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Assessment of matters pertaining to renewal of Regional Forest Agreements

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David Willison

DPI Forestry

Sydney

www.dpi.nsw.gov.au

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Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences (Cth)
ABS	Australian Bureau of Statistics (Cth)
AFS	Australian Forestry Standard
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CAM	Common assessment method
CAPAD	Collaborative Australian Protected Area Database
CAR	Comprehensive, adequate and representative (reserve system)
CO_2	Carbon dioxide
CRA	Comprehensive regional assessment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cth	Commonwealth (of Australia)
C&D	Construction and Demolition
C&I	Commercial and Industrial
DAWR	Department of Agriculture and Water Resources (Cth)
DoEE	Department of the Environment and Energy (Cth)
DPI	Department of Primary Industries (NSW)
EMS	Environmental Management System
EPA	Environment Protection Authority (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPL	Environment Protection Licence
ERF	Emissions Reduction Fund
ESFM	Ecologically sustainable forest management
FA	Forest Agreement
Forestry Act	*Forestry Act 2012* (NSW)

FCNSW	Forestry Corporation of NSW
FM Act	*Fisheries Management Act 1994* (NSW)
FMP	Forest Management Plan
FMS	Forest Management System
FMZ	Forest management zoning (zones)
FRAMES	Forest Resource and Management Evaluation System
FTAs	Free Trade Agreements
FTE	Full-Time-Equivalent
GBMWHA	Greater Blue Mountains World Heritage Area
HQL	High-quality large sawlogs
HQS	High-qualiry small sawlogs
HWP	Harvested wood product(s)
IFOA	Integrated forestry operations approval
ILUA	Indigenous land use agreement
IPART	Independent Pricing and Regulatory Tribunal
IUCN	International Union for Conservation of Nature
JANIS	Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee
LALC	Local Aboriginal Land Councils
LGA	Local Government Area
LiDAR	Light Detection and Ranging
LLS Act	*Local Land Services Act 2013* (NSW)
LNE	Lower North East
MIG	Montréal Process Implementation Group for Australia
MOU	Memorandum of Understanding
m^3	Cubic Metres

NFI	National Forest Inventory
NFPS	National Forest Policy Statement (1992)
NPWS	National Parks and Wildlife Service (NSW)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NRC	Natural Resources Commission
NRS	National Reserve System
NV Act	*Native Vegetation Act 2003* (NSW)
OEH	Office of Environment and Heritage (NSW)
pa	Per Annum
PAS	Priority Action Statement
PMF	Park Management Framework
PMP	Park Management Program
PoM	Plans of Management
PNF	Private native forestry
PNF Code	Private Native Forestry Code of Practice (NSW)
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PPG	Poles, piles and girders
PR Act	*Plantations and Reafforestation Act 1999* (NSW)
PR Code	Plantations and Reafforestation (Code) Regulation 2001 (NSW)
RD&E	Research, Development and Extension
RFA	Regional Forest Agreement
RFA Act	*Regional Forest Agreements Act 2002* (Cth)
RIFA	Red Imported Fire Ant
RNE	Register of the National Estate
R&D	Research and Development
SEED	Sharing and Enabling Environmental Data

SLA	Service Level Agreement
SOC	State Owned Corporation
SOFR	Australia's State of the Forests Report
TAP	Threat abatement plan
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
UNE	Upper North East
UNESCO	United Nations Educational, Scientific and Cultural Organization
WH	World Heritage
WHA	World Heritage Area
WSA	Wood supply agreement

Introduction

Between 1999 and 2001, the State of New South Wales and the Commonwealth of Australia (i.e. 'the Parties') entered into three Regional Forest Agreements (RFAs) covering the coastal and tablelands regions of NSW.

The three NSW RFAs were among 10 that were signed between the Commonwealth and four states – NSW, Tasmania, Victoria and Western Australia – between 1997 and 2001.

The NSW RFAs were signed following Comprehensive Regional Assessments (CRAs) of the Eden, Upper North East, Lower North East, and Southern regions, which provided an information base from commissioned projects, to evaluate the economic, social, environmental and heritage uses and values of the forests in each RFA region.

Experts contributing to the CRAs came from such fields as archaeology, botany, forest ecology, geography, geomorphology, geology, hydrology and soil science, as well as economics, regional development and social planning. The CRAs were a result of detailed study, consultation and negotiation with a diverse range of stakeholders.

The CRAs were described in the 1996 scoping agreement for the NