Australian Government
Department of Climate Change

The Global Carbon Monitoring System Initiative: Supporting post-2012 Climate Change

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Outline

- Current National Carbon Accounting System and Land-cover change mapping programs
- International Activities - GCMS
- Global partnerships, including Japan, USA and Europe
- GCMS under the GEOSS Framework

Types of Forest Change for Routine Monitoring in a Forest Carbon Monitoring System





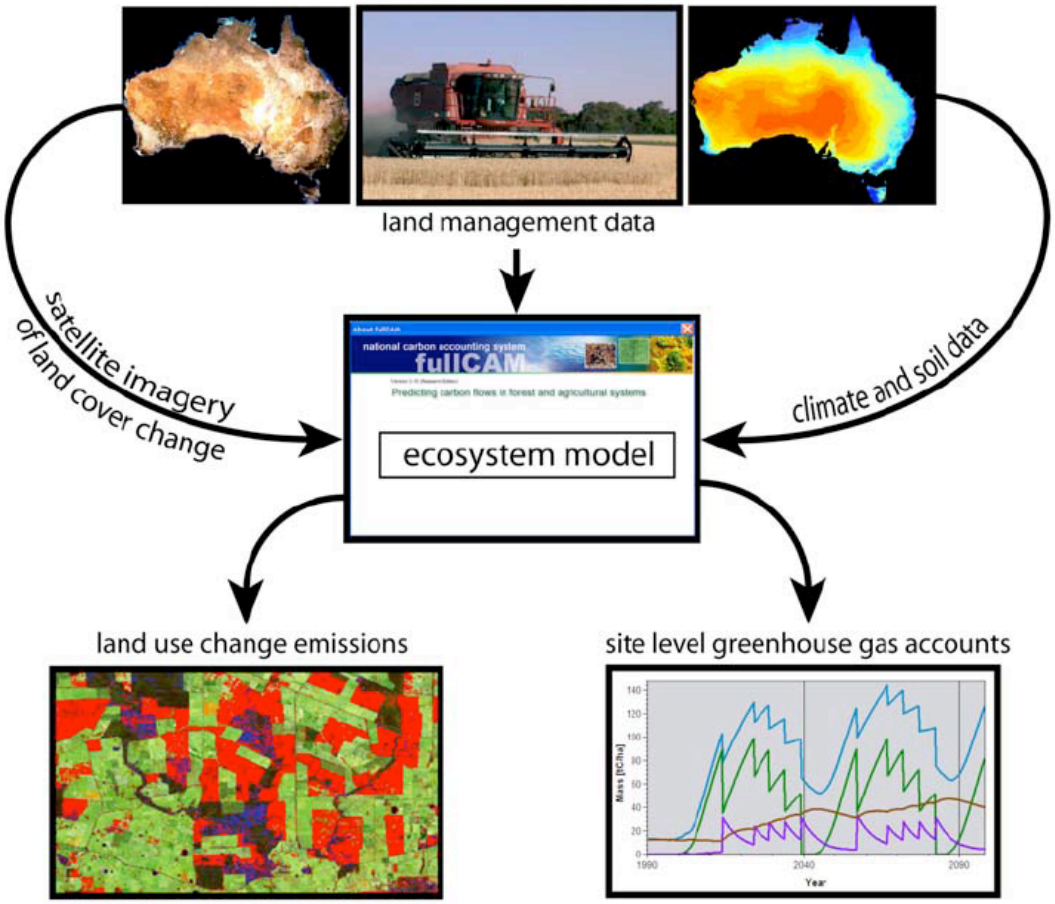
Type of clearing	Characteristic size	Characteristic temporal cycle
Selective logging	Gaps < 30 x 30 m	30-80 yrs
Clear-cut logging	> several ha	80 yrs
Shifting cultivation	Small fields, < 6 ha	5-10 yrs
Small-holder agriculture	Small fields, < 6 ha	Permanent until abandoned
Intensive mechanized agriculture	> 100 ha	Permanent until abandoned
Urban growth, or other uses	Ranging from small settlements to urban expansion	Permanent until abandoned

The National Carbon Accounting System – (NCAS): Features

Initiated in 1999, the Australian NCAS accounts for activities such as livestock and crop production, land clearing and forestry, through a highly integrated system that combines:

1. Remotely sensed land cover change (including mapped information from thousands of satellite images)
2. Land use and management data
3. Climate and soil data
4. Greenhouse gas accounting tools, and
5. Spatial and temporal ecosystem modelling

NCAS (2)


land management data
satellite imagery of land cover change
climate and soil data
national carbon accounting system
fullCAM
Predicting carbon flows in forest and agricultural systems
ecosystem model
land use change emissions
site level greenhouse gas accounts
Mass [tC/ha]
Year
1990
2040
2090


Carbon Source
Carbon Sink

Carbon Stocks Accounting

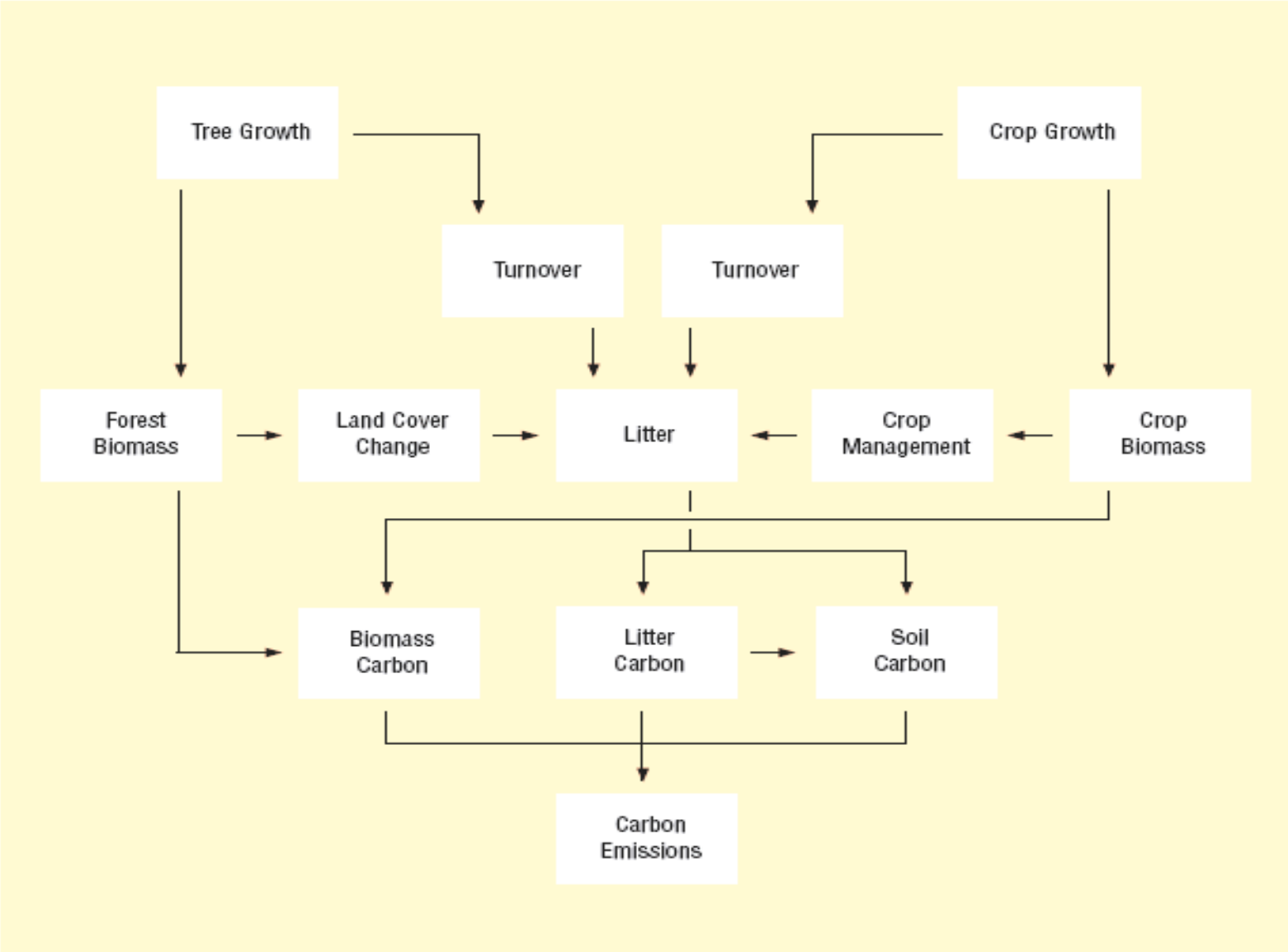


Figure 2. Major Carbon Pools and Processes.

