

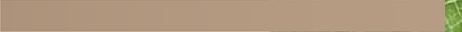


**Australian Government**

**Australian Greenhouse Office**

# **Australia's National Carbon Accounting System**

**Dr Gary Richards  
Director and Principal Scientist**



Australian Government  
Australian Greenhouse Office

national carbon accounting system

# Government Commitment



- The Australian Government has committed to a 10 year, 3 phase, ~\$35M program for a national, comprehensive (all pools, gases and processes) and integrated (mass balance, process driven) capability to:
  - account for all land based emissions (C & N)
  - singular multi-scale (bottom-up) project to national
  - sub-hectare monthly reporting
  - provide projections and scenario capability

national carbon accounting system



# Ten Year 3 Stage Plan



- **Phase 1 (1998-2002)**
  - Establish comprehensive framework
  - Provide Land Use Change 1990 baseline – primarily CO<sub>2</sub>
- **Transitional (2002-2004)**
  - Consolidate Phase 1
  - Development Activities for Phase 2 (particularly n-cycle)
- **Phase 2 (2004-2008)**
  - Develop comprehensive capability (all pools, gases and activities)
  - Public tools and data dissemination

national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Key Characteristics



- Centralised and integrated national programs to support a spatially based, mass balance process model (FullCAM)
  - Based around CO2Fix, RothC, Gendec, Century, 3PG, Gorcam, Boundary Line, Palisade @Risk
- Founded on key national datasets
  - 13 Landsat coverages 1972-2004
  - Monthly climate surfaces
  - Physical inventories
  - Land management, land use data

national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Implementation



- Critical mass and coordination
  - Remote sensing at < 20% of benchmark costs
  - Structured programs for verification, continuous improvement and uncertainty management
- Systems of relationships for data and human resources
- Focus on extending applications and therefore partnerships
- Public accessibility to support individual action

national carbon accounting system



# Barriers



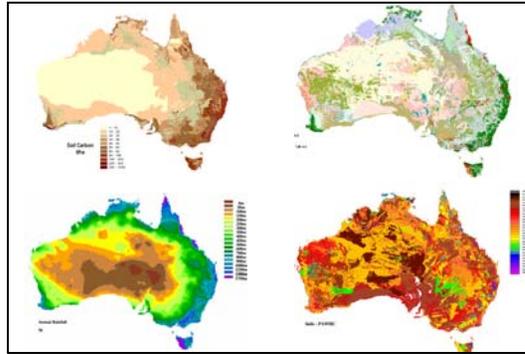
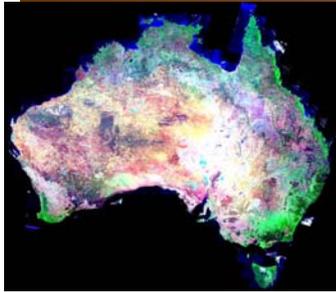
- Data availability
- Model capability
- Systems and business models
- Skills – technical and administrative
- Governance issues – largely around whole of government support and usage

national carbon accounting system

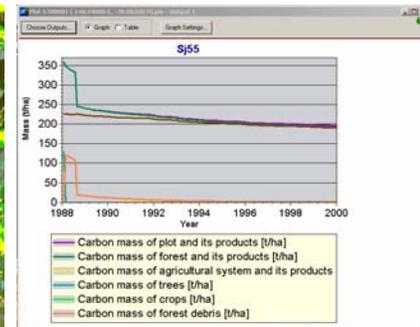
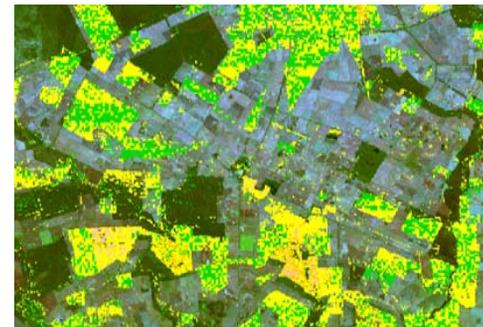
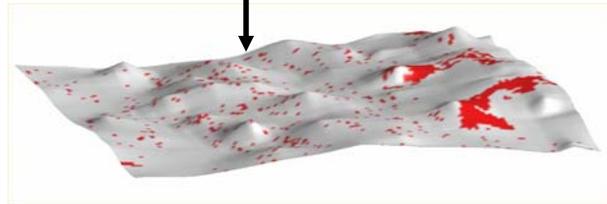
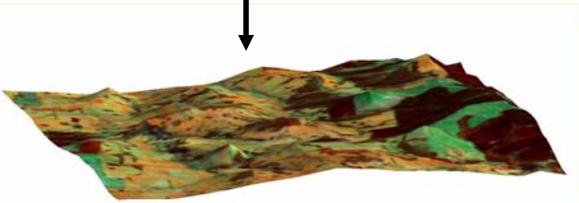


