REPORT ON THE NATIONAL FOREST INVENTORY WORKSHOP ON

MONITORING FOREST EXTENT AND CONDITION

MELBOURNE, 15 & 16 NOVEMBER 2005

EXECUTIVE SUMMARY

The National Forest Inventory convened a workshop of 45 forest researchers and inventory specialists to consider the technical needs of the proposed Continental Forest Monitoring Framework. The workshop concluded that there was a fundamental need for policy makers to clarify the specific objectives and scope of the framework, the agency responsible and a process for its implementation. The workshop agreed that a national framework was needed because current approaches using periodic map compilations are not adequate to report on change in forest extent or condition.

A wide range of speakers from all States and Territories and from New Zealand provided a summary of relevant forest monitoring activities through their presentations. The design of the Continental Forest Monitoring Framework and its pilot implementation in NE Victoria was also presented. A summary report demonstrated the results, benefits and anticipated costs of the system. The workshop focussed on technical issues that required resolution. A number of these issues were also discussed in detail including sampling design and statistics, satellite imagery, airborne systems including laser scanning (LIDAR) and air photos, and linkages to field plot measurements. There was strong support to develop a system that can also report on other vegetation and possibly link with other national landscape monitoring systems (eg in agricultural and possibly into arid areas). Issues discussed at the workshop will help develop a refined "Purpose" statement and proposed design for a forest and vegetation monitoring system for consideration by policy-makers and other stakeholders in 2006.

OBJECTIVES AND OUTCOMES OF THE WORKSHOP

	OBJECTIVES	OUTCOMES
1.	Review current work being undertaken nationally on monitoring trends in forest extent and condition particularly using remote sensing and links to field plots;	Seventeen presentations covering a wide range of research from all States and Territories and NZ demonstrated the substantial amount and high quality of work underway to monitor forests for a range of values. Most were relatively short term projects in specific regions and there were very few long term monitoring systems and none that were nationally comprehensive. Many projects were using remote sensing to scale up and analyse results over large areas and some using multi-year time series imagery which is complex but has powerful monitoring potential.
2.	Present and review of the rationale, design and results from the pilot implementation of the Continental Forest Monitoring Framework	The Continental Forest Monitoring Framework (CFMF) design was outlined and key results from the Pilot project in NE Victoria were presented. The CFMF approach aims to provide scientifically reliable information on trends and status in forest condition through a structured design linking broad scale and detailed remote sensing to field plots where a consistent core set of data are measured. Recommendations from the CFMF pilot were discussed.
3.	Discuss and explore opportunities for expanding the CFMF and incorporating the best current techniques into a Continental Forest and Vegetation Monitoring Framework.	There was general agreement that monitoring should be extended to include non-forest native vegetation. A wide range of monitoring methods were presented and there was less agreement as to the best techniques to use in a national system. It was recognised that any proposal for a new system, such as the CFMF, should aim to build linkages with other existing systems, have the ability to incorporate existing data, provide opportunities for partnerships and data sharing, and create efficiencies in sharing knowledge and expertise.
4.	Develop options for the next steps in developing and implementing an agreed integrated continental monitoring framework.	A wide range of issues raised by participants were discussed at the workshop and will be used by the NFI to develop a refined "Purpose" statement for a forest and vegetation monitoring system for consideration by policy-makers and other stakeholders in early 2006. Other suggested paths include a paper to the Forest and Forest Products Committee outlining issues and developing options and recommendations for future funding and institutional arrangements to implement a national forests and vegetation monitoring system.

KEY POINTS

This short report is intended to present the key points discussed at the workshop and does not provide a complete record of the workshop. It does not attempt to summarise the many presentations that were given or all the working group results. For additional detail, most presentations and project reports are available on the workshop website: http://data.brs.gov.au/cfmf/index.htm

1. ON THE FUNDAMENTALS OF THE FRAMEWORK

1.1 The need for a CFMF.

The workshop recognised that current approaches using periodic map compilations are not adequate to report on change in forest or vegetation extent or condition. The workshop participants provided almost unanimous support for an improved approach to monitoring Australia's forests to meet national and international reporting obligations. It was agreed that a national continental framework was required.

1.2 Fundamental objective(s)

There was considerable discussion over the fundamental objective and focus of the framework. The workshop agreed that the CFMF could not be "all things to all people". It should focus on the key needs commensurate with available support and resourcing. All agreed that forest inventory should be a central component. There was general agreement that it should be extended to include non-forest native vegetation. For these reasons some suggested that the framework be re-phrased as the Continental Vegetation Monitoring Framework to reflect a potential broadening of its scope.

The workshop acknowledged that the objective(s) should be set by the policy makers and that it should be driven by strong imperatives at Commonwealth and state jurisdiction levels. These need to be clearly established to act as primary drivers to provide direction to the CFMF and build government support.

A wide range of comments and issues raised by participants were discussed at the workshop and will be used to develop a refined "Purpose" statement for consideration by policy-makers. Potential issues for resolution by the policy makers included its scope to cover:

- Clear explanation of why we need a monitoring framework.
- Intention to cover all forest types and all land tenures.
- Extent and condition and health of all forest and other native vegetation types.
- Broader landscape management and the consequences of land-use in the landscape.
- Commercial woodflows and environmental sustainability and the triple bottom line.
- A national picture only or national plus state? The desired reporting level is particularly important for determining the number of plots and thus the overall cost and accuracy.
- If regional reporting is required (eg down to NHT sized regions) then many more plots are required than if just reporting to national or State levels.

1.3 Principles

The report by Wood *et al* (2005) sets out a number of principles for the CFMF. It would be useful if these were reviewed by the policy makers to enable the establishment of the guiding principles in the design and execution of the CFMF.

1.4 One business owner

The workshop participants recommended that one agency should be awarded ownership of the CFMF by the governing jurisdictions. It was also agreed that this, or another, agency should be charged with the responsibility for implementing the CFMF. There was some discussion over the potential of the Australian Bureau of Statistics to fulfil one or both of these roles. It was felt that the ABS offered a number of advantages; nation-wide credibility, long experience in surveys, and a growing interest in environmental issues, amongst others.

The implementation of a national forest and vegetation monitoring framework will require collaboration between the Commonwealth and all States and Territories to provide both existing data and resources for ongoing data collection and analysis. The project will ultimately need to be a joint partnership between a range of agencies to be successful in the long term. In the interim it was agreed that the NFI fulfil the role of championing the CFMF.

1.5 Marketing and building support

The CFMF needs to obtain wide support from those agencies and organisations that can both contribute to, and benefit from, its implementation. Such support should be sought at an early stage as part of the conceptualisation, design, approval and implementation of the CFMF.

1.6 Early wins and a strategic outlook

The workshop agreed that it would be prudent to look for "early wins" whilst simultaneously setting out to provide strategic and long term (inter-generational) benefit in the national interest. One suggestion for getting early results is to enable the use of existing data and/or models to predict or backtrack and estimate change. The use of time series data that is becoming more available, especially remote sensing information, has good potential to assist with this.

1.7 Risk, cost and benefit

As an integral part of the case to establish the CFMF it was agreed that the potential benefits should be quantified. In doing so it should be demonstrated that these benefits exceed the costs. An analysis of the cost of the 'do nothing' option should also be investigated. There is considerable information available on costs from other work and a study could be initiated to summarise what is currently known.

2. ISSUES OF CONTENT OF THE FRAMEWORK

2.1 Definition of the resource

It was agreed that the definition of forest or forest and other native vegetation needs to be clearly established for this will drive the design of the framework. The current design of the CFMF was developed with a focus on forests, so further development would be required to extend the monitoring system to cover other vegetation.

2.2 Core attributes of the framework

Core elements of the framework that are unarguably needed could include:

- Forest (> 2m and 20% cc), and a range of crown cover classes
- Forest type or dominant genus
- A minimum mapping unit
- A specified frequency of monitoring
- and others to be agreed.

Desirable but not essential attributes should also be canvassed.

2.3 A 3 Tiered approach

There was general agreement for a three tiered approach linking ground-based plots to high and low resolution remote sensing as per the CFMF design and presented in the report by Wood *et al* (2005). A combination of permanent plots and modelling also appeared to be the best approach. It was acknowledged that the inventory should harness a range of technologies but we should be wary of designing the framework around specific technologies because of the likelihood of technological changes through time. There was no agreement to the specifics of the approach. The extensive work undertaken by the NFI Steering Committee and the CFMF Technical Advisory Committee and the pilot implementation by BRS and DSE staff and reported by Wood *et al* (2005) was acknowledged.

2.4 Baseline year

There was some discussion over the need and desirability of establishing a baseline year. Such an approach would help both with forecasting and backcasting (identification of historic trends). No baseline year was proposed or chosen, though it is well known that 1990 is being used as a baseline for reporting for the Kyoto Protocol.

2.5 Emphasis on monitoring and reporting on change

It was agreed that the inventory should be designed to detect trends and change. Its emphasis should therefore be on temporal issues rather than single date 'snap shots'.

2.6 Optimise the use of our existing information

A majority of workshop participants recognised the benefits of using as much existing information as possible together with information that was scheduled to be collected in the forward commitments of agencies. However there was an important qualification that sought to ensure that the overall objective(s) should be set first and should not be compromised by existing legacies.

The workshop acknowledged that it would be useful for the NFI to update the review of existing data sources of relevance to the CFMF.

2.7 Statistically valid

The workshop considered the degree to which the framework must be statistically valid. Related issues of accuracy, precision and fitness for purpose were also considered. Several statisticians present who noted that the framework may seek to collect attribute information for potential future uses that are yet to be tightly specified. A good example of data in this category was that of carbon which contributed to inventories over decade ago, prior to the detail of the Kyoto Protocol and our subsequent more detailed knowledge of global climate change. Designing 'statistically valid' inventories under these circumstances is problematic.

2.8 Standards to ensure the quality and consistency of data collection

The workshop noted the need to align with robust existing standards where-ever possible (eg data, and data exchange protocols) and to consider the role of the framework in setting new standards.

The CFMF has developed a field manual (on web) which will be an important reference to enable the system to be implemented consistently across all States and Territories.

3. IMPLEMENTATION OF THE CFMF

3.1 Ownership and control

It was proposed that a well-established, independent and credible data management agency should be identified to have ownership of a monitoring system e.g. the ABS. This had support from a significant number of workshop participants. While the NFI had a key role in initiating and developing the system, it may not be the organisation for the long term running and management of data because it is currently within the Department of Agriculture, Fisheries and Forestry and there could be perceptions of conflict of interest with DAFF's regulatory role.

3.2 Sourcing funds, approval for access to existing inventories (if required)

These issues required resolution and were acknowledged but put aside and not discussed in detail at the workshop.

3.3 Partnerships

It was acknowledged that there was great benefit in utilising existing and new networks. These relationships will yield significant additional benefit if they are cultivated early on in the design of the CFMF. They may also contribute to the process of approval and resourcing.

3.4 Reporting

The framework would be well served in the design phase if it determined the current mechanism for bringing required reports into being (i.e. National State of the Forests Reports, SoE reporting and other mechanisms). The format and content of reports should also be carefully considered in the design phase.

4. OTHER ISSUES

4.1 Monitoring system not to be used for compliance

There was strong agreement that the framework should not be used for the purposes of compliance and that this role should be explicitly excluded as the framework is prepared. Data confidentiality and impartiality in the use of the data for the purposes of monitoring was seen as important.

4.2 Access to freehold land for the purpose of the inventory

A voluntary approach through willing consent of landowners was seen to be desirable. Past experience has shown there may be difficulties in getting access to private/freehold land. James Barton reported that New Zealand has legislation that facilitates access to freehold land for the purposes of surveys like the proposed CFMF. This may warrant further consideration in Australia.

4.3 Very low crown cover forest and woodland

There was general agreement that very low crown cover woody vegetation posed specific problems for the inventory. The choice of the lower threshold for forest/vegetation cover and minimum mapping unit is particularly important and that special consideration would need to be given to the spatial data and inventory methods in this regard.

4.4 Moving window and the 'Habitat Hectare' approach

There was a view that there was merit in the further investigation of these approaches.

4.5 Australian Greenhouse Office data

The Australian Greenhouse Office (AGO) has demonstrated the application of a contiguous 'wall to wall' approach using LANDSAT imagery for woody/nonwoody and change across Australia with objectives that are tightly focussed. This data set and methodology may offer potential for a consistent national reporting of change in woody extent over time.

4.6 Queensland State Land and Tree Survey (SLATS)

Two Queensland presentations demonstrated the value of the SLATS program that has had the benefit of 9 years of continuous development. It showed promise for contiguous mapping of a range of foliage projected cover classes down to approx. 7%. It also showed its ability to respond to changing objectives through time.

4.7 Light Detection and Ranging (aerial laser scanning or LIDAR)

LIDAR showed good ability to measure tree heights and crown cover. It also demonstrated the scale dependency of the inventory and the potential for the introduction of systematic errors at various scales.

4.8 Condition, health, biodiversity and productivity

There are strong relationships between each of these factors which the framework needs to give careful consideration to getting right.

4.9 The context of the CFMF

There was a view expressed that the framework will be a 'plank' of a much bigger system of monitoring. Consequently the framework would be well served if it identified its place in this system, the linkages that this involves and the synergies that this brings.

4.10 The Water Resource Observation Network Model

A number of participants noted that the proposed Water Resource Observation Network model offered useful lessons that could be applied to the framework. It was suggested that the model and its governance structure be further investigated.

4.11 National Forest Policy Statement

The 1992 Statement sets up a need to establish a continental inventory framework. It would help to underpin the framework if the currency of this statement was re-confirmed by todays policy makers.

REFERENCES

Wood, M., Lee, A., Keightly, E., and Norman, P. (2005) Continental Forest Monitoring Framework: NFI technical report for the design of a pilot study, Bureau of Rural Sciences, Australian Government.

CFMF background information on DAFF website.
DAFF Home > Scientific Advice HOME > Forest and Vegetation Sciences > National Forest Inventory Australia > Continental Forest Monitoring Framework

Forest Monitoring workshop
http://data.brs.gov.au/cfmf/index.htm

Peter Woodgate
Workshop facilitator
CRC for Spatial Information
25 November 2005

Adam Gerrand
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Bureau of Rural Sciences

Workshop Agenda

The Continental Forest Monitoring Framework

A National Forest Inventory Workshop on Monitoring forest extent and condition

The National Forest Inventory (NFI), in partnership with States and Territories and with the support of the Natural Heritage Trust is convening a workshop on 'Monitoring forest extent and condition' **on 15-16 November at the Grand Chancellor Hotel, 131 Lonsdale Street, Melbourne.** The program for the workshop is attached.

The objectives of the workshop are to:

1. Review current work being undertaken nationally on monitoring trends in forest extent and condition particularly using remote sensing and linkages to field based plots;
2. Present and review of the rationale, design and results from the pilot implementation of the Continental Forest Monitoring Framework (CFMF);
3. Discuss and explore opportunities for expanding the CFMF and incorporating the best current techniques into a Continental Forest and Vegetation Monitoring Framework.
4. Develop options for the next steps in developing and implementing an agreed integrated continental monitoring framework.

Day 1 Tuesday 15 November, 2005

10:00am	Welcome and introduction	Peter Woodgate (CRC)
Session 1	**Monitoring forest extent at the national scale**	
10:10am	Objectives and expected outcomes of workshop	Adam Gerrand (NFI BRS)
10:20am 25 mins	Background to the CFMF - rationale and systematic grid design	Mellissa Wood (BRS), Phil Norman (DPINR NSW)
10.45am 15 mins	Use of remote sensing information in updating vegetation information in national mapping systems	Phil Tickle, Geoscience Australia
11.00 am 20 mins	New Zealand's forest monitoring and carbon accounting system	James Barton, NZ Ministry for the Environment
11.20am 20 mins	Monitoring vegetation condition and extent changes over time: Some national issues and selected examples from Queensland.	Bruce Wilson, Queensland Herbarium.
11.40am	Comments and discussion on linkages and relevance to CFMF	All
12.00 pm	*Lunch*	
Session 2	**Monitoring of forest extent at the State level**	
1.00pm 15 mins	A remote sensing based system for monitoring change in woody vegetation in Queensland - SLATS	Tim Danahar (Qld Dep't of Natural Resources & Mines)
1.15pm 15 mins	Remote sensing and forest and vegetation mapping in the Northern Territory (incl. NORFOR)	Dave Howe (TBC) or Peter Brocklehurst (other NT?)
Session 3	**Monitoring of forest extent and type at regional scale**	
1.30pm 15 mins	Improved forest mapping using remote sensing in WA (incl.GOLDFOR)	Greg Strelein CALM WA
1.45pm 15 mins	Remote sensing of private forests in Tasmania for monitoring and management – recent experiences with SPOT5, IKONOS and QUICKBIRD.	Andy Warner, Regional Private Forester, Private Forests Tasmania
2.00pm 15mins	CFMF Tier 2 – High Resolution Image Plots and airborne laser scanning (LIDAR) analysis	Alex Lee, ANU
2.15pm	Comments and discussion on linkages and relevance to CFMF	All

3:00pm	*Afternoon Tea*	
Session 4	**Remote sensing and linkages to field plots for forest condition at the local/plot scale**	
3.30pm 15 mins	Ground based laser scanning for forest structure and tree canopy distribution mapping.	Glenn Newnham, Darius Culvenor, CSIRO / ENSIS
3.45pm 15 mins	Aerial Photo-Typing and ground based plot sampling of Tasmania's Forests.	Martin Stone, Forestry Tasmania
4.00pm 15 mins	The Western Australian FORESTCHECK system	Greg Strelein, & Richard Robinson, CALM
4.15pm	CFMF Tier 3 Field plot methods and results	Alex Lee, Emma Lawrence, Cris Brack ANU
4.30pm	Comments and discussion on linkages and relevance to CFMF	All
End 5pm	**Workshop dinner (details TBC)**	All

Day2: Wednesday 16 November

Session 5	**Monitoring for biodiversity, forest health and condition**	
9.00 15 mins	Mapping the ecological condition of remnant native vegetation across Victoria	Graeme Newell, DSE Victoria
9.15am 15 mins	Forest health monitoring using remote sensing – prospects and problems.	Christine Stone, Forests NSW
9.30am 15 mins	SE Queensland Private native forest inventory methods, analysis and overview of results	Cris Brack, ANU
9.45am 15 mins	Scaling up – statistical relationships between field plot data and remote sensing.	Robert Clark, Wollongong University & Emma Lawrence, BRS
10.00am 15 mins	Comments and discussion on linkages and relevance to CFMF	All
10:15am	*Morning Tea*	
10.45am 15 mins	Outline of approach for discussion groups on next steps	Adam Gerrand, BRS
11.00am 30mins	Discussion groups 1: (break into groups of ≈10 people) • Do we need a forest monitoring system and can the CFMF design deliver what we need for national forest monitoring and reporting? • If not, what do we need to include or modify? • What are the best methods and tools and how to incorporate them into a national monitoring system?	All participants Facilitators: Peter Woodgate Mellissa Wood Adam Gerrand Jerry Vanclay
11.30am 30mins	Plenary - Discussion groups report back	All
12:00	*Lunch*	
1.00pm 30mins	Discussion groups 2: (break into groups of 10 people) • Can States adapt or incorporate existing systems to fit with a CFMF style linked grid? • Linkages with other national and state activities. • What are the opportunities for expanding the framework to include monitoring other vegetation outside forests?	All participants Facilitators: Peter Woodgate Mellissa Wood Adam Gerrand Jerry Vanclay
1.30pm	Plenary - Discussion groups report back	All
2.00pm	*Afternoon Tea*	

2.30pm 60mins	Final plenary conclusions:
	• Scope options and future directions for a national forest and vegetation monitoring framework?
	• Next steps to build support:
	  o State and Federal funding opportunities,
	  o governance/management structures (incl. a future home) and
	  o collaborators and champions
	• Other issues?
		All

3.30pm	Summary and closing comments	Peter Woodgate
4.00pm	Close	

Workshop attendees:

Title	First_name	Last_name	Organisation	State
Mr	John	Armston	NRM Qld	QLD
Dr	James	Barton	NZ MAFF	NZ
Dr	Matt	Bolton	DEH	ACT
Dr	Cris	Brack	SRES - ANU	ACT
Ms	Katrina	Burton	BRS	ACT
Dr	Robert	Clark	University of Wollongong	NSW
Mr	Nick	Collett	University of Melbourne	VIC
Dr	Tim	Danaher	NRM Qld	QLD
Mr	Geoff	Dunn	BRS	ACT
Ms	Felicity	Faulkner	DPIWE, Tas	TAS
Mr	Adam	Gerrand	BRS	ACT
Mr	Ashley	Goldstraw	Gippsland Private Forestry	VIC
Ms	Fiona	Hamilton	DSE, Vic	Vic
Dr	Andrew	Haywood	Jaakko Poyry	Vic
Mr	David	Howe	NRETA - NT	NT
Prof.	Rod	Keenan	Melb Uni	Vic
Dr	Margaret	Kitchin	Environment ACT	ACT
Ms	Emma	Lawrence	BRS	ACT
Mr	Alex	Lee	ANU	ACT
Dr	Simon	Murphy	SFES - Uni of Melb	VIC
Dr	Graeme	Newell	DSE	Vic
Dr	Glenn	Newnham	ENSIS/CSIRO	ACT
Ms	Liz	Quinn	DPIWE, Tas	TAS
Mr	Peter	Scarth	Qld NRM	QLD
Ms	Jane	Siebuhr	DPI Forestry Qld	QLD
Ms	Felicity	Smith	SA DEH	SA
Dr	Christine	Stone	Forests NSW	NSW
Mr	Martin	Stone	Forestry Tasmania	TAS
Mr	Greg	Strelein	CALM	WA
Dr	Michael	Sutton	DSE, Vic	Vic
Mr	Phil	Tickle	Geoscience Australia	ACT
Mr	Cain	Trist	DSE	VIC
Prof.	Jerry	Vanclay	Southern Cross University	NSW
Mr	Detlev	Vogt	Forestry SA	SA
Mr	Andy	Warner	Private Forestry Tasmania	TAS
Mr	Mike	Welch	SF NSW	NSW
Dr	Bruce	Wilson	EPA, Queensland	QLD
Ms	Mellissa	Wood	BRS	ACT
Dr	Peter	Woodgate	CRC for spatial information	Vic
Dr	Andre	Zerger	CSIRO Sustainable Ecosystems	ACT