NCAS(3): Ecosystem Model

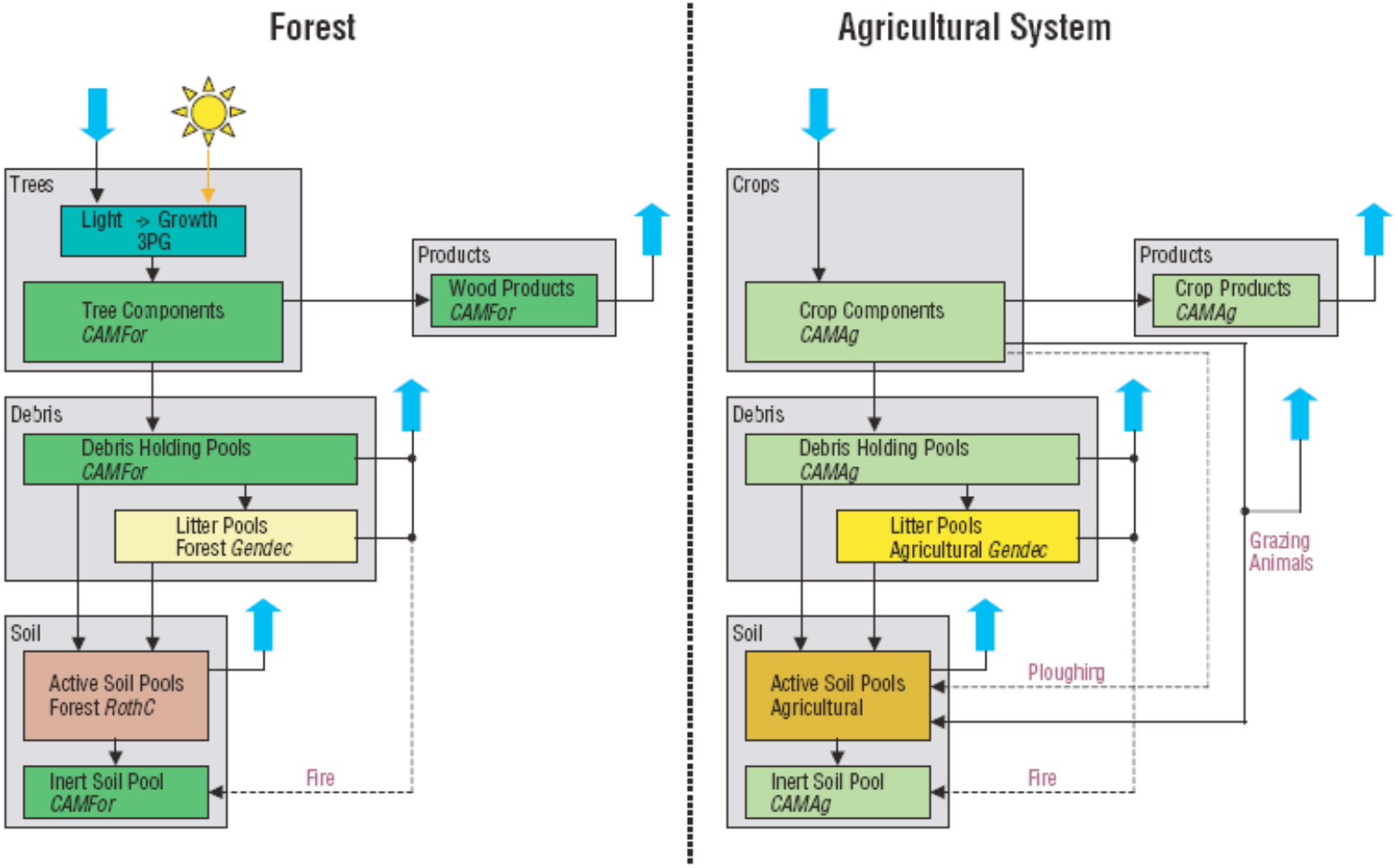
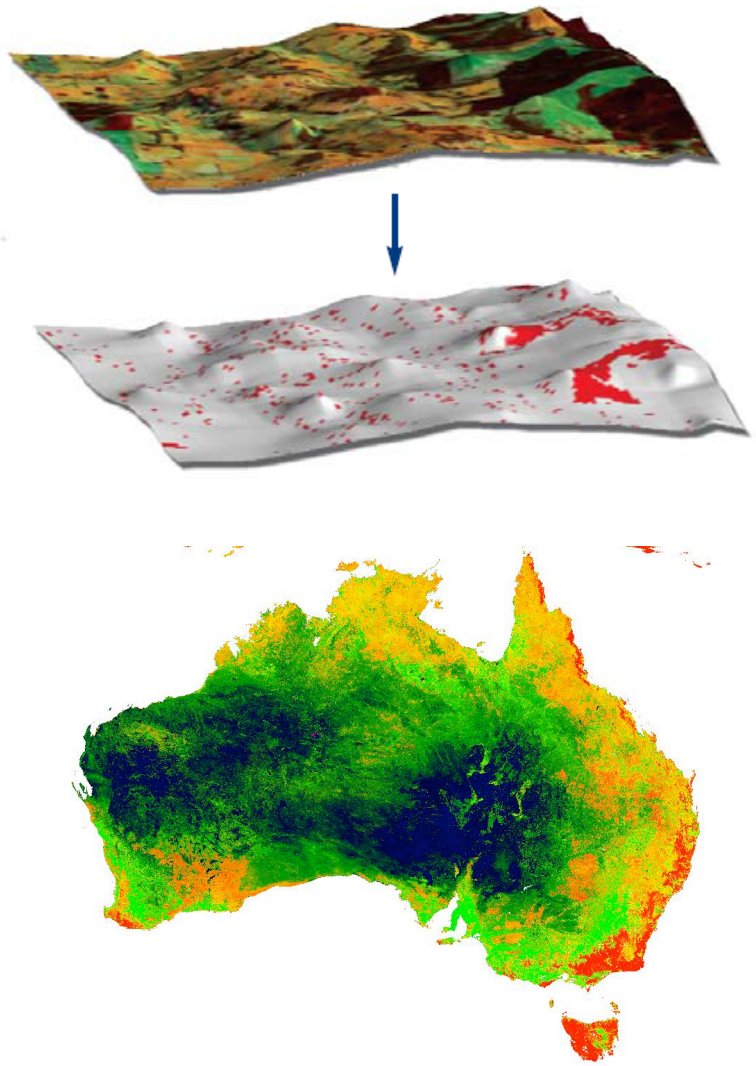


Figure 1. The *FullCAM* Model

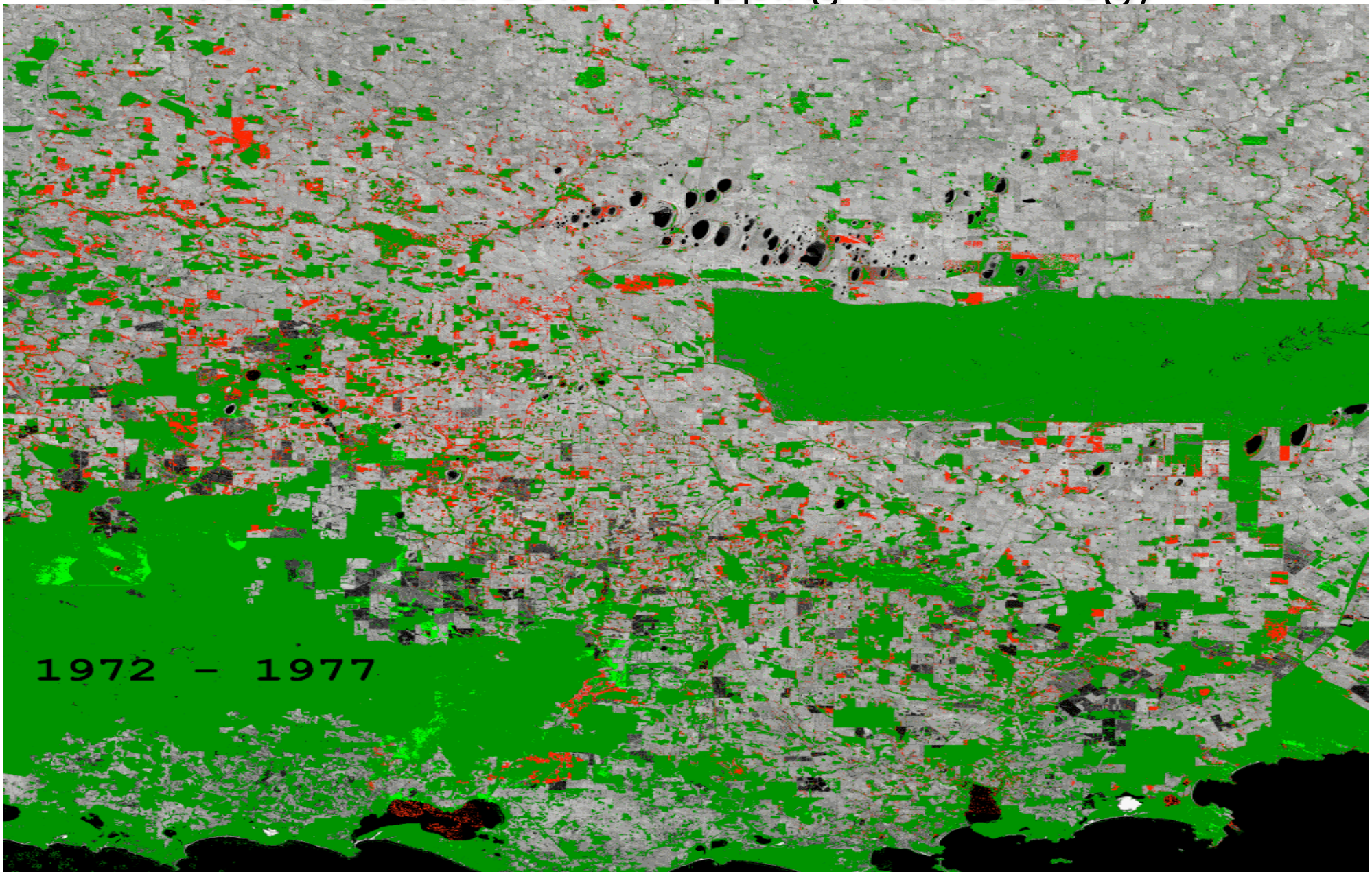
NCAS Land-cover Change Mapping

(Source P. Caccetta - CSIRO)