Australian Government  
Australian Greenhouse Office

# National Carbon Accounting System – the process



national carbon accounting system  
**fullCAM**



national carbon accounting system

Australian Government  
Australian Greenhouse Office

# Time Series Change (02 backdrop)

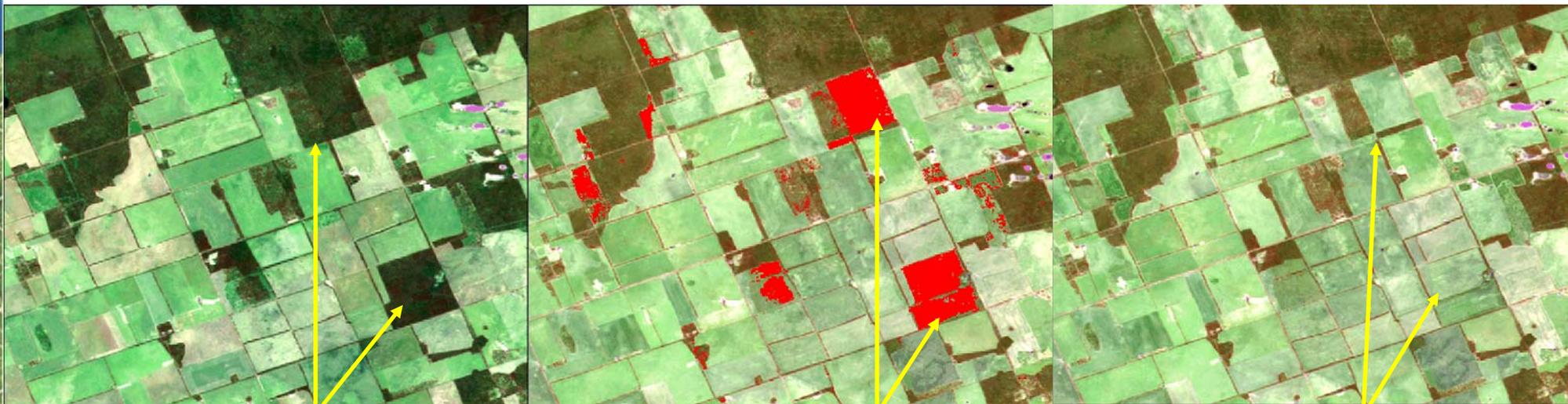


national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Forest Conversion



1995

conversion

2000

national carbon accounting system

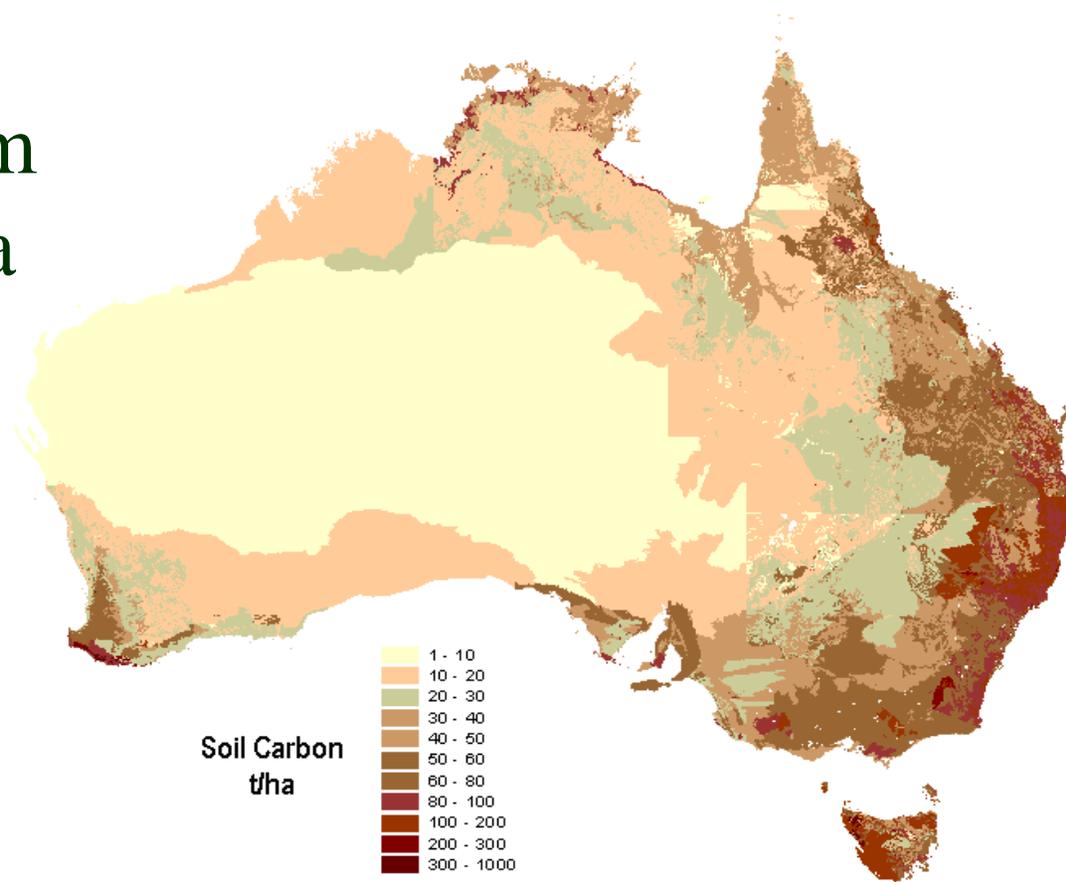


Australian Government  
Australian Greenhouse Office

# Resource Inventory (eg Soil Carbon)



Initial Soil C  
inventory from  
available data



national carbon accounting system

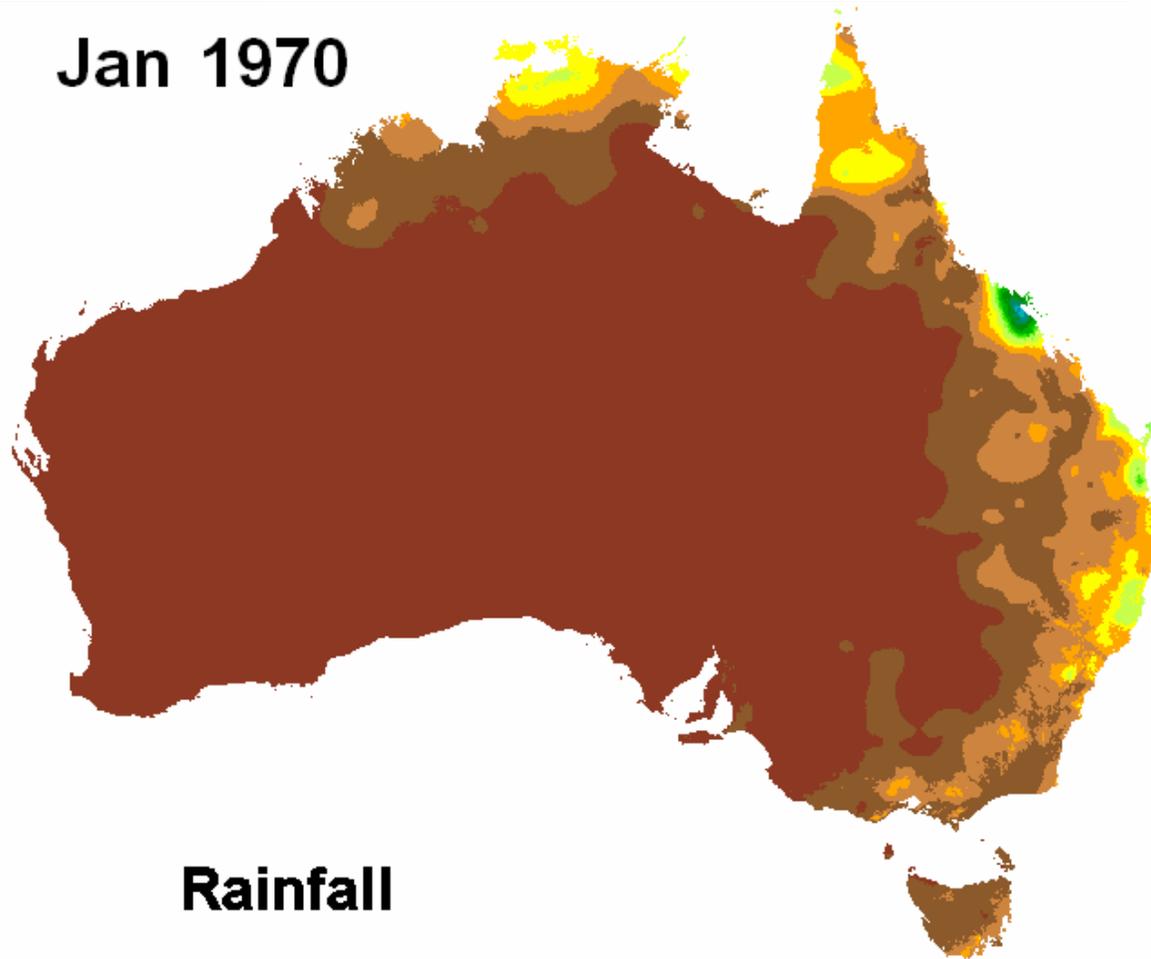


Australian Government  
Australian Greenhouse Office

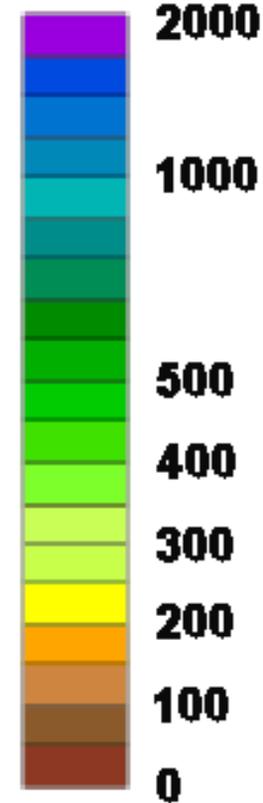
# Climate (eg Rainfall)



Jan 1970



Rainfall (mm)



Rainfall

national carbon accounting system

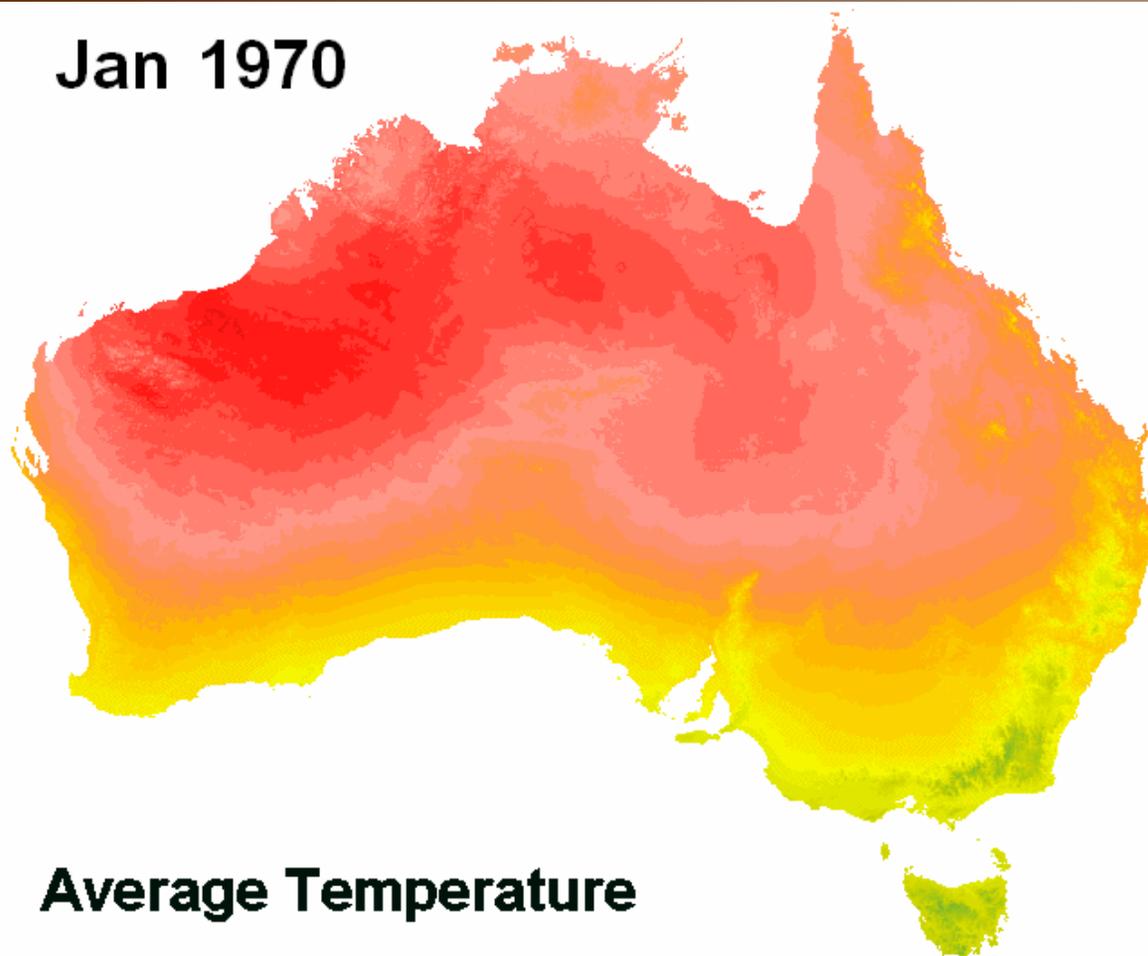


Australian Government  
Australian Greenhouse Office

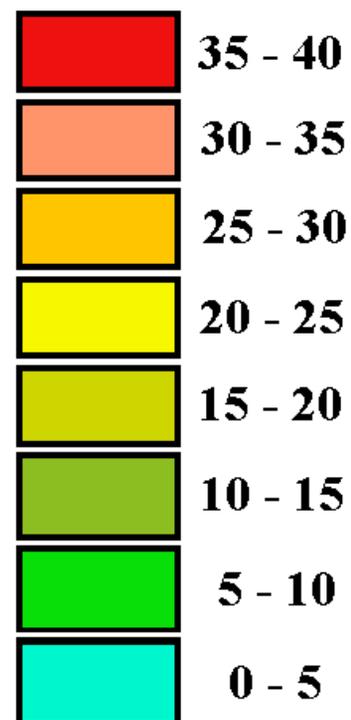
# Average Temperature



Jan 1970



Temperature (°C)



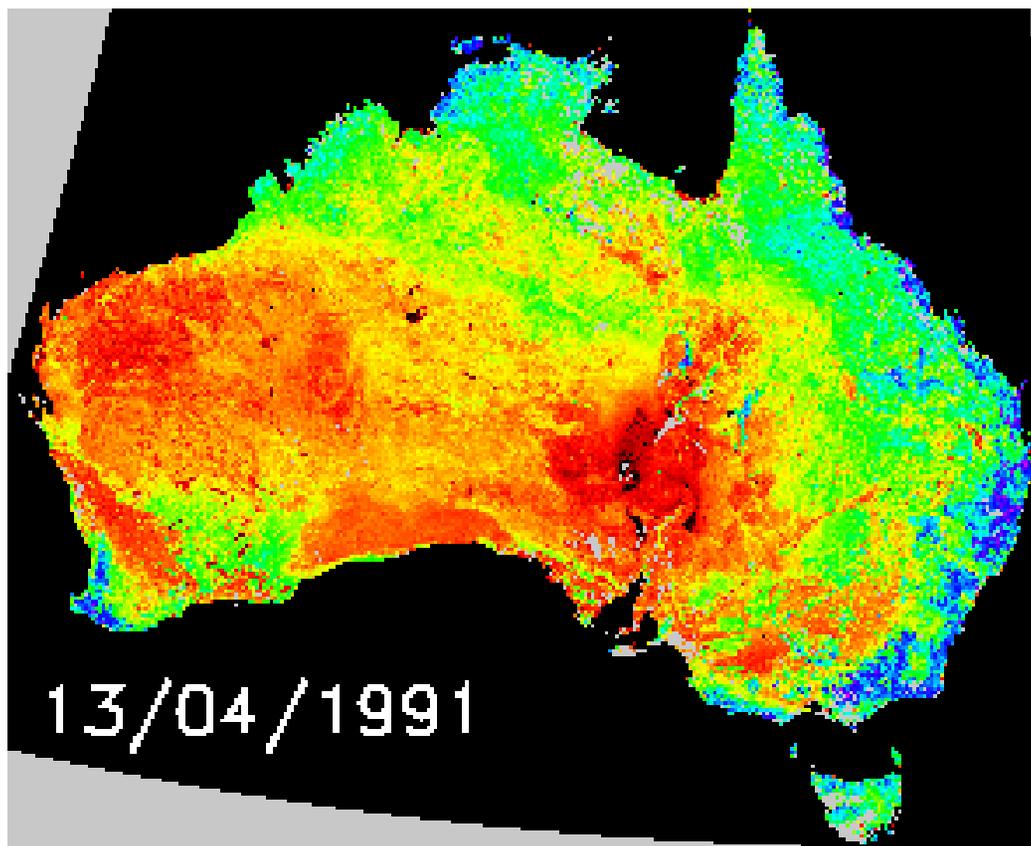
Average Temperature

national carbon accounting system



Australian Government  
Australian Greenhouse Office

# NDVI



Cloud



High

Low

national carbon accounting system

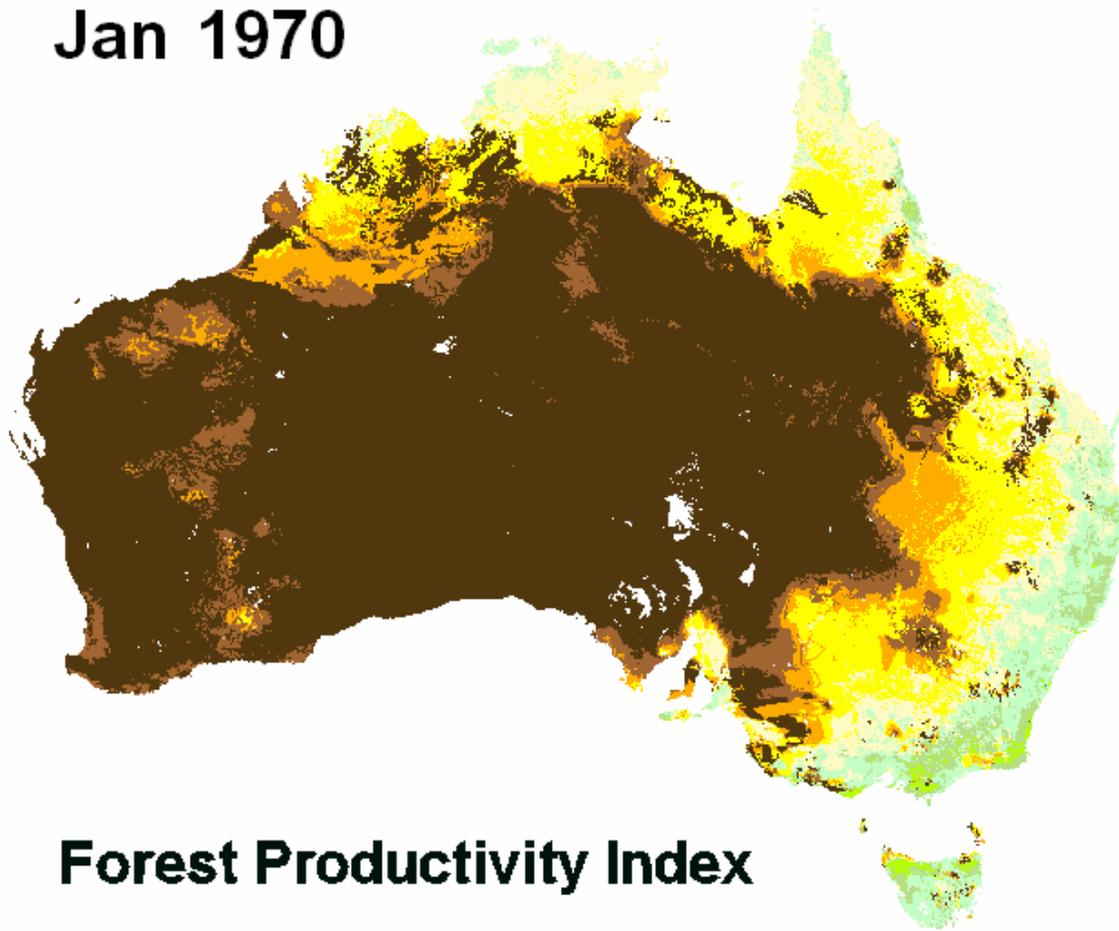


Australian Government  
Australian Greenhouse Office

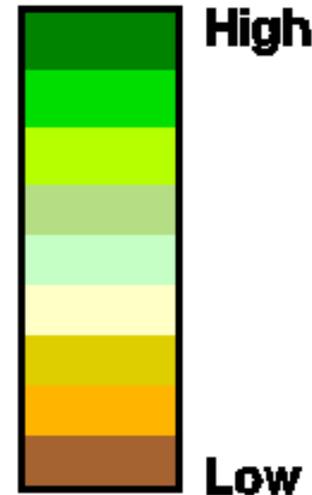
# Model subroutines (eg Forest Productivity Index)



Jan 1970



**Forest Productivity Index**



**Forest Productivity Index**

national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Land Use



- Currently by regional survey of agricultural and forestry management practices – mapped to soil types
- Proposed move from regional survey to spatially relevant ‘mapping’ using historic (remote sensing) AVHRR and current MODIS data

national carbon accounting system



# Land Use & Management



PLOT : Plot 168000001 ( 120.00000 E, -33.75000 N).plo : Input

Events ✓ < Back Next > ?

Event List	Year	Day	In Current Simulation	Type	'C' if Clearing	Extent or Species
1990.262	1990	96	Yes	Thinning	C	100.0 %
1990.262	1990	96	Yes	Forest Fraction		0.0 %
1990.760	1990	278	Yes	Forest Fire		100.0 %
1991.248	1991	91	Yes	Ploughing	C	100.0 %
1991.333	1991	122	Yes	Crop Planting		Annual pasture
1991.916	1991	335	Yes	Grazing		85.0 %
1992.081	1992	30	Yes	Grazing		Off
1992.248	1992	91	Yes	Ploughing	C	100.0 %
1992.333	1992	122	Yes	Crop Planting		Cereal forage
1992.834	1992	305	Yes	Harvest		0.0 %
1992.916	1992	335	Yes	Grazing		70.0 %
1993.081	1993	30	Yes	Grazing		Off
1993.166	1993	61	Yes	Agri. Fire		95.0 %
1993.248	1993	91	Yes	Ploughing	C	100.0 %
1993.333	1993	122	Yes	Crop Planting		Annual pasture
1993.664	1993	243	Yes	Herbicide	C	100.0 %
1993.664	1993	243	Yes	Tree Planting		Default Tree Species
1993.664	1993	243	Yes	Forest Fraction		100.0 %

List Events ?

By Time  By Type

New ... Edit ...

Clone Delete

Event Queue Status:

Valid

Starting forest:

Starting agricultural:

Number of events:

Simulation Timing:

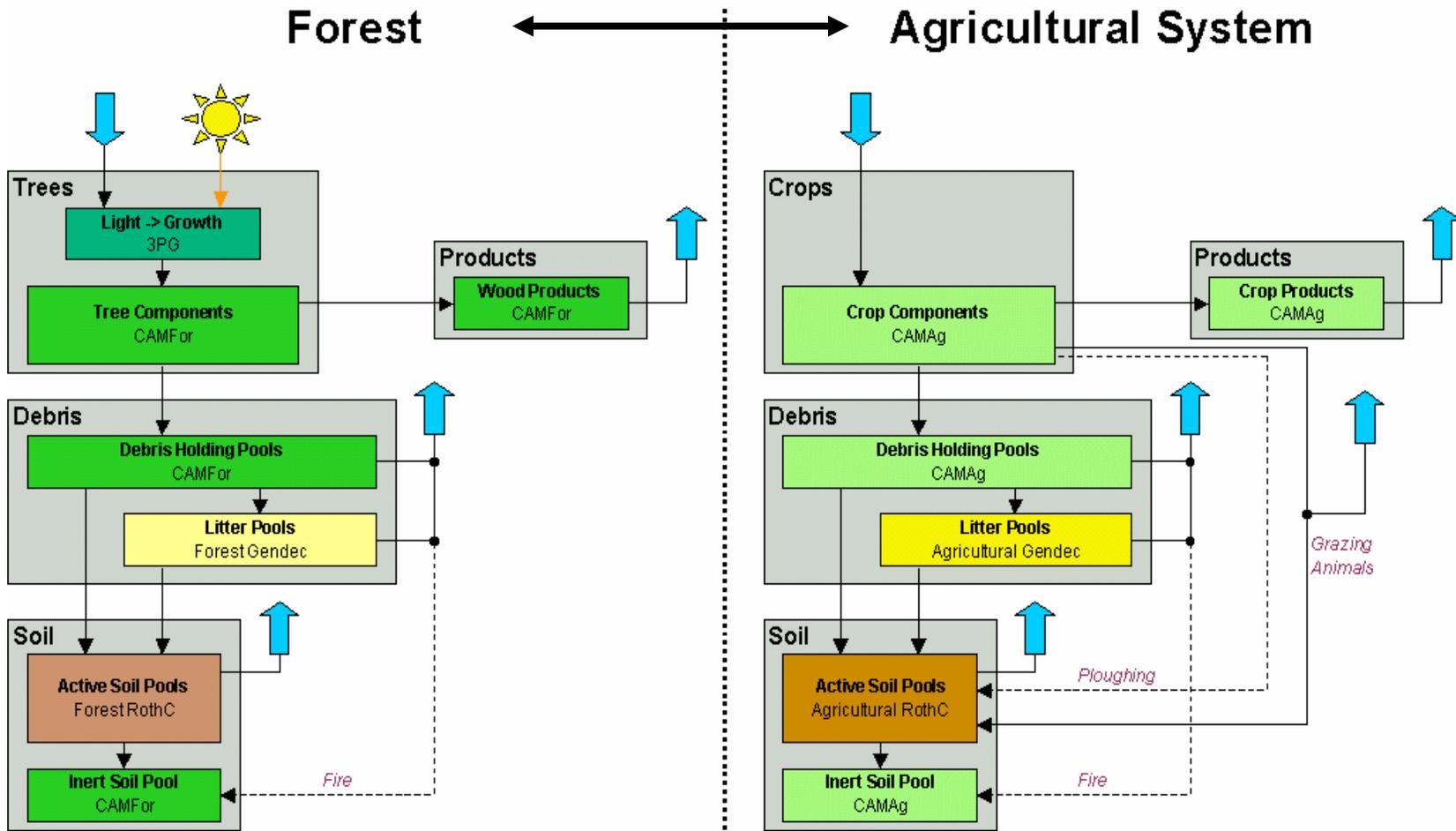
From step 4/12 in 1990

To step 12/12 in 1999

national carbon accounting system



# FullCAM Model

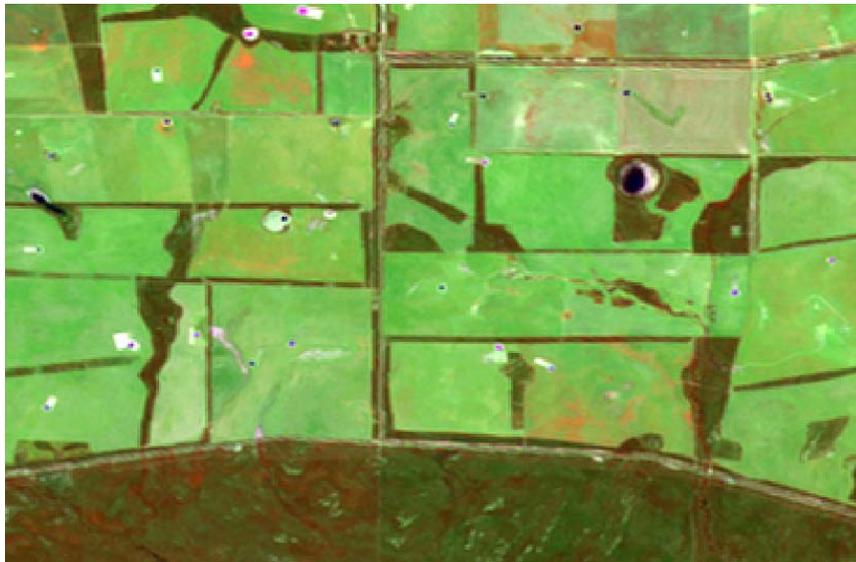


national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Carbon Stock Change Output



national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Verification Principles



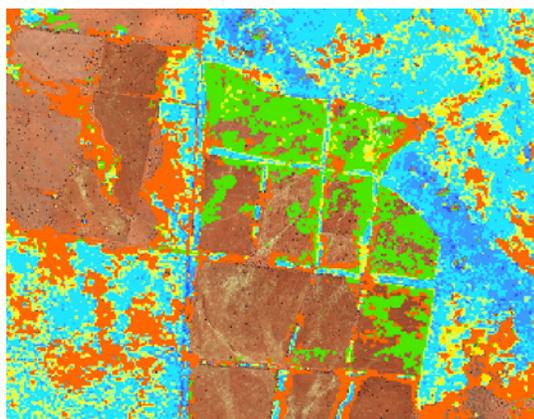
- Physically measurable
- Transparent and visible
- Contribute to continuous improvement
- Progressively reduce uncertainty
- Provide input to sensitivity analysis
- Top-down & bottom-up

national carbon accounting system

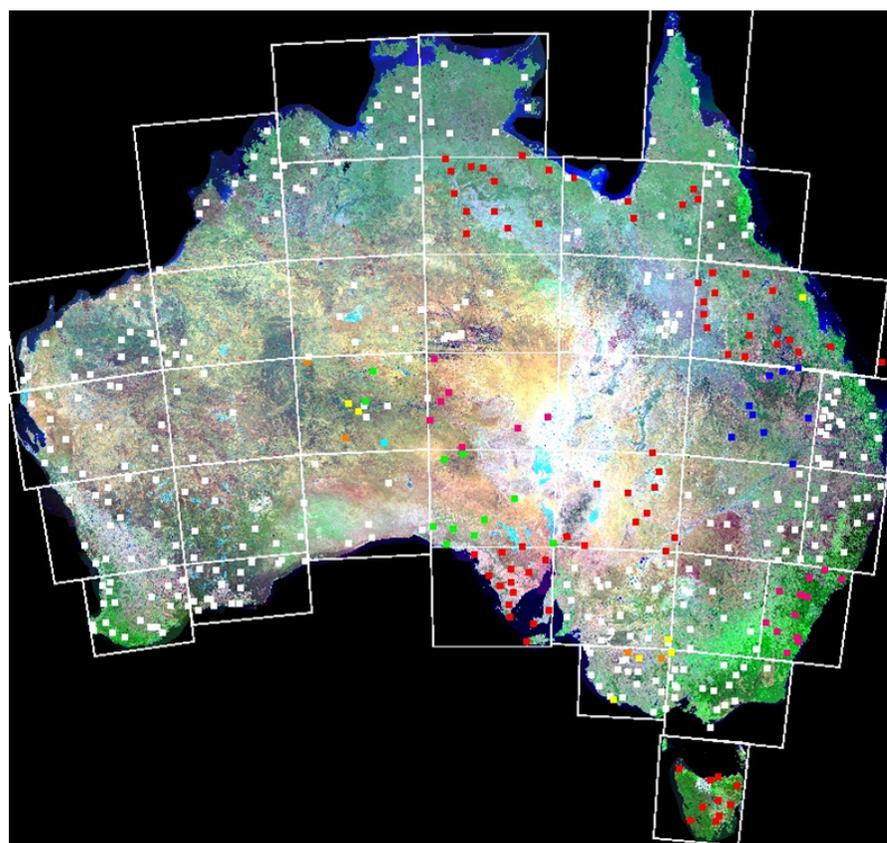


Australian Government  
Australian Greenhouse Office

# Remote Sensing - Verification



 Recent clearing



national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Biomass Verification

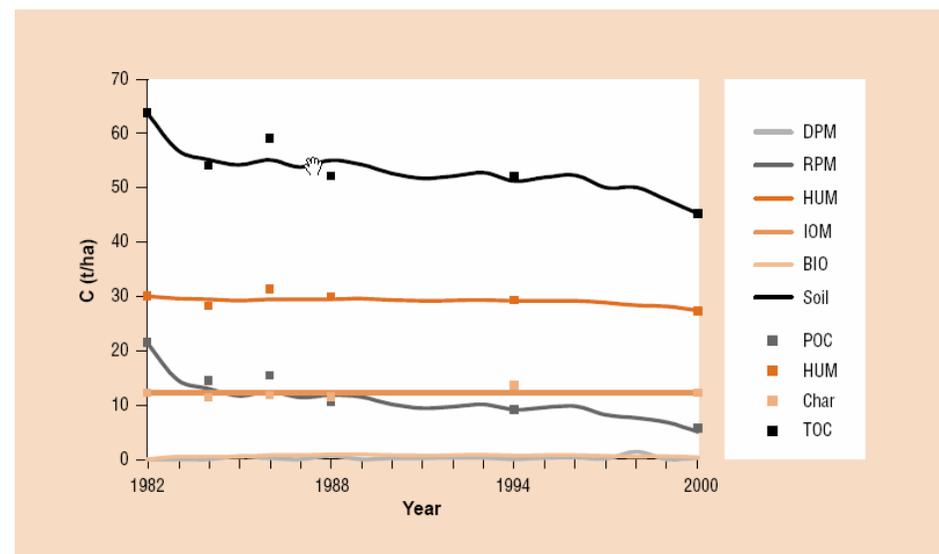
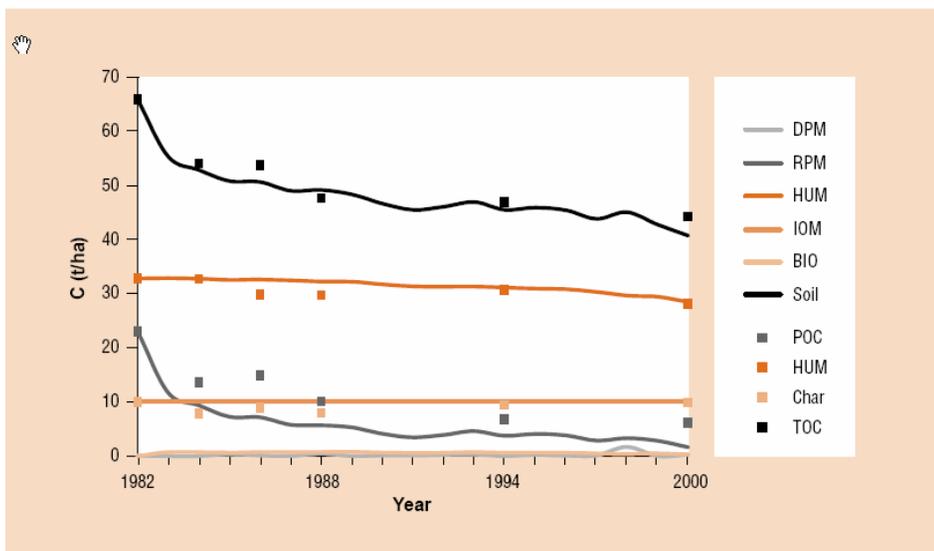


national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Soil Model Verification



national carbon accounting system



Australian Government  
Australian Greenhouse Office

# Current Developments



- a non-CO2 national account coupled to current carbon accounts
- provide a publicly available carbon accounting toolbox representing full NCAS capability
- further develop the Image Viewer product as the primary vehicle for general dissemination of NCAS data; and provide ready access to the NCAS data library
- integrate carbon accounting and economic scenarios to provide a sound biophysical and economic basis for greenhouse emissions projections
- review, maintain and enhance system hardware and software capability and systematize and catalogue the recording and access to data holdings

national carbon accounting system



# Product Releases



- Base natural resource and satellite data via Geoscience Australia
- In 2005 (March):
  - NCAT
    - FullCAM model and webserver and database access to the NCAS data holdings
    - NCAS Technical support documentation in a searchable format
  - Image Viewer vers. 2.0
    - 13 time series of satellite data 1972-2004
    - Select spatial data
    - Regionalised statistics (natural resource and economic)

national carbon accounting system



Australian Government  
Australian Greenhouse Office