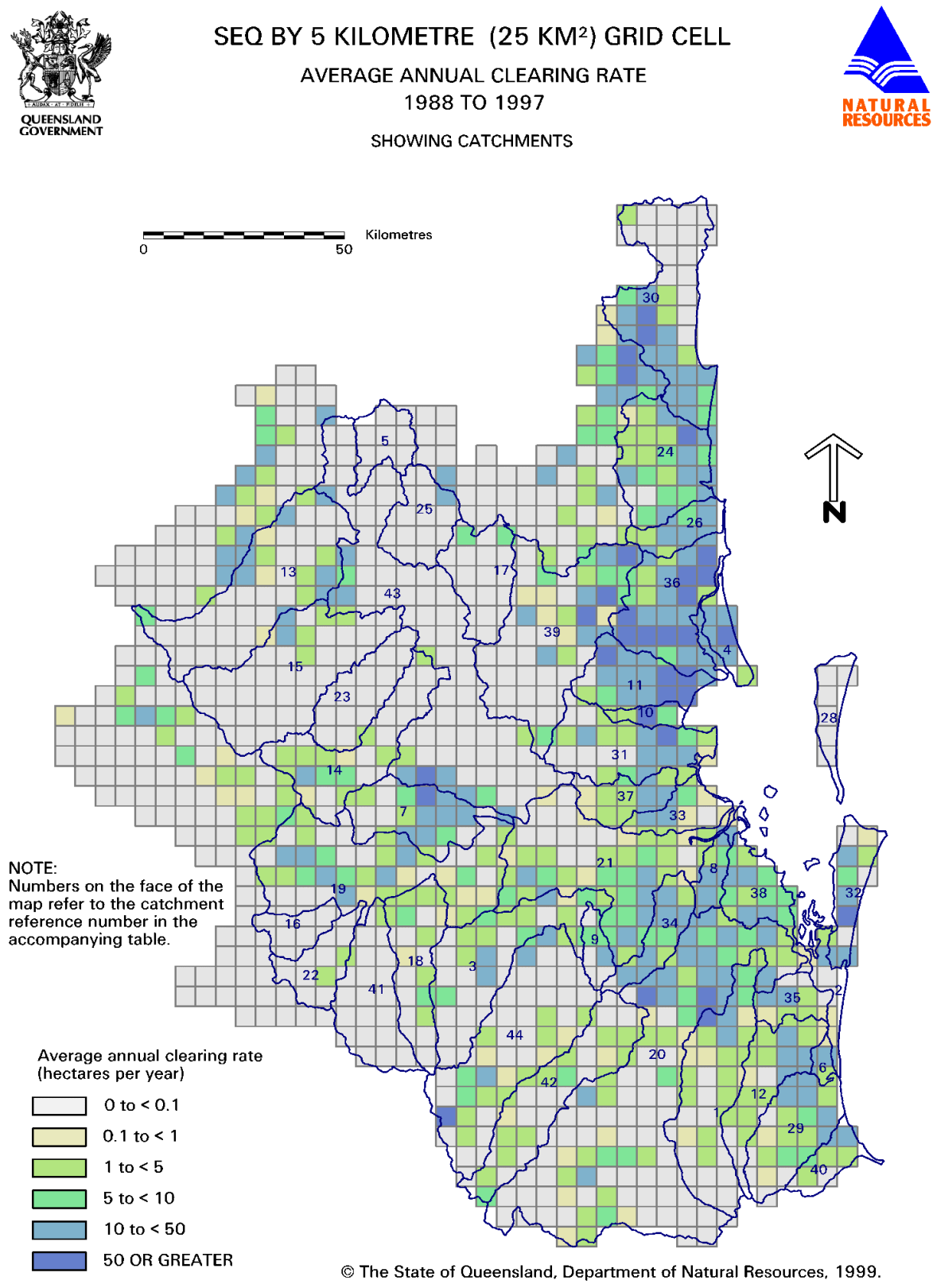

Figure 4: Average annual clearing rate per 5x5km grid cell over the South East Queensland study area from 1988 to 1997. Map numbers represent catchment names: refer to table 5 to identify catchment names.

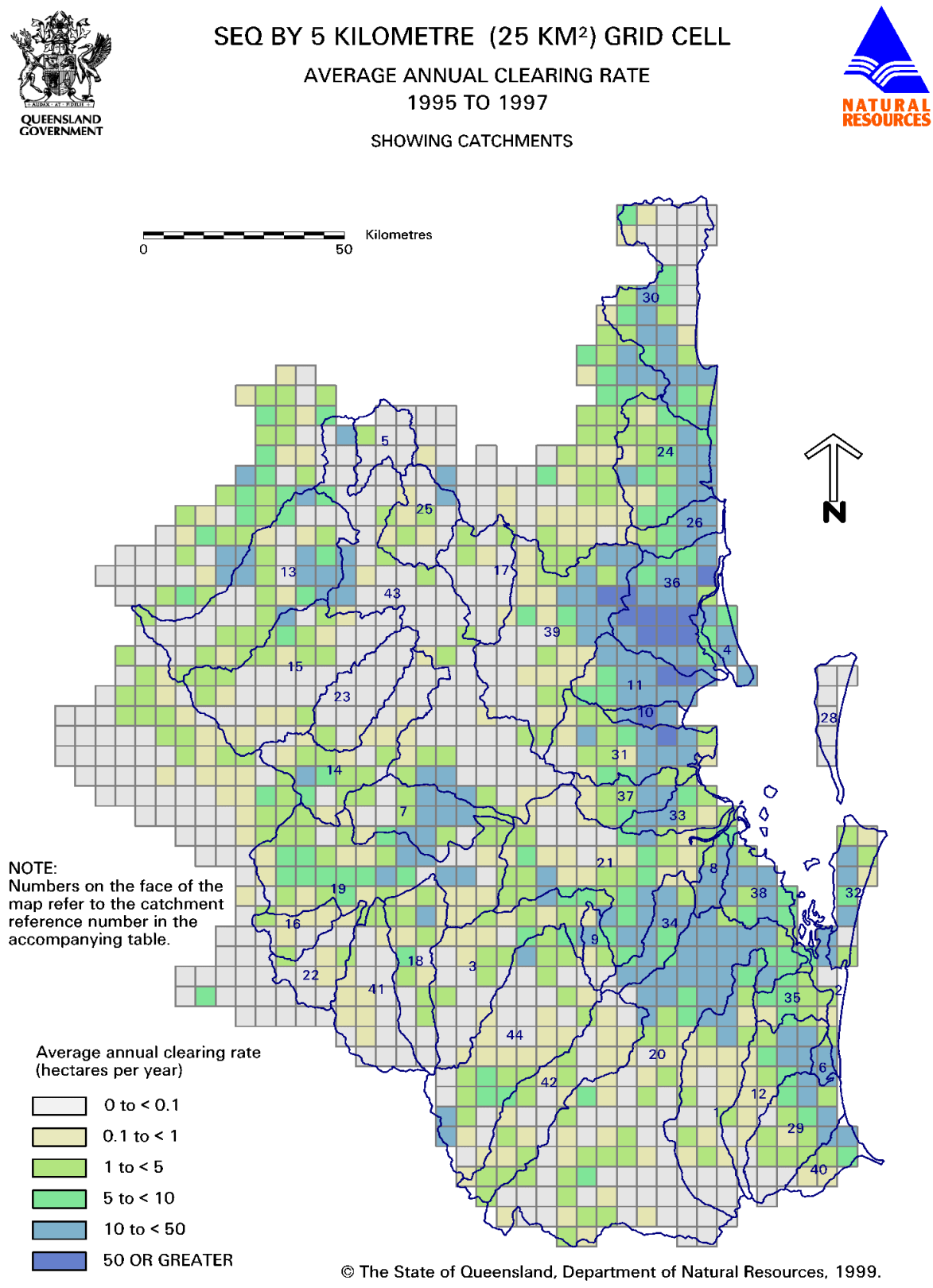

Figure 5: Average annual clearing rate per 5x5km grid cell over the south East Queensland study area from 1995 to 1997. Map numbers represent catchment names: refer to table 5 to identify catchment names.

Table 5: Catchment names and reference numbers.

Map Ref. No.	Name	Map Ref. No.	Name	Map Ref. No.	Name
1	Albert River	16	Flagstone Creek	31	North Pine River
2	Bay Islands	17	Kilcoy Creeks	32	North Stradbroke Island
3	Bremer River	18	Laidley Creek	33	Northside Bay Creeks
4	Bribie Island	19	Lockyer Creek	34	Oxley Creek
5	Brisbane River (East Branch)	20	Logan River	35	Pimpama River
6	Broadwater Creeks	21	Lower Brisbane River	36	Pumicestone Passage Creeks
7	Buaraba & Spring Creeks	22	Ma Ma Creek	37	South Pine River
8	Bulimba Creek	23	Maronghi & Ivory Creeks	38	Southside Bay Creeks
9	Bundamba Creek	24	Maroochy River	39	Stanley River
10	Burpengary Creek	25	Monsildale Creek	40	Tallebudgera & Currumbin Cks
11	Caboolture River	26	Mooloolah River	41	Tenthill Creek
12	Coomera River	27	Moreton Bay	42	Teviot Brook
13	Cooyar Creek	28	Moreton Island	43	Upper Brisbane River
14	Cressbrook Creek	29	Nerang River	44	Warrill Creek
15	Emu Creek	30	Noosa River		

Table 6: Description of replacement landcover / land use classes.

Replacement landcover or land use	Description
Pasture	Cleared to pasture. Includes clearing for rural residential, grazing, future urban land use and privately owned plantations cleared to pasture (i.e. not replanted as plantations).
Settlement	Cleared for urban development
Forest	State forest clearing including plantation and native forest.
Crops	Cleared for growing crops.
Mining	Cleared for mining.
Infrastructure	Cleared for roads, railways water storage.