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Criteria, Indicators, Targets and monitoring processes  
of Ecologically Sustainable Forest Management for  
Southern RFA Region

A project undertaken as part of the NSW Comprehensive Regional Assessments  
April 2000

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**CRITERIA, INDICATORS,  
TARGETS AND  
MONITORING  
PROCESSES OF  
ECOLOGICALLY  
SUSTAINABLE FOREST  
MANAGEMENT FOR  
SOUTHERN RFA  
REGION**

**ESFM TECHNICAL COMMITTEE**

**A project undertaken as part of the  
NSW Comprehensive Regional Assessments  
Project number NA41/ESFM**

**April 2000**

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ISBN 1 74029 058 5

This project has been jointly funded by the New South Wales and Commonwealth Governments and managed through the Forest Conservation Unit, Forest Assessment and Management Division, NSW National Parks and Wildlife Service.

The project has been overseen and the methodology has been developed through the ESFM Group, which includes representatives from the New South Wales and Commonwealth Governments and stakeholder groups.

The project is the work of ESFM PA3 Working Group, assisted by officers of NSW State Agencies and Commonwealth Government Departments.

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# CONTENTS

Project summary

Introduction	1
Criterion 1: Biodiversity	3
Ecosystem Diversity	3
Species Diversity	8
<b>Criterion 2: Maintenance Of Productive Capacity Of Forest Ecosystems</b>	4
<b>Criterion 3: Maintenance Of Ecosystem Health And Vitality</b>	9
<b>Criterion 4: Conservation And Maintenance Of Soil And Water Resources</b>	11
<b>Criterion 5: Maintenance Of Forest Contribution To Global Carbon Cycles</b>	13
<b>Criterion 6: Maintenance And Enhancement Of Long Term Multiple Socio-Economic Benefits To Meet The Needs Of Societies</b>	15
Production And Consumption	15
Recreation And Tourism	16
Indicator 6.4 Cultural, Social And Spiritual Needs And Values	17
Employment And Community Needs	20
<b>Criterion 7: Legal, Institutional And Economic Framework For Forest Conservation And Sustainable Management</b>	22
Glossary	33
Acronyms	36
Tables	
A: Suggested format for reporting Indicator 1.1a	
B: Suggested format for reporting area of Growth Stage by Forest Ecosystem	
C: Suggested format for reporting Forest Dwelling Species (by forest ecosystem, management zone, disturbance history, land tenure and growth stage)	
D: Suggested format for reporting Indicator 6.4C	



# PROJECT SUMMARY

This working paper describes a project undertaken as part of the comprehensive regional assessments of forests in New South Wales. The Comprehensive Regional Assessments (CRAs) provide the scientific basis on which the State and Commonwealth Governments will sign Regional Forest Agreements (RFAs) for major forest areas of New South Wales. These agreements will determine the future of these forests, providing a balance between conservation and ecologically sustainable use of forest resources.

## **Project objective/s**

This document outlines and describes the Criteria, Indicators, Objectives and Indicative Targets for the Southern RFA Region for use in guiding and measuring ecologically sustainable forest management (ESFM). ESFM aims to maintain, in perpetuity, a full range of forest values. In this project, forest values, legal, institutional and economic frameworks for forest conservation and sustainable management are represented by the 7 Criteria. Each Criterion is characterised by a set of related Indicators, which are measured in quantitative or narrative terms, and are monitored periodically to assess change. For each Indicator, indicative targets have been identified on the basis of the best available information and advice at levels considered appropriate to achieve ESFM. These may change over time as our knowledge and understanding of indicators for ecologically sustainable forest management improves. Details of data availability, monitoring methodology, reporting requirements and research and development requirements are also provided. Systematic measurement and assessment of each Indicator will show if our indicative targets for ESFM are being met. If necessary, our forest management practices can then be adapted to better meet our goals.

## **Methods**

The Criteria and Indicators recommended here were developed from “A Framework of Regional (Sub-National) Level Criteria and Indicators of Sustainable Forest Management in Australia” (Montreal Implementation Group 1998), and tailored to the Southern RFA Region by consultation with independent experts, relevant government agencies and stakeholders through the Southern Regional Forest Forums.

## **Key results and products**

Twenty-one indicators that are immediately implementable (Category A), supplemented by 3 indicators that require research and development before implementation immediately after the first 5 year review of the RFAs (Category B), have been identified. Short-term interim indicators or reporting mechanisms for some Category A indicators have also been included until mechanisms for their full implementation have been determined. The indicators for ESFM in the Southern Region are listed below:

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**INDICATORS OF EFSM FOR THE SOUTHERN RFA REGION  
ALL INDICATORS ARE CATEGORY A (IMPLEMENTABLE IMMEDIATELY) UNLESS  
OTHERWISE SPECIFIED.**

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- 1.1.a Extent of area by forest ecosystem and tenure.
  - 1.1.a.1 Understorey vegetation layer (Category B).
- 1.1.b Area of forest ecosystem by growth stage distribution by tenure.
- 1.1.e Fragmentation of forest ecosystems.
- 1.2.a A list of forest dwelling species
- 1.2.b The status (threatened, rare, vulnerable, endangered, or extinct) of forest dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment.
  - 1.2.b.1 The status of endangered populations and ecosystems as determined by legislation or scientific assessment (sub-indicator of 1.2.b).
- 2.1.a Area of forest land and net area of forest land available for timber production.
- 2.1.b Total growing stock of both merchantable and non-merchantable tree species on native forest land available for timber production.
- 2.1.d Annual removal of wood products compared to sustainable volume.
- 2.1.e Annual removal of non-timber forest products (eg berries, mushrooms, game, honey, wildflowers, tree ferns and possums) compared to the sustainable level
- 2.1.f Area and percent of plantation established meeting effective stocking one year after planting.
- 2.1.g Area and percent of harvested area of native forest effectively regenerated.
- 3.1.a Area and percent of forest affected by processes or agents that may change ecosystem health and vitality (narrative as interim)
- 4.1.a Area and percent of forest land covered by comprehensive Road Management Plans, which include:
  - an assessment of the extent of existing road infrastructure,
  - processes for ongoing improvement,
  - targets and milestones.
- 4.1.a Area and percent of forest land systematically assessed for soil erosion hazard, and for which site-varying scientifically-based measures to protect soil and water values are implemented (Interim).
- 5.1a Total forest ecosystem biomass and carbon pool, and if appropriate, by forest ecosystem, age class, and successional stages (Category B).
- 5.1c Contribution of forest products to the global carbon budget (Category B).
- 6.1.a Value and volume of wood and wood production
- 6.3.a Value of Investment, including investment in forest growing, forest health and management, planted forests, wood processing, recreation and tourism (Category B)
- 6.2.c Number of visits per annum.
- 6.4.c (i) Change in condition and number of Aboriginal cultural heritage recorded places, artefacts, sites, or other structures.
- 6.4.c (ii) Change in condition and number of recorded places, artefacts, sites, buildings or other structures
- 6.5.a Direct and indirect employment in the forest sector and forest sector employment as a proportion of total employment. (Category B)
- 7.1 Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests (Narrative).



7.2 Extent to which the institutional framework supports the conservation and sustainable management of forests (Narrative).

7.4 Capacity to measure and monitor changes in the conservation and sustainable management of forests (Narrative).

7.5 Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services (Narrative).

# INTRODUCTION

Ecologically Sustainable Forest Management (ESFM) will be the guiding philosophy of forest management in the Southern Region of NSW. ESFM is founded on a set of basic principles that have been developed in the Regional Forest Agreement (RFA) process and which seek to ensure fulfilment of the international commitments of Australia, the National Forest Policy Statement, State Government policies and the concerns and interests of stakeholders in the forests of the Southern Region.

In ESFM, the use of indicators is an attempt to reflect the key environmental, social and economic aspects of a healthy regional society. These different aspects are reflected as different criteria. The seven criteria are:

- CRITERIA 1: Biodiversity
- CRITERIA 2: Maintenance of Productive Capacity of Forest Ecosystems
- CRITERIA 3: Maintenance of Ecosystem Health And Vitality
- CRITERIA 4: Conservation and Maintenance of Soil and Water Resources
- CRITERIA 5: Maintenance of Forest Contribution to Global Carbon Cycles
- CRITERIA 6: Maintenance and Enhancement of Long Term Multiple Socio-Economic Benefits to Meet The Needs of Societies

Specific indicators, which have been developed under each of the above criteria, will measure our success at reaching ESFM goals. Indicators are designed to provide information in an understandable way. We have long used indicators for assessing economic performance such as Gross National Product or Per Capita Income, and social indicators like employment rates, life expectancy and birth rates. In ESFM, a 'basket' of indicators has been chosen that will help portray the regional quality of life relating to the forests of southern NSW. These indicators will be used to assess our performance in implementing the Southern RFA and demonstrate over time whether we are achieving our goals.

A set of regional criteria and indicators of ESFM were developed by the Montreal Implementation Group (MIG) and endorsed by State agencies and Ministers for use in Regional Forest Agreements as a core set of indicators of ESFM across Australia. MIG identified Category A indicators which are implementable immediately, Category B Indicators which require some development but will be implementable within 5 years, and Category C indicators that require substantial research and development before they can be utilised.

In the development of indicators for the Southern Region, MIG Category A indicators were adopted and further developed for implementation at the regional level. Input from experts and stakeholders in the RFA process was sought to tailor the MIG indicators

specifically to the Southern RFA Region. In some cases, Interim indicators have been suggested for Category A indicators that require the development of specific management plans before implementation. In addition, some Category B indicators have been developed where no Category A Indicators were available, and where supplementation of the Category A indicators was necessary. The indicators listed in this document are Category A indicators unless otherwise indicated.

The objectives and indicative targets for each indicator will be finally determined by the RFAs, agencies policies, community consultation, expert opinion, and feedback from monitoring of indicators. Objectives and indicative targets are intended only to set a broad direction for conservation efforts, protection of catchments, industry development and other aspects of forest management. Targets for indicators at this stage of monitoring and reporting are indicative because they are too difficult to forecast due to lack of knowledge about thresholds or levels needed for sustainability. For some indicators, indicative targets could not be set due to a lack of knowledge, information, or relevant data. In these cases broad objectives have been identified which rely on continuous improvement and indicative targets can be set as the appropriate information becomes available.

Standard repeatable monitoring and reporting systems will be established for each indicator. Monitoring will require a commitment to data collection by management agencies, communities and forest-dependant businesses.

An annual report on our performance in achieving ESFM in this region will be presented to NSW parliament as part of the Forest Agreements, and a 5 yearly review will assess the success of the RFAs in implementing ESFM in each region. If the reviews indicate that ESFM objectives and indicative targets are not being met, there will be an opportunity to adapt forest management practices to better meet these aims. Successful implementation of ESFM will require a collective commitment by stakeholders and forest conservation and management agencies to monitor and interpret the trends in the indicators over time. For several indicators this success is dependent on political or environmental fluctuations and variations. Interpretation and reporting of these indicators will be conducted in relation to these dependencies. Public participation in the review process will be encouraged.

Each indicator, though self contained, is not isolated. Indicators may be interlinked in objectives, indicative targets or data requirements and subsequently reporting. For example indicator 1.1.a - Extent of area by forest ecosystems and tenure, is directly linked to indicator 1.1.e – Fragmentation of forest ecosystems. Reporting of these interlinked indicators will involve interpretation of trends in data in relation to linkages.

The economic and social criteria and indicators were reviewed by Hassall and Associates Pty Ltd and they produced a separate report titled “Economic and Social Criteria and Indicators Southern Region”. This report was used by the Working Group to develop the criteria and indicators.

# CRITERION 1: BIODIVERSITY

## ECOSYSTEM DIVERSITY

### Indicator 1.1.a Extent of area by forest ecosystem and tenure.

#### Rationale

This indicator is one of a set of indicators to assess ecosystem diversity and should be examined with regard to the full suite of ecosystem diversity indicators. The rationale is to monitor the change in **forest ecosystem**\* cover for the entire forest estate within the RFA area against targets set for retention of forest ecosystems. This indicator aims to identify which forest ecosystems are increasing or decreasing in area, as a basis for adaptive management.

#### Objectives

- To monitor the change in extent of forest ecosystem by tenure;
- To ensure the distribution and extent of forest ecosystems do not fall below a precautionary minimum level, to be specified, to ensure their long term viability.

#### Indicative target

- All tenures to be managed to maintain or increase the extent of forest ecosystem ecosystem (as per CRA data systems).
  - Public tenures to be managed to maintain or increase, where possible, the extent of native forest ecosystem;
  - Private tenures to be managed to maintain regional targets (by Local Government Areas or bio regions) as determined under Regional Vegetation Management Plans.

#### Data requirements and Monitoring methodology.

- Baseline data from the CRA forest ecosystem data sets;
- Ongoing data from SFNSW tenure will be provided through operational updates to a forest management database. Ongoing data from NPWS will be provided by mapping disturbance (e.g., fire);
- Regional Vegetation Management Plans and applications for clearing licences may provide relevant information for private and leasehold land;
- Re-inventory using remotely sensed imagery may be possible across all tenures if appropriate resourcing is available;

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\* **Bold type** within the text indicates that the word or phrase appears in the glossary.

- Ecosystem types or other community association types may be reported upon at the local level and must fit into regional and national reporting requirements;
- State Forest and NPWS management plans and zoning systems will provide information of changes to forest area under these tenures;
- Plantations should be distinguished and **non-treed elements** of forest ecosystems are to be recognised;
- For CAR reserves identify separately areas:
  - in dedicated reserves;
  - in informal reserves;
  - where values are protected by prescription;
  - private land managed to protect values.
- Ground surveys may also be used to assess expansion/contraction of forest cover;
- Consultation with local Aboriginal communities may provide information regarding pre-1750 forest ecosystem distributions, or indicate where such information may be found.

### Reporting

- Area (ha) for each forest ecosystem by tenure (where available). Add narrative to describe how much of the total forest area the data refers, and to identify tenures that are not mapped or poorly known;
- The methodology, including the scale and the level of confidence at which the area of forest ecosystem is to be reported, will be specified. Changes in forest ecosystems are likely to be small and reporting at too coarse a scale will not detect changes;
- Area actively restored and managed of forest ecosystem types previously reduced below a state-wide level that was less than 15% of pre-1750 levels;
- Methodologies for obtaining information for private lands will be developed in accordance with the RFA;
- Tenures need to be reported upon in the following categories: private land (freehold and leasehold), State Forest, conservation reserves, other crown tenures (by management classification such as production, conservation, protection/water, special management), Commonwealth land and other land;
- Changes in this indicator need to be interpreted in relation to indicator 1.1.b

**TABLE A: SUGGESTED FORMAT FOR REPORTING INDICATOR 1.1A**

Forest ecosystem by tenure	% of extant	% pre-1750	target	% target met

This table to be completed with data layers from the CRA and RFA outcomes (targets).

### Research and Development

- A standardised state-wide vegetation and age class mapping system is required;
- A state-wide (private lands) clearing monitoring program is required;
- Government to initiate private land vegetation survey and mapping program;

- Development of monitoring and reporting methodologies to assess any reduction in forest ecosystem resulting from **human induced disturbance**;
- Development of effective classification of ‘ecosystem types’ for mapping and monitoring purposes.

#### **Indicator 1.1.a.1 Understorey vegetation layer (Category B).**

##### **Rationale**

This indicator provides an indication of the diversity of the understorey vegetation layer. The management and maintenance of shrub and ground vegetation should be based upon the same principles devised for tree cover.

##### **Objective**

- To manage native forest so that a range of understorey vegetation types and structures are maintained throughout the. (Methodologies will need to be developed to classify, map and monitor understorey vegetation layers).

##### **Indicative target**

To be developed.

##### **Data requirements and Monitoring methodology**

To be developed.

##### **Reporting**

To be developed.

##### **Research and Development**

- Development of a methodology to classify, map and monitor the understorey vegetation types;
- To identify sources of shifts in species composition.

#### **Indicator 1.1.b Area of forest ecosystem by growth stage distribution by tenure.**

##### **Rationale**

Ecological processes and the species associated with those processes, within any forest ecosystem or forest type, are associated with vegetative structures and developmental stages. This indicator should make allowances for certain areas to undergo natural succession (National Parks) and others (State Forests) to be maintained at a range of growth stages while minimising the loss of old growth from threatening processes.

##### **Objective**

- To maintain a range of growth stages and forest ecosystems across the landscape.

##### **Indicative targets**

- Increase the proportion of mixed aged forest in a **balance of growth stages** that broadly reflects natural disturbance regimes and silvicultural regimes;
- Manage native forests to ensure that growth stages are fully represented within each forest ecosystem across the regional landscape. No one growth stage should be allowed to dominate the forest landscape;
- Maintain a spatial arrangement of age classes to ensure the maintenance of threatened species, where appropriate.

##### **Data requirements and Monitoring methodology**

- Baseline data will be used from the CRA forest ecosystem data sets;

- Ongoing data from SFNSW tenure will be provided through operational updates to a forest management database. Ongoing data from NPWS will be provided by mapping disturbance (e.g., fire);
- Regional Vegetation Management Plans and applications for clearing licences may provide relevant information for private and leasehold land;
- Re-inventory using remotely sensed imagery may be possible across all tenures if appropriate resourcing is available.

### **Reporting**

- Report on the percent of forest estate with a mix of early, mid and late age classes. Record by the same forest ecosystems as used in Indicator 1.1.a. Report forest stands as:
  - regeneration stands - defined as stands where the most abundant crown form is regeneration and or the year of origin indicates that the majority of trees within the stand are less than 20 years of age;
  - regrowth stands - defined as stands where the most abundant crown form is regrowth and or the year of origin indicates that the majority of trees within the stand are between 20 and 80 years of age;
  - mature stands - defined as stands where the most abundant crown form is regular and or the year of origin indicates that the majority of trees within the stand are greater than 80 years of age;
  - overmature stands - defined as stands where the most abundant crown form is irregular and this has been determined to be due to age.
- Report forest stands as per data layer (disturbance) categories in CRAFTI;
- Changes in area over time related to forest management objectives;
- Implications of changes in the indicator for flora and fauna dependent upon particular growth stages need to be considered.

### **Research and Development**

- Development of specific target levels for an appropriate balance of growth stages;
- A clear understanding of successional processes in different forest ecosystems needs to be developed;
- Natural disturbance regimes need to be defined;
- Spatial arrangements of growth stages, within plots at the local scale, should be identified.

### **Indicator 1.1.e Fragmentation of forest ecosystems.**

#### **Rationale**

To provide information on the loss of forest cover and the spatial configuration of that loss within a region. Fragmentation can have the following effects on the gene pools of formerly continuous populations:

- small populations become demographically vulnerable through inbreeding;
- loss of variability from local populations can limit adaptations to environmental change.

The extent of connectivity on the forest landscape should be considered in relation to threatened species habitat, **general retained habitat** on public and private land, and conservation reserves.

**Objectives**

- To ensure **functional connectivity** through implementation of conservation protocols, planning and connectivity between reserves and retained habitat;
- To identify where connectivity needs to be restored across the regional landscape;
- To ensure that clearing does not increase the degree of fragmentation across tenures;
- To ensure that reserves and retained habitat incorporate the full suite of topographic and physical landscape properties, as well as biotic habitat and forest ecosystems;
- Restrictions to native animal movement will be reduced by optimising road surfacing and construction and easement construction.

**Indicative targets**

- Ensure connectivity at the regional, catchment and sub-catchment scales;
- Ensure connectivity supports **functional populations** of target species between reserves and retained habitat (see Research and Development);
- Minimisation of the number and width of roads and other easements through retained habitat and connection corridors.

**Data requirements and Monitoring methodology**

- Maps of the area of interest at an appropriate scale and level of accuracy derived from sources including API, remote sensing, CRA tenure maps and conservation protocol connection corridor maps;
- Each agency to develop a road management plan that itemises future road construction and road closure over retained habitat patches and connection corridors over its estate (see Indicator 4.1.a).

**Reporting**

- During the first five-year term of the Regional Forest Agreements, maps will be used to assess connectivity among the key features identified by targets. Reporting will be narrative until mathematical approaches are developed;
- Quantify proportion of connection corridors that are dissected by roads and easements.

**Research and Development**

- Research and development should follow the guidelines outlined in the BRS Scoping study on MIG Fragmentation 1.1.e;
- Research needs to identify ecologically functional groups across a broad range of niches;
- Research needs to assess the adequacy of fragmentation indices to see if they can be used in remote sensing;
- Develop mathematical approaches to assessing connectivity;
- Investigate connectivity requirements to meet functional requirements of selected species;
- Establish Codes of Practice for connection corridor design and management that adopt standards for maintaining habitat and population connectivity for all regions and tenures.



## SPECIES DIVERSITY

### Indicator 1.2.a A list of forest dwelling species

#### Rationale

This indicator measures the change in species richness and composition over time and provides a list of species that should be managed for. It is recognised that this list would never be comprehensive. The list should discriminate between indigenous and non-indigenous species.

**Forest dwelling** is taken to include forest dependent species. This indicator has limited application to plantations.

#### Objectives

- To maintain the extent and quality of species habitat at levels that support **functional populations** across landscapes;
- To maintain or restore the species composition, richness and abundance (of representative species) of forest dwelling species;
- To prevent the endangerment of indigenous species;
- To, where possible, fill survey gaps;
- To identify representative species, within guilds, in representative habitats, to monitor over time;
- To identify species potentially at risk within the Southern Region.

#### Indicative targets

- Prevention of the loss of species;
- Maintenance of species abundance at **viable and functional population levels** across the regional landscape;
- Maintenance of regional species composition;
- Protection of the habitat of endangered species.

#### Data requirements and Monitoring methodology

- Baseline data from CRA flora and fauna data layers, research data and agency databases;
- SFNSW collects survey records during harvest planning;
- Survey records are collected by NPWS and SFNSW during research or planning;
- Other available sources of data eg. NPWS get additional information from external sources (e.g., universities and the public) which is collated in the Wildlife Atlas, Community interest groups (eg. Royal Australian Ornithological Union, Field Naturalist Societies) collect information on species abundance and distribution;
- Work is required to develop a complementary sampling scheme to cover sampling gaps and facilitate comparative studies. Integration of records across agencies is also required;
- Work is required to identify and incorporate other sources of data such as Regional Vegetation Management Plans and consultancy reports;
- Populations of a known subset of species, possibly representative species from functional guilds, should be monitored to indicate patterns of abundance.

#### Reporting

- The names of all vertebrate animals including fish, vascular plant species, and their habitat, conservation status and distribution are to be recorded for each region;

- Trends in abundance of representative species to be interpreted with respect to management practices and environmental influences;

**TABLE C: SUGGESTED FORMAT FOR REPORTING FOREST DWELLING SPECIES (BY FOREST ECOSYSTEM, MANAGEMENT ZONE, DISTURBANCE HISTORY, LAND TENURE AND GROWTH STAGE).**

Species name	Guild	Conservation Status	Abundance	Habitat

- Interpretation should separate species richness and species composition.

### **Research and Development**

- Establish a network of sites, possibly using some of the long term study sites from Dr Martin Denny's report for Environment Australia. New sites could be biological equivalents to State Forests' growth plots (habitat structure, seral disturbance, fire history etc.);
- Develop a highly systematic, standardised and stratified survey methodology applicable across tenures and management systems;
- Develop appropriate analytical procedures;
- Develop a standardised habitat assessment description;
- Develop a single publicly accessible fauna and flora information database;
- Develop a recognised system for classification of species' status based on survey data;
- Identify representative species within guilds;
- Research the biology of species so that minimum viable and functional population levels can be estimated.

**Indicator 1.2.b The status (threatened, rare, vulnerable, endangered, or extinct) of forest dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment.**

### **Rationale**

To manage threatened species so as to improve their **conservation status** and formal designation. This is essential to the conservation of biodiversity. Changes in designated classification can be used as a crude indicator. However, these changes may be based on primary data, which should be used as early indicators of change if available. Some threats to species may be beyond the control of forest managers. Changes in status should be reported and reviews undertaken to develop risk management strategies for the future.

### **Objectives**

- To improve the conservation status of **scheduled forest dwelling species**;
- To maintain non-endangered species at their current status.

### **Indicative targets**

- Improvement of the status of scheduled forest dwelling species;
- Protect habitat where endangered species occur;

- Development and implementation of recovery plans for listed species. Recovery plans to conform to agreed standards and include clear indicators of success and performance criteria.

#### **Data requirements and Monitoring methodology**

- Commonwealth and State lists of threatened (rare, vulnerable, endangered or extinct) species, under whatever terminology is used, and their rationale for listing;
- Data on the range and abundance of threatened taxa from pre-logging surveys, other surveys, research and incidental reports;
- Data from Recovery Planning and related performance indicators.

#### **Reporting**

- Changes to the status of species to be interpreted with regard to the cause of the change in listing;
- Systematic and periodic scrutiny of recovery plans and threatened species licence conditions for forest activities (under the Threatened Species Conservation Act 1995, National Parks and Wildlife Act 1974, and the Fisheries Management Act 1994), and their performance success.

#### **Research and Development**

- Research and development issues are identified in Recovery Plans and should be considered.

### **Sub-indicator 1.2.b.1 The status of endangered populations, ecological communities and ecosystems as determined by legislation or scientific assessment.**

#### **Rationale**

To manage endangered populations and ecosystems so as to improve their **conservation status** and formal designation. This is essential to the conservation of biodiversity. Changes in designated classification can be used as a crude indicator. However these changes may be based on primary data which should be used as early indicators of change if available. Some threats to endangered populations and ecosystems may be beyond the control of forest managers. Changes in status should be reported and reviews undertaken to develop risk management strategies for the future.

#### **Objectives**

- To improve the conservation status of scheduled endangered populations and ecosystems;
- To maintain non-endangered populations and ecosystems at their current status.

#### **Indicative targets**

- Improvement of the status of scheduled endangered populations and ecosystems;
- Protect habitat where endangered populations and ecosystems occur;
- Development and implementation of recovery plans for endangered populations and ecosystems. Recovery plans to conform to agreed standards and include clear indicators of success and performance criteria;
- Changes to the number of listed endangered populations and ecosystems, interpreted with regard to the cause of change in listing.

**Data requirements and Monitoring methodology**

- Commonwealth and State lists of threatened (rare, vulnerable, endangered or extinct) populations, ecological communities and ecosystems, under whatever terminology is used, and their rationale for listing;
- Data on the range and abundance of endangered populations, ecological communities and ecosystems from pre-logging surveys, other surveys, research and incidental reports;
- Data from Recovery Planning and related performance indicators.

**Reporting**

- Changes to the status of populations, ecological communities and ecosystems to be interpreted with regard to the cause of the change in listing;
- Systematic and periodic scrutiny of recovery plans and their performance success.

**Research and Development**

- Research and development issues are identified in Recovery Plans and should be considered.

# CRITERION 2: MAINTENANCE OF PRODUCTIVE CAPACITY OF FOREST ECOSYSTEMS

## **Indicator 2.1.a Area of forest land and net area of forest land available for timber production.**

### **Rationale**

This indicator is a measure of the capacity of forests to meet society's demand for timber products. Plantations are to be included in this indicator.

### **Objectives**

- To maintain the net area of native forest available for ecologically sustainable timber production;
- To optimise and where possible increase the area of land under softwood and hardwood plantation from existing cleared land.

### **Indicative targets**

- Maintenance or increase of the net area of native forest available for timber production;
- Maintenance or increase the area of softwood and hardwood planted forests on cleared land.

### **Data requirements and Monitoring methodology**

- CRA databases provide baseline data for SFNSW;
- FRAMES provides the relevant data for State Forests. This database will be updated and maintained as part of ongoing management practices;
- Regional Vegetation Management Plans may provide relevant information for private tenures.

### **Reporting**

- Report area (ha) of forest land, and area (ha) available for timber production across all land tenures and forest ecosystems, including secondary forest on private land and softwood and hardwood plantations separately.

### Research and Development

- None identified

### Indicator 2.1.b Total growing stock of both merchantable and non-merchantable tree species on native forest land available for timber production.

#### Rationale

This indicator shows the total growing stock of both merchantable and non-merchantable tree species on forest land available for timber production.

#### Objective

- To maintenance or increase the total growing stock of merchantable and non-merchantable tree species on native forest land available for timber production.