- 15 time-steps of Landsat MSS, TM and ETM+ data are used to monitor land clearing and revegetation from 1972 to 2008
- All data is calibrated to a common geographic, topographic and spectral base.
- Advanced statistical techniques compare and validate changes in individual pixels, and eliminate false change
- Aerial photographs, hi-res satellite images and field data to verify changes detected by 25 m resolution satellite imagery
- AVHRR and MODIS NDVI time series data provide background information for productivity modelling and land use mapping
- Investigating SAR data analysis methodologies

NCAS Land-cover Mapping Methodology



NCAS Results

Table 3. Land Use Change Emissions (Mt CO_2-e)[9] National and by Australian State and Territory, 1998-2003.

Year	National	New South Wales	Northern Territory	Queensland	South Australia	Tasmania	Victoria	Western Australia
1988	114.9	23.3	1.0	62.4	4.1	6.4	5.9	11.7
1989	119.1	26.5	0.8	68.1	0.4	6.9	6.3	10.1
1990	126.2	22.7	0.6	79.2	1.1	7.8	4.7	10.1
1991	101.3	21.8	0.6	59.7	0.6	7.0	3.9	7.6
1992	84.5	19.0	0.8	48.0	0.4	6.0	5.1	5.2
1993	71.1	14.0	0.4	43.1	-0.7	6.1	3.8	4.3
1994	68.0	12.3	0.4	43.5	0.0	5.6	2.9	3.2
1995	64.4	12.6	0.5	38.2	-0.1	6.1	3.0	4.1
1996	61.5	10.7	0.8	36.2	0.0	7.0	2.5	4.3
1997	57.7	9.5	0.7	36.1	-0.4	6.3	2.4	3.1
1998	71.3	12.5	0.5	45.9	-0.3	6.3	2.5	3.9
1999	57.8							
2000	59.6							
2001	53.4							
2002	60.6							
2003	38.7							

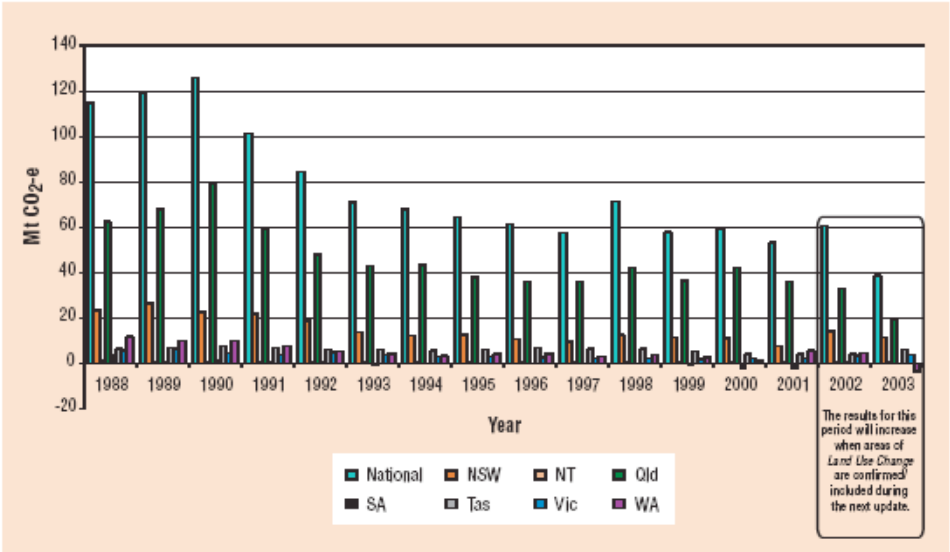
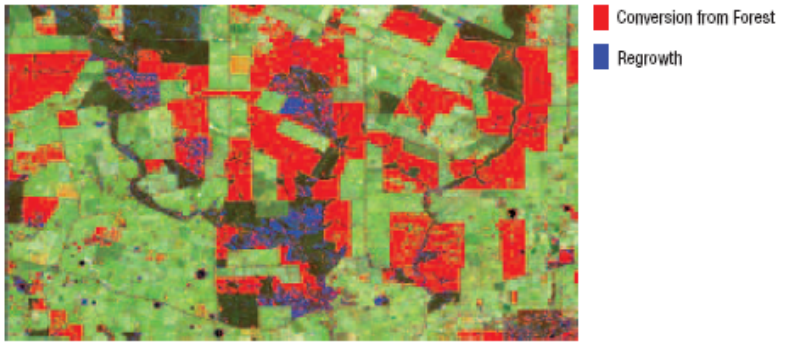
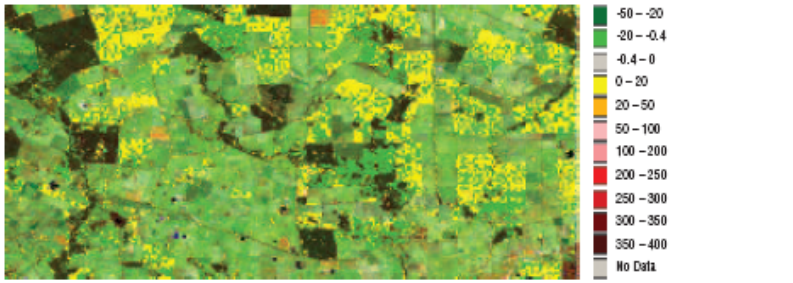


Figure 12. Emissions (Mt CO_2-e) Over Time by Australian State and Territory.

(a) An Example Land Cover Change Image (1972-2000 composite).



(b) An Example Carbon Output (Emissions in 1998).



Spatially Explicit Accounts

International Activities

- Establishment of Global Carbon Monitoring System Initiative – February 2008; Ministerial Announcement w. Clinton Foundation
- Working with Governments of Indonesia, Papua New Guinea and China to develop national forest and carbon monitoring systems
- Collaboration between DCC, NIES, JAXA, Woods Hole, JRC, CSIRO, CRCSI and UNSW on use of optical and JERS and ALOS-PALSAR data for tropical deforestation and degradation mapping
- Strong support from US NGO's such as Clinton Foundation and Rockefeller Foundation for use of GCMS in poverty alleviation and development projects around the world.

Global Carbon Measurement System - GCMS

Goal: Development of a consistent and robust global land cover change monitoring and carbon accounting system, to address international programs to also estimate emissions from deforestation and forest degradation (REDD), as well as emerging carbon trading markets

Anticipated System Elements:

- WebGIS delivery tool for free, open access to forest cover change monitoring data
  - *Opportunity to link to Sentinel Asia data distribution system*
- Application of Australia's world-class Land-use Change Mapping Methods and Forest Productivity Models
- Establishment of global satellite database, 10-15 year layers: optical & SAR
- Wall-to-wall mapping of all land-use changes at ~ 25-30 m resolution world-wide over last ~10 years.
- Develop pilot sites and demonstration projects (incl. Indonesia, PNG, China, Africa)
- Promotes development of next-generation satellite mapping methodologies (ie. multi-sensor fusion SAR - hyperspectral + Lidar)
- Establish precision forest measurement & verification sites (Australia, Asia, USA, Africa, etc.)

ALOS PALSAR DATA
Key Component of GCMS

Strong Synergies between GCMS and GEOSS Vision & Societal Benefits

- Also crosscutting benefits e.g.: links between land-cover – biodiversity – water quality
- Promotes 'virtual constellations' concepts, and multi-sensor, multi-scale data integration with simulation models

- **Encourages a global monitoring framework under consistent GEOSS interoperability frameworks**
- **Linkages to UNFCCC current and future monitoring requirements**
  - **Provides monitoring base for the future broad inclusion of forests and land into international frameworks to address climate change.**
- **Strong support by NGO's and private sector**

Thank you