#### Data requirements and Monitoring methodology

- CRA databases provide baseline data for State forests;
- Continuation of the FRAMES inventory process provides relevant data for State Forests. It is unlikely that growing stock will be assigned by individual tree species. Growing stock is more likely to be assigned by merchantable strata class and inferred commerciality. This database will be updated and maintained as part of ongoing management practices;
- Regional Vegetation Mapping Plans may provide relevant information for private tenures although yield relationships will need to be quantified.

#### Reporting

- The anticipated reporting units are basal area of trees >10 cm dbhob and timber volume of trees >10 cm dbhob across the net harvestable area;
- Total growing stock of merchantable and non-merchantable tree species in native forest reported separately for private land and State Forest.

### Research and Development

- Resolution of the method for strategic inventory review. Growing stock may be assigned to merchantable and non-merchantable categories according to inferred commerciality of like species within FRAMES strata;
- FRAMES requires further development to incorporate data on species and quality;
- Mechanisms for appropriate reporting for private land need to be developed;
- Research the extent to which factors such as rainfall, soils and site fertility contribute to variability in models of productive capacity;
- Investigate remote sensing techniques to improve the effectiveness of forest inventory to estimate timber productivity.

### Indicator 2.1.d Annual removal of wood products compared to sustainable volume.

#### Rationale

This indicator is a measure of the actual harvest, to meet society's demand for wood products, against the sustainable level of production.

#### Objective

- To ensure consistent and **ecologically sustainable** supply of wood products from production forest across all tenures.

**Indicative target**

- Removal of high quality large logs and high quality small logs, low quality logs and pulp grade timber does not exceed the **allowable cut** by  $\pm 25\%$  within any 1 year and  $\pm 5\%$  over a 5 year RFA period;
- Track and report on trends for all wood products in order to determine if the **allowable cut** (as per RFA) equals sustainable yield.

**Data requirements and Monitoring methodology**

- CRA databases provide baseline data for State forests;
- FRAMES provides the relevant data for State forests. This database will be updated and maintained as part of ongoing management practices. The SFNSW Forest Management Plan will also contain this data;
- Regional Vegetation Mapping Plans may provide relevant information for private tenures although yield relationships will need to be quantified. Returns from sawmills could supplement this data;
- Actual yield will be calculated by aggregating information from coupes across an appropriate geographic scale, compared to annual targets, and reported on an annual basis;
- All monitoring procedures should be reviewed in the second year of reporting. This review should consider the reliability and magnitude of changes reported for harvested compartments against other changes in State Forest and other tenures. A full accounting of timber harvest and log stocks will be undertaken in the fifth year review of the RFA.

**Reporting**

- Report species, size and type of wood products removed during forestry operations;
- Annual and 5 yearly reporting of volume removed against allowable timber cut;
- Report for public and private tenures separately, and plantations and native forests separately;
- Report on: high quality large sawlogs (including large veneer logs); high quality small sawlogs; pulp grade timber; and poles, piles, girders high quality small logs and low quality logs.

**Research and Development**

- Improve the collection of data relating to private land;
- Develop a methodology for assessing sustainable yield on private land.

**Indicator 2.1.e Annual removal of non-timber forest products (eg berries, mushrooms, game, honey, wildflowers, tree ferns and possums) compared to the sustainable level****Rationale**

This indicator is a measure of the actual harvest, to meet society's demand for non-wood products, against the sustainable level of production.

**Objective**

- To ensure consistent and **ecologically sustainable** supply of non-wood products from production forest across all tenures.

**Indicative target**

- To identify sustainable volume settings for a range of non-wood products by tracking and reporting on trends in production;

- Maintain production at sustainable set supply levels.

#### **Data requirements and Monitoring methodology**

- Collate and track trends in removal of non-wood products under licence

#### **Reporting**

- Report on trends in production of non-wood products removed from public forests under licence;
- Annual and 5 yearly reporting of volume of non-wood products removed.

#### **Research and Development**

- Improve the collection of data;
- Develop a methodology for assessing sustainable yield.

### **Indicator 2.1.f Area and percent of plantation established meeting effective stocking one year after planting.**

#### **Rationale**

To determine the extent and efficacy of the planting effort.

#### **Objective**

- To increase the area of effectively stocked plantations.

#### **Indicative targets**

- Increase stocking success.

#### **Data requirements and Monitoring methodology**

- Each plantation manager/owner to report on the total area of plantations established as well as the area of effectively stocked plantations;
- Data provided for new plantations and re-planting after clearfelling;
- SFNSW has existing information systems that report on plantation performance. Further information may also be available from the Hardwood Plantation Strategy and the SFNSW Information Memorandum;
- Additional data will be required from private plantation owners/managers.

#### **Reporting**

- Success of plantation establishment measured against the defined effective stocking level.

#### **Research and Development**

- None identified.

### **Indicator 2.1.g Area and percent of harvested area of native forest effectively regenerated.**

#### **Rationale**

To determine the success of regeneration effort. It is acknowledged that after some practices, such as thinning, regeneration may not be required.

#### **Objective**

- To effectively regenerate all areas of harvested native forest.

#### **Indicative target**

- 100% of harvested native forest **effectively regenerated**.



**Data requirements and Monitoring methodology**

- SFNSW collect this data in post-harvest surveys, and maintain records as part of their ongoing management program;
- Data on private lands is not currently available and will require the development of methods for the collection of data;
- Field surveys will be undertaken to determine the success of regeneration.

**Reporting**

- Areas and percent of area by forest strata that have been effectively regenerated, and have not been effectively regenerated, are to be reported on;
- The expected survey method will rely on point-to-plant sampling of seedling regeneration in conjunction with post harvest monitoring;
- Effective regeneration levels are assigned depending on the forest strata and harvesting regime applied. Consequently, the threshold level that determines effective regeneration differs across the landscape.

**Research and Development**

- Determine the levels of effective regeneration in relation to regeneration achieving biodiversity goals.

# CRITERION 3: MAINTENANCE OF ECOSYSTEM HEALTH AND VITALITY

**Indicator 3.1.a Area and percent of forest affected by processes or agents that may change ecosystem health and vitality (narrative as interim).**

## **Rationale**

A number of agents can affect ecological processes in forests and may produce significant changes to the condition of the forest. This indicator measures the areas affected by those processes, and the level of impact within those areas. This indicator should be considered together with indicators under Criterion 1 to give an overall picture of forest health and vitality.

## **Objectives**

- To maintain **ecosystem health** and **vitality**;
- To control outbreaks of disease, pests or other agents affecting ecosystem health and vitality, through cooperative planning and management;
- To minimise the risk of outbreaks of disease, pests or other agents affecting ecosystem health and vitality.

## **Indicative target**

- Minimisation of the area and percent of forest affected by processes or agents that reduce ecosystem health and vitality. Note that on the level of individual agents, specific targets may be generated with further research.

## **Data requirements and Monitoring methodology**

- Processes and agents that may change ecosystem functioning need to be identified on a regional basis. These include interactions between natural events and management actions in the following areas; fire, **climatic events**, river regulation, salinisation, grazing, introduction of exotic biota, logging, clearing, roading, bell-miner dieback, insects and diseases;
- CRAFTI data should be considered as baseline data, e.g., disturbance codes;
- Data is available from agency fire monitoring, pest control programs and pest survey and research. Data may be generated out of local observation.

**Reporting**

- Narrative, and where possible quantitative, reporting of the area and percent of forest affected by given processes or agents considered important at a regional level;
- Narrative, and where possible quantitative, reporting of the area and percent of forest where given processes or agents are controlled or their effects are countered by rehabilitation;
- Reporting processes should distinguish between natural and human induced effects.

**Research and Development**

- Research and development required to establish if increases or decreases in processes are affecting ecosystem health and vitality;
- Methodology required to link processes with outcomes and the type of interaction between them.

# CRITERION 4: CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

**Indicator 4.1.a Area and percent of forest land covered by comprehensive Road Management Plans, which include, an assessment of the extent of existing road infrastructure, processes for ongoing improvement, targets and milestones.**

## **Rationale**

To assess and manage the impact of roading in forests in regards to the conservation of soil and water resources.

## **Objectives**

- To ensure the conservation and maintenance of soil and water resources;
- To optimise road type and density to meet soil, aquatic habitat and water protection controls and adequate access for forest use and management;
- To optimise the type and density of drainage line crossings to meet soil, aquatic habitat and water protection controls and adequate access for forest use and management.

## **Indicative target**

- Road Management Plans are to be completed for all RFA regions within 5 years of the signing of the relevant RFA.

## **Data availability and Monitoring methodologies**

Each agency to develop a Road Management Plan that details road lengths, regolith class, road category density, stream crossing density, future road construction and road closure etc. over its estate. Road Management Plans should consider road and crossing density by catchment.

- The Ecologically Sustainable Roading Index and Ecologically Sustainable Crossing Index may be used to test the efficacy of Road Management Plans at meeting targets.

## **Reporting**

- Reporting against targets and milestones built into Road Management Plans.

**Research and Development**

- Development and trial of the Ecologically Sustainable Roading Index and Ecologically Sustainable Crossing Index proposed by the EPA.
- Monitor impacts on soil and water resources and determine the effectiveness of road management plans;
- Cooperative approach between relevant agencies to developing system targets.

**Indicator 4.1.a (Interim) Area and percent of forest land systematically assessed for soil erosion hazard, and for which site-varying scientifically-based measures to protect soil and water values are implemented.****Rationale**

This indicator aims to demonstrate that soil erosion risk has been explicitly addressed in forest management planning and field operations. The percentage of area effected by soil erosion may be very small but can still produce a significant effect, e.g. a picnic area in a pristine catchment.

**Objective**

- To ensure all areas where forest activities/operations are occurring are systematically assessed for soil erosion hazard;
- To ensure that appropriate site-specific scientifically-based measures to protect soil and water values are implemented.

**Indicative targets**

- All areas where forest activities/operations are occurring are systematically assessed for soil erosion hazard;
- Site-specific scientifically-based measures to protect soil and water values are implemented in all areas where forest activities/operations are occurring.

**Data requirements and Monitoring methodology**

- Data on the area and percent of forest land systematically assessed for soil erosion hazard, and the site-specific scientifically-based measures to protect soil and water values implemented, are to be derived from management and operation plans;
- EPA to provide data on SFNSW compliance with licence conditions as specified in the regional Integrated Forestry Operations Approval.

**Reporting**

- The effectiveness of protective measures, including Licence conditions and Codes of Practice, in preventing soil erosion and water pollution need to be assessed.

**Research and Development**

- Indicators need to be developed regarding the conservation of organic matter, nutrients and site quality.

# CRITERION 5: MAINTENANCE OF FOREST CONTRIBUTION TO GLOBAL CARBON CYCLES

**Indicator 5.1a: Total forest ecosystem biomass and carbon pool, and if appropriate, by forest ecosystem, age class, and successional stages (Category B)**

## **Rationale**

Forests can maintain their contribution to global carbon cycles by maintaining or increasing the amount of carbon stored within them. At a local scale, forests can undergo significant changes of carbon storage associated with natural mortality, thinning, fire, harvesting and regrowth, but for a larger forest area the harvest loss from one area can be balanced by regrowth in a number of other areas. The age class distribution and successional stage of forests provides information on the changing structure of forests and determines whether they are in a predominantly regenerating or mature stage.

The National Greenhouse Response Strategy includes the National Greenhouse Gas Inventory (NGGI) which estimates for each State the annual changes in C-stocks in native and plantation forests, be it with wide bands of uncertainty. The Kyoto Protocol requires Australia to track changes in national C stocks from deforestation, reforestation and afforestation activities initiated since 1990. The National Carbon Accounting System is currently being established in the Australian Greenhouse Office to conduct such accounting. Indicators for Criterion 5 should be compatible with and contribute to that internationally binding requirement.

## **Objective**

- To determine total forest ecosystem biomass and carbon pool;
- To ensure that the total carbon stored across the regional forest area is not reduced.

## **Indicative target**

- Maintenance or increase in the total carbon stored in the forest.

**Data requirements and Monitoring methodology**

- Data on wood loss by natural mortality, thinning, fire and harvesting can be balanced against regrowth data to indicate positive or negative changes to carbon across the region;
- Partial reporting of this indicator can be derived from wood volume and age class data in Indicators 1.1.a and 1.1.b, provided that appropriate biometric relationships have been established. SFNSW will develop these biometric relationships based on FRAMES and will provide these to other agencies.

**Reporting**

- Changes in Carbon held in above-ground wood volumes will be reported once biometric relationships are established. This must be interpreted as a surrogate for total forest contribution to global carbon.

**Research and Development**

- Biometric relationships between wood volume, age classes and carbon storage above and below ground need to be developed;
- The relationship between wood volume and total carbon storage needs to be confirmed for subtler shifts in management;
- If forest ecosystems change over time, research will be necessary to establish the relationship between wood volumes and total carbon storage;
- Collation of ground-based records will be gradually augmented with verification by interpretations of satellite imagery.

**Indicator 5.1c: Contribution of forest products to the global carbon budget (Category B).****Rationale**

Different forest products decay at varying rates. The rate at which carbon is removed, albeit temporarily, from the system, can be assessed by accounting for the different end-products from forest industries. By increasing the proportion of wood converted to long-lived products, such as building materials and furniture, the quantity of carbon held in storage will be increased.

**Objectives**

- To measure the amount of carbon stored in forest products and therefore not in the atmosphere contributing to changes in atmospheric conditions.

**Indicative target**

- Increase the average longevity of forest products.

**Data requirements and Monitoring methodology**

- Quantify the relative proportions of wood used for different products. The decay rates of these products also need to be quantified;
- Data may be available from a variety of sources including the Australian Bureau of Statistics and industry sources. Integration of data will involve desktop analysis and synthesis of different data formats.

**Reporting**

- Data from different sources will be integrated using an agreed classification system.

**Research and Development**

None identified

# CRITERION 6: MAINTENANCE AND ENHANCEMENT OF LONG TERM MULTIPLE SOCIO-ECONOMIC BENEFITS TO MEET THE NEEDS OF SOCIETIES

## PRODUCTION AND CONSUMPTION

### **Indicator 6.1.a Value and volume of wood and wood production**

#### **Rationale**

Enables socio-economic benefits to be monitored by ascertaining trends in value and volume of wood production against management objectives

#### **Objectives**

To increase economic development from sustainable management of public forest.

#### **Indicative target**

- Volume should be in line with the allowable timber cut as determined by the RFA

#### **Data requirements and Monitoring methodology**

- SFNSW collates sale volumes and total royalties for logs sourced from State Forests to fit RFA boundaries;
- SFNSW data is currently collected on a regional basis, however, SFNSW are developing techniques for collation at a CRA level;



- Following annual reporting, ongoing monitoring would ensure that the process of data collection is achieving the stated objectives and opportunities to improve the adopted methodology are implemented.

### Reporting

- Reporting should occur against the log product themes by sale volume and value assigned in Indicator 2.1.d.;
- The volume of wood products will be recorded in either cubic metres (m<sup>3</sup>) or tonnes (t).

### Research and Development

None identified

## RECREATION AND TOURISM

### Indicator 6.2.c Number of visits per annum.

#### Rationale

This indicator provides an indication of the amount of overall recreation use and suggests the amount of demand for forest based tourism and recreation. It is a key variable in determining the sustainability of recreation and tourism. Tourism and recreational demand must be balanced against the conservation of forest by determining ecologically sustainable levels of use.

#### Objective

- To integrate tourism and recreation demands with ecological sustainable forest management.

#### Indicative target

- Area and percent of forest lands covered by comprehensive cross-agency Integrated Tourism and Recreation Plans, including information on;
  - the management of visitation to State Forest and National Parks,
  - the maintenance of opportunities for visits in response to demands,
  - mitigation measures in place in high-use areas.
- Growth in line with regional or state recreation and tourism trends. These will provide a benchmark for forest related tourism growth relative to local or state tourism growth rates.

#### Data requirements and Monitoring methodologies

- NPWS to supply data on the number of visits per annum to identified areas from vehicle counters, track counters, registration books, booking systems and license allocations. SFNSW to provide additional data where available;
- Narrative information from Agency staff and public survey, where available, about 'overuse' of particular sites by visitors;
- Data should be measured upon a consistent unit, ie visitor days, which is a combination of visitor nights and number of visits;
- Tourism NSW should develop (using existing tourism region data as a base) a Southern CRA region specific database of tourism visitation.

#### Reporting

- Report on trends in annual recreation and tourist use and compare with area available;

- Report on area and percent of land suffering material damage from overuse, and effectiveness of damage mitigation and rehabilitation measures.

#### **Research and Development**

- Monitor the impact of different tourism and recreation uses to identify the **carrying capacity** and ecologically sustainable recreation and tourism levels for State Forests and National Parks. The relationship between visitor numbers, visitor value and ecological impact should be determined;
- Inter-agency working group to develop an Integrated Tourism and Recreation Plan for the forest estate;
- Need to develop a methodology to consistently gather and report narrative style information in order to make it comparable across agencies/areas.

### **INDICATOR 6.4 CULTURAL, SOCIAL AND SPIRITUAL NEEDS AND VALUES**

#### **Indicator 6.4.c (i) Change in condition and number of Aboriginal cultural heritage features within the forest estate including recorded places, artefacts, sites or other structures.**

##### **Rationale**

The protection and enhancement of Aboriginal cultural heritage features within the forest estate. This indicator measures the degree of management of **recorded places**, artefacts and structures within the forest estate. This indicator should make allowances for the changing condition of sites being managed, and for the number of sites being added to (or deleted from) site records. This indicator specifically recognises Aboriginal cultural heritage.

##### **Objectives**

- To manage forests such that Aboriginal heritage values are protected;
- To minimise and, where possible, eliminate threats to the condition of sites;
- To ensure that site integrity, function and meaning is maintained within the landscape;
- To ensure that appropriate mechanisms that meet Aboriginal community requirements are in place to protect heritage features and that threatening processes are managed with regards to cultural values;
- To ensure Aboriginal groups are involved in the monitoring and rehabilitation of their sites;
- To increase the number of Aboriginal people involved in managing cultural sites and the forest estate;
- To preserve sites with Aboriginal peoples' cultural resource management;
- To enhance Aboriginal cultural values through public awareness;
- To manage Aboriginal peoples' cultural sites sensitive to the communities' requirements.

##### **Indicative targets**

- Maintenance and promotion of cultural heritage values, places, sites and other items in forests;
- Increase in the number of Aboriginal people involved in site protection and rehabilitation;

- Increase in the proportion of heritage places, sites and other items managed in accordance with established heritage management principles and endorsed Conservation Management Plans;
- Increase the protection of places, sites and other items from threats to their physical condition.

#### **Data requirements and Monitoring methodology**

- The Aboriginal Sites Register for New South Wales and agency Section 170 registers to be used as a collection point for data concerning Aboriginal places, sites and other items. The Aboriginal Sites Register could be modified to include appropriate fields to incorporate information on maintenance or protection works on Aboriginal sites;
- Information and data on cultural sites will also be collected in consultation with the Aboriginal community. All information and data will be protected as requested by the Aboriginal community;
- NPWS records of Section 90 consents to destroy sites will be used as a primary source of data. Data will include information on the site type, content and location and reasons for destruction.

#### **Reporting**

Each agency to monitor and report through consultation with Aboriginal community groups on the condition of known places, sites and other items and any changes in the condition of places, sites and other items within its own tenure. Narrative information as to the reason for change in condition.

**TABLE D: SUGGESTED FORMAT FOR REPORTING INDICATOR 6.4C (i) AND (ii)**

Heritage Feature (Place Name)	National Estate/ State Heritage Value	Location	Tenure	Threatening Processes	Current Protective Mechanisms	Management and resource Implications

- Report on the known condition, of recorded places, sites and other items and any changes in the condition of places, sites and other items within the Southern Region as defined by and referenced through the local Aboriginal communities;
- Agencies to annually report on number of sites for which permits have been given for 'consent to destroy';
- Compliance of management practices with endorsed Conservation Management Plans to be reported;
- Number of Aboriginal people employed in the monitoring, rehabilitation and management of their places, sites or artefacts, and the forest estate, be monitored and reported by each agency;
- Level of Aboriginal participation and consultation in the protection and management of cultural heritage values places sights and other items in forests are monitored and reported under Criterion 7.1.c.

#### **Research and Development**

- Establish standard protocols for surveying and protection of sites, applicable across tenures;
- Targeted survey of the forest estate to identify so-far unrecorded cultural heritage sites;

- Determination of potential threats to Aboriginal cultural heritage sites.

**Indicator 6.4.c.(ii) Change in condition and number of historic heritage features within the forest estate including recorded places, artefacts, sites, buildings or other structures.**

**Rationale**

The protection and enhancement of historic heritage features within the forest estate. This indicator measures the degree of management of **recorded places**, artefacts and structures within the forest estate. This indicator should make allowances for the changing condition of sites being managed, and for the number of sites being added to (or deleted from) site records. This indicator specifically recognises historic cultural heritage, which encompasses the heritage of all Australians including historic heritage of Aboriginal Australians.

**Objectives**

- To manage forests such that historic heritage values are protected;
- To minimise and, where possible, eliminate threats to the condition of sites;
- To ensure that site integrity, function and meaning is maintained within the landscape;
- To ensure appropriate mechanisms which meet community requirements are in place to protect heritage features and that threatening processes are managed with regards to cultural values;
- To ensure community groups are involved in the monitoring and rehabilitation of site;
- To enhance cultural values through public awareness.

**Indicative targets**

- Maintenance and promotion of cultural heritage values, places, sites and other items in forests;
- Increase in the proportion of heritage places, sites and other items managed in accordance with established heritage management principles and endorsed Conservation Management Plans;
- Increase the protection of places, sites and other items from threats to their physical condition.

**Data requirements and Monitoring methodology**

- NPWS Sites Register for New South Wales and Agency Section 170 registers (maintained separately by each agency). Agency historic sites registers (including Section 17 registers) to be used as collection points for data. These may require modification to include appropriate fields to incorporate information on maintenance or protection works on sites.

**Reporting**

Each agency to monitor and report on the condition of known places, sites and other items and any changes in the condition of places, sites and other items within its own tenure. Narrative information as to the reason for change in condition

**TABLE D: SUGGESTED FORMAT FOR REPORTING INDICATOR 6.4C (i) AND (ii)**

Heritage Feature (Place Name)	National Estate/ State Heritage Value	Location	Tenure	Threatening Processes	Current Protective Mechanisms	Management and resource Implications


- Report on the condition of known places, sites and other items and any changes in the condition of places, sites and other items within the Southern region;
- Compliance of management practices with endorsed Conservation Management Plans to be reported.

### **Research and Development**

- Establish standard protocols for surveying and protection of sites, applicable across tenures;
- Determination of potential threats to cultural heritage sites.

## **EMPLOYMENT AND COMMUNITY NEEDS**

### **Indicator 6.5.a Direct and indirect employment in the forest sector and forest sector employment as a proportion/percentage of total employment. (Category B)**

#### **Rationale**

Employment is an important measure of the economic contribution of forests to the needs of the whole community.

#### **Objective**

- To monitor the level of employment to determine the contribution of the forest sector to employment and community needs.

#### **Data requirements and Monitoring methodology**

- Data from the Australian Bureau of Statistics, Agency and industry sources to be collated to provide employment data for the forest industry (production and tourism) and associated industries covering a range of activities such as ecotourism, birdwatching, etc. Data may also be available from the Community Development Employment Program (CDEP) scheme from local Aboriginal communities;
- FISAP may also provide data at a regional level;
- Assessment of the impacts of changes in the forestry industry on employment that is indirectly related to the forestry industry. This could be undertaken using I-O techniques from the first survey conducted in 1999;

#### **Reporting**

- Employment trends to be considered in context of community expectations and industry developments in and close to the region;
- Reporting will be via desktop analyses, possibly supplemented by economic models
- Using the results of the survey process. A central agency needs to establish a mechanism reporting of direct and indirect employment for the region;
- The data should be reported against various categories, including employment category, and forestry dependent and ancillary business.

**Research and Development**

- Develop multipliers for calculating indirect employment in the forest sector;
- Develop and implement a strategy to account for indirect and direct Aboriginal employment and management in the forest sector;
- Determine social and ecological goals for employment in forest and forest related industries.

# CRITERION 7: LEGAL, INSTITUTIONAL AND ECONOMIC FRAMEWORK FOR FOREST CONSERVATION AND SUSTAINABLE MANAGEMENT

**Indicator 7.1 (Narrative) Extent to which the legal framework (laws, regulations, guidelines) supports the conservation and sustainable management of forests.**

## **Indicator 7.1.a**

This indicator provides mechanisms to clarify **property rights** and **establish appropriate land tenure arrangements** that recognise **traditional management practices** and **self-management** as well as the existence of native title and the customary and traditional rights of Aboriginal peoples.

Self-management is defined as a “a delegated function whereby a group or some type of formal authority carries out tasks with funds and program designed by others outside the group or region”. Recognition that the Commonwealth Government has responsibility in implementing the current native title legislation.

## **Rationale**

The indicator accounts for the inextricable links between land ownership, land management and custodial obligation. It is useful as it identifies changes to:

- the legal system and frameworks for land ownership and management, including self management;
- the legal system and frameworks for Aboriginal land;

- ownership and other inherent rights relating to land; particularly the rights and interests of Aboriginal peoples.

The conservation and sustainable management of forests must comply with the requirements of any native title/land right legislation.

### **Objective**

This indicator intends to show the adequacy of the legal framework in providing mechanisms for clarifying property rights and establishing appropriate land tenure arrangements.

### **Data requirements and Monitoring methods**

An inventory of Acts (refer to indicator 7.1e and 6.6a) and assessment and evaluation of all relevant instruments within legislation, policies and plans of Commonwealth and State Governments that address customary and traditional rights of Aboriginal peoples including:

- Native title and other land rights mechanisms;
- mechanisms (including effective resourcing) for involvement of Aboriginal peoples in management of natural and cultural resources which reflect their cultural and social values;
- recognition of compatible Aboriginal activities within the context of forest management, traditional management practices and self management;
- management of **co-existing rights**; and
- appropriate mechanisms for the protection of intellectual property.

### **Reporting**

- Report on assessment outcomes of the above inventory.

### **Research and Development**

None identified

**Indicator 7.1.b Provides for periodic forest-related planning, assessment, and policy review that recognises the range of forest values, including coordination with relevant sectors.**

### **Rationale**

This indicator shows how the legal framework demonstrates a regional commitment to achieving sustainable forest management. The existence of a legal framework that adequately addresses this indicator will demonstrate a commitment to sustainable forest management.

### **Indicative Target**

- That the full range of NSW forest values, as defined within NSW ESFM Principles, are addressed through the current management system, including appropriate legislation and policies, regulatory framework - including licence approvals and their equivalent, codes of practice, regional prescriptions and management plans.

### **Data requirements and Monitoring methods**

Description of legislation, the regulatory framework and management plans and the process of review for forest planning, assessment, and policy for the following range of NSW forest values identified in the NSW Forest Agreements and RFAs, including coordination with relevant sectors:

- Biodiversity;
- Productive capacity and sustainability of forest ecosystems;
- Forest ecosystem health and vitality;
- Soil and water;



- Positive contribution of forests to global geochemical cycles;
- Long-term social and economic benefits;
- Natural and cultural heritage values.

**Reporting**

- Narrative report describing and evaluating legislation, the regulatory framework and management plans and the process of review for forest planning, assessment, and policy for the range of NSW forest values identified in the NSW Forest Agreements and RFAs.

**Research and Development**

None identified

**Indicator 7.1.c Provides opportunities for public participation in public policy and decision making related to forests and public access to information.****Rationale**

Enables the policy framework to be assessed for transparency and public participation in public policy and decision making at the regional level.

**Indicative Target**

- That there is an effective public participation and information process involving all parts of the community recognising the need for informed participatory decision-making.

**Data requirements and Monitoring methods**

- List of mechanisms for public participation, consultation, access to information, including frequency of review of policy and decision making processes at the regional level.

**Reporting**

- Narrative report providing a list of mechanisms for public participation, consultation, access to information, including periodicity of review of policy and decision making processes at the regional level.
- This information should allow the effectiveness of the public participation and information process involving all parts of the community to be assessed, recognising that different perceptions of public participation processes may exist, and that some commercial and traditional Aboriginal information may be of a sensitive or exclusive nature and may need to be retained under local control.

**Research and Development**

None identified

**Indicator 7.1.d Encourages the development and application of best practice codes of forest management****Rationale**

Codes of practice indicate a commitment to compliance with environmental management systems, including the legislative, regulatory and policy framework, and continuous improvement in forest management practices.

**Indicative Target**

- To establish effective environmental controls and regulations over forest operations and management activities that address ecologically sustainable forest management across all

forest tenures and uses, through codes of practice, licensing arrangements, and regional prescriptions, and which are subject to regular review and (continual) improvement.

#### **Data requirements and Monitoring methods**

- A list of relevant legislation, codes of practice and associated regional prescriptions for the management of the full range of NSW forest values across native forest and plantation areas (content and coverage);
- Reporting of reviews and improvements made to codes of forest practice and regional prescriptions;
- Area and per cent of native forest and area and percent of plantations covered by codes of forest practice and regional prescriptions.

#### **Reporting**

- Narrative report of the above.

#### **Research and Development**

None identified

### **Indicator 7.1.e Provides for the management of environmental, cultural, social and/or scientific values in forests and ensures the participation of Aboriginal people in all aspects of forest planning and management processes**

#### **Rationale**

This indicator provides for qualitative and quantitative measurement of the legal framework covering special environmental, cultural, social and/or social values in forest management and including the recognition of Aboriginal perspective and value systems. This indicator allows for Aboriginal self-determination through the articulation of values by Aboriginal people. It intends to show the adequacy of the legal framework in providing for participation in planning and management with links to indicators 6.6a and 7.1a to provide an analysis of the legal framework.

#### **Indicative Target**

- That the legal and policy framework is adequate for conserving special environmental, cultural, social and/or scientific values, including the recognition and inclusion of Aboriginal peoples perspective's and value systems.

#### **Data requirements and Monitoring methods**

- List of relevant legislation, policy and plans in relation to the full range of NSW forest values.

#### **Reporting**

Narrative list of the legislation, policy and plans in relation to the full range of NSW forest values. Links with 7.1a in recognising the needs of Aboriginal people and 7.1b in relation to management of the full range of values in forests.

- Narrative addressing government policies including a list of relevant Acts, policies and plans that address NSW forest values drawing on the NSW ESFM Group report "Statewide Assessment of NSW Management Systems and Processes for ESFM";
- Measure the implementation of the legal framework including those Acts relating to Aboriginal peoples by comparing the legal and policy framework in place under NSW and Regional Forestry Agreements with changes (improvements) in the framework at appropriate intervals over the period of these Agreements, such as the five year period of review;

- Report on changes in the forest management system addressing silviculture and conservation, including regional prescriptions, covering scientific basis, periodicity of review and public availability.

### **Research and Development**

- Develop a process for review and improvement of the legal and planning framework to achieve ecologically sustainable forest management. The NSW ESFM Group report “Statewide Assessment of NSW Management Systems and Processes for ESFM” provides useful information for developing such a process.
- Existing legislation offers some provisions for conserving cultural and social values associated with conservation and management of forests. Work is needed to examine ways for improved recognition and incorporation of cultural values, including Aboriginal values.

## **Indicator 7.2 (Narrative) Extent to which the institutional framework supports the conservation and sustainable management of forests.**

### **Indicator 7.2.a Provide for public involvement activities and public education, awareness and extension programs and making available forest-related information.**

#### **Rationale**

To assess whether effective public education, participation and awareness processes are in place to build community awareness and support for the ecological sustainable management of forests.

#### **Indicative target**

- To maintain or increase public involvement activities, public education, public awareness, extension programs;
- To maintain or increase public awareness of Aboriginal peoples’ rights in forest-related information; to better educate the broader community on the need for the recognition of Aboriginal rights;
- To enhance availability of forest-related information and extension services.

#### **Data requirements and Monitoring methods**

- List of public involvement activities public involvement activities and public education, awareness and extension program;
- Mechanisms for public participation, public awareness and extension for a range of forestry activities such as regional policies, management plans, regional prescriptions and codes of practice for State Forests, reserves and crown lands;
- Number of consultative meetings with community groups including Aboriginal communities in relation to cultural heritage information;
- Expenditure on public participation, public education, public awareness, and extension for a range of forestry activities such as regional policies, management plans, regional prescriptions and codes of practice for state forest, reserves and crown lands (Links with 7.1c);
- Types and number of reports, information papers and circulars on forest-related public involvement activities and public education, awareness and extension programs (such as, annual reports, value specific reports, State of the Environment reporting and State of the Forest reports etc.).

**Reporting**

- Narrative report on the above.

**Research and Development**

None identified

**Indicator 7.2.b Undertake and implement periodic forest-related planning, assessment, and policy review including cross-sectoral planning and coordination****Rationale**

Procedures are in place for periodic regional planning, assessment and policy review by the responsible institutions and provide the basis for continuous improvement in forest management.

**Indicative Target**

- Procedures for monitoring, reviewing and evaluating management policies, plans and processes, including cross sectoral planning and coordination, covering:
  - Laws, regulations and guidelines to ensure the effective implementation of plans;
  - State-wide policies on NSW ESFM values;
  - Status and currency of management plans for forests, crown lands and reserves and assessment of performance of targets and objectives in management plans;
  - Processes for updating and adapting regional management plans and policies in the light of changing environmental, social and economic circumstances and new information;
  - Management of CAR values in Formal and Informal Reserves.

**Data requirements and Monitoring methods**

- Document the presence and currency of regional management policies and plans including the reporting of performance indicators and targets of ecologically sustainable forest management;
- Document processes for periodic review (frequency and scope) of policies, management plans, and planning instruments

**Reporting**

- Narrative report on the above.

**Research and Development**

None identified

**Indicator 7.2.c Develop and maintain levels of human resource skills across relevant disciplines.****Rationale**

Appropriate levels of human resource skills are required to implement sustainable forest management.

**Indicative Target**

- To maintain or increase/improve the numbers, competency and currency of skills required to service management responsibilities/accountabilities to deliver ecologically sustainable forest management;
- To reduce the number of forest management related breaches and prosecutions for a region;

- Incentive schemes to foster skills development.

### **Data requirements and Monitoring methods**

For public and private enterprises:

- Total number of training days and number of attendees, by type of training per year;
- Expenditure on and number of staff training, trainee and development programs against NSW forest values;
- Document and report number of employees by qualification category (graduate, diploma/certificate, trade skill) in relation to NSW ESFM forest values and critical areas of forest management, such as:
  - Forest planning and management;
  - Reserve management and planning;
  - Codes of forest practice;
  - Conservation protocols and prescriptions;
  - Silviculture;
  - Fire management and control;
  - Pathology;
  - Sustainable yield monitoring and projection (including inventory);
  - Research into forest management and conservation issues
  - Soil conservation
  - Water quality.
- Report on incentive schemes to foster skill development.

### **Reporting**

- Narrative report on the above.

### **Research and Development**

None identified

## **Indicator 7.2.e Enforce laws, regulations and guidelines**

### **Rationale**

Enforcement of laws, regulations, guidelines etc. may encourage effective implementation of ecologically sustainable forest management practices which includes plans being effectively implemented, noting that number of breaches can reflect both enforcement effort and compliance with the law.

### **Indicative Target**

- Mechanisms are in place to ensure compliance with plans, codes, prescriptions and licences;
- Achievement of 100% compliance with laws, regulations, licences, guidelines and codes.

### **Data requirements and Monitoring methods**

- Presence and currency of objectives, targets and indicators in management plans, codes, prescriptions and licences for which conformance and compliance is required;
- Number of forest-related breaches and prosecutions in comparison to the number of enforcement audits undertaken from regulatory agencies for individual departments, including trends in compliance audits (noting that low levels of breach and prosecution may mean high level of compliance or a low level of enforcement);
- Annual reporting of compliance with Integrated Forestry Operations Approval, Codes of Practice and Regional Prescriptions;
- Industry self-regulation and enforcement strategies used by industry;

- Monitoring and enforcement effort and expenditure.

### **Reporting**

- Narrative reporting of the above.

### **Research and Development**

- Develop an appropriate strategy for measuring sustainability with respect to compliance audits and performance of management plans in relation to target achievement.

## **Indicator 7.4 (Narrative) Capacity to measure and monitor changes in the conservation and sustainable management of forests, including:**

### **Indicator 7.4.a Availability and extent of up-to-date data, statistics and other information important to measuring or describing indicators associated with criteria 1-7**

#### **Rationale**

To ensure a regional framework monitoring system and sufficient current data is available to measure and monitor changes in the full range of NSW forest values to ensure ecological sustainable forest management. Trends over time should show whether there is improved reporting capacity.

#### **Indicative Target**

- Data, statistics and other information important to measuring or describing indicators associated with Criteria 1-7 are available and up-to-date;
- Data and monitoring methodologies are available to meet annual and 5-yearly reporting requirements of ESFM under the Regional Forest Agreement.

#### **Data requirements and Monitoring methods**

- Data to be collected from State agencies, institutions and private enterprises as appropriate.

#### **Reporting**

- Table showing data availability and currency for each indicator associated with Criteria 1-7, including a list of activities in relation to NSW ESFM values being monitored under the NSW Regional Forest Agreements and currency of information;
- Summarise data inadequacies and review relevance of indicators in the region to build relevant and current monitoring program;
- Review and assess comprehensiveness and adequacy of forest inventories, including monitoring;
- Refer to each indicator for particular details of reporting.

#### **Research and Development**

None identified

### **Indicator 7.4.b Scope, frequency and statistical reliability of forest inventories, assessments, monitoring and other relevant information.**

#### **Rationale**

A comprehensive and current inventory provides the basis for all forest planning for ecologically sustainable forest management. The data will show the degree to which the forest inventories and monitoring cover all NSW forest values and contribute to their ongoing sustainable management throughout appropriate planning.

**Indicative Target**

- Inventories, assessments and monitoring programs cover all NSW ESFM values (including those addressed under Montreal process Criteria and Indicators) on both public and private lands at a scale, frequency and reliability that provides a basis for the ecologically sustainable management of forests.

**Data requirements and Monitoring methods**

- Document inventories, assessments and monitoring programs for forest management activities for all NSW ESFM values, together with their scale, frequency and measures of reliability. Particular effort will be required to obtain data from private forests and conservation reserves.

**Reporting**

- Narrative report on the above.

**Research and Development**

None identified

**Indicator 7.5 (Narrative) Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services, including:****Indicator 7.5.a Development of scientific understanding of forest ecosystem characteristics and functions****Rationale**

A scientific understanding of forest ecosystem characteristics and functions is needed to underpin sustainable forest management.

**Indicative Target**

- To establish a sound scientific understanding of forest ecosystem characteristics and functions;
- To achieve appropriate coverage of NSW forest values and areas of forest management by research programs and projects;
- To achieve an appropriate coverage of ecosystem components by research publications;
- To identify areas not covered by current research for the purposes of strategic planning.

**Data requirements and Monitoring methods**

Document research effort in relation to:

- Monitor and report on research effort in relation to NSW forest values as identified in NSW and Regional Forest Agreements and NSW ESFM Group reports on Criteria and Indicators and Knowledge and Information Gaps in relation to:
  - number of people employed (scientific and technical staff) ;
  - expenditure in each area;
  - total expenditure on R&D;
  - number of research papers published.
- Identify research issues to be addressed over the following five-year period in relation to NSW ESFM forest values and report on initiatives undertaken to address regional research needs identified five years previously.

**Reporting**

- Narrative report on the above.

**Research and Development**

None identified

**Indicator 7.5.d Enhancement of ability to predict impacts of human intervention on forests.****Rationale**

The ability to predict impacts is required to ensure that long term objectives are likely to be met. Predictive ability is dependent on good inventory data and scientific knowledge.

**Indicative Target**

- To improve the capacity to predict impacts of human intervention on forests through Research & Development and the measurement and monitoring of changes in NSW forest values resulting from forest management;
- To identify gaps in knowledge and information for determining ecologically sustainable forest management;
- To improve capacity for continuous improvement in forest management by identifying and acting upon deficiencies in planning and operations to achieve ecologically sustainable forest management;
- To improve capacity to conduct and apply research and development to achieve sustainable forest management, continuous improvement, and the delivery of forest goods and services.

**Data requirements and Monitoring methods**

- Document results of monitoring programs of impacts of forest management activities on NSW forest values;
- Identify areas requiring more knowledge and information (eg. impacts of management practices on biodiversity and silviculture, biodiversity surveys, strategic inventory);
- Identify areas of improvement in forest management planning and operations to achieve ecologically sustainable forest management;
- Document capacity to conduct and apply research and development for sustainable forest management;
- Document improvements in forest management practices and adaptive management that lead to ecologically sustainable forest management.

**Reporting**

- Narrative report on the above.

**Research and Development**

- Develop mechanisms (eg, predictive models) to measure the impacts of human intervention on NSW forest values and achievement of ecological sustainable forest management.

**Indicator 7.5.f Per cent of native forests and plantations that are formally supported by silvicultural and utilisation research support.****Rationale**

Research support is required to ensure that all forests have an adequate scientific basis for management. The data should show the extent of forest areas that lack research support.



**Indicative Target**

- To increase the area of private forests and plantations that have sustainable scientifically based silvicultural prescriptions and harvesting codes of practice and research support.
- Data requirements and Monitoring methods
- Area on area of private forests and plantations that are formally supported by silvicultural and utilisation research support;
- Identify forest areas associated with forest research effort to indicate areas that are not covered by current research.

**Reporting**

- Tabular and narrative report on the above.

**Research and Development**

None identified

# GLOSSARY

## Indicator 1.1a

- **forest ecosystem** - a class in the hierarchy of vegetation classification of forests characterised by the taxonomic and or structural composition of canopy trees (usually by the dominant species) - as defined by CRA forest ecosystem data sets.
- **non-treed elements** - areas within the forest ecosystems in which trees are not the dominant structural vegetation ecosystem. e.g. swamps, marshes, rocky outcrops.
- **human induced disturbance** - disturbance of forest ecosystem extent by human activities, whether for land management, recreational or other purposes.

## Indicator 1.1.b

- **balance of growth stages** – forest comprised of a range of tree stands that reflect natural forest disturbance regimes, such as regeneration stands, regrowth stands, mature stands and overmature stands.
- **mixed-aged forest** – forest comprised of more than one age-class, usually created by natural processes, long-term selective logging or gap-phased replacement.

## Indicator 1.1.e

- **general retained habitat** - habitat that is suitable for use by a species and is not subject to management practices or changes in land use that may render the habitat unsuitable for any period of time.
- **functional connectivity** - connectivity between patches of retained forest allowing for population viability and the continuation of ecosystem processes across the regional landscape. Connectivity is usually provided by corridors of retained or restored habitat.
- **functional populations** - populations that are both viable and of sufficient abundance to play their traditional role in ecosystem processes.

## Indicator 1.2.a

- **forest dwelling** - species living in forest and/or reliant upon resources provided by forest. The term “forest dwelling” is taken to include all forest dependent species.
- **functional populations** - populations that are both viable and of sufficient abundance to play their traditional role in ecosystem processes.
- **viable populations** - populations that have enough individuals, genetic variation and are spatially distributed in such a way that allows continued survival of the population.

**Indicator 1.2b**

- **conservation status** - the designation of species on Commonwealth or State conservation legislation. e.g. threatened species may be either “endangered” or “vulnerable” under the NSW Threatened Species Conservation Act 1995 (TSC Act).
- **scheduled forest dwelling species** - forest dwelling species (above) that appear on the lists (schedules) of species identified on either Commonwealth or State species conservation legislation. e.g. endangered species are listed on Schedule 1 and vulnerable species are listed on Schedule 2, of the TSC Act.

**Indicator 1.2b1**

- **conservation status** - the designation of populations or ecosystems on Commonwealth or State conservation legislation. e.g. populations and ecosystems may be listed as endangered under the NSW Threatened Species Conservation Act 1995 (TSC Act).
- Indicator 2.1.d **ecologically sustainable timber production**- where the rate of removal of any forest product is consistent with sustainable levels, that is where the effects of activities/disturbances which threaten forests, forest health, forest productivity, or forest values do not compromise ecological processes.
- **allowable timber cut** - as determined by the RFA

**Indicator 2.1.f**

- **effective stocking** - a plantation block is effectively stocked where sufficient trees remain after one year so that all possible silviculture regimes intended for the site remain viable

**Indicator 2.1.g**

- **effective regeneration** - success of regeneration in re-establishing the pre-harvesting forest structure and species composition, specific for each forest ecosystem and locality.

**Indicator 3.1.a**

- **ecosystem health** - the state of an ecosystem’s processes (energy, nutrient, hydrological, and biological processes) which maintains the vitality of the system.
- **vitality** - is equated to the ability of the ecosystem to perpetuate self.
- **climatic events** - including flood, storm, wind, drought etc.

**Indicator 6.2c**

- **carrying capacity** - the number of visitors to forest, for tourism and recreation purposes, that can be maintained without damage to ecosystem function, health or vitality. The ecologically sustainable rate of visitation and use.

**Indicator 6.2d**

- **recorded places** - sites of significance to Aboriginal peoples that have been formally registered by State agencies, archaeological survey reports and on the Register of the National Estate.

**Indicator 7.1**

- **property rights** - the right of ownership, control or management over an area of land.

- **appropriate land tenure arrangements** - the recognition of rights of ownership, control or management by establishing land tenure agreements with the traditional Aboriginal owners of an area of land.
- **traditional management practices** - the recognition and acceptance of traditional Aboriginal management practices (including the harvesting of plants and animals, and the use of fire, for traditional purposes).
- **self management** - the recognition and acceptance of the rights of Aboriginal people to manage their own interests without intervention.
- **co-existing rights** - the recognition and acceptance of the rights of Aboriginal people to manage or have a say in management decisions of land under joint Aboriginal and non-Aboriginal management (private or public).

# ACRONYMS

<b>ABS</b>	<b>Australian Bureau of Statistics</b>
<b>API</b>	<b>Aerial Photography Interpretation</b>
<b>BRS</b>	<b>Bureau of Resource Sciences, Department of Primary Industries and Energy</b>
<b>CDEP</b>	<b>Community Development Employment Program</b>
<b>CRA</b>	<b>Comprehensive Regional Assessment</b>
<b>EPA</b>	<b>Environment Protection Authority</b>
<b>ESFM</b>	<b>Ecological Sustainable Forest Management</b>
<b>FRAMES</b>	<b>Forest Resource And Evaluation System</b>
<b>LNE</b>	<b>Lower North East</b>
<b>MIG</b>	<b>Montreal Implementation Group</b>
<b>NFI</b>	<b>National Forest Inventory</b>
<b>NGGI</b>	<b>National Greenhouse Gasses Inventory</b>
<b>NPWS</b>	<b>NSW National Parks and Wildlife Service</b>
<b>RFA</b>	<b>Regional Forest Agreement</b>
<b>SFNSW</b>	<b>State Forests of New South Wales</b>
<b>UNE</b>	<b>Upper North East</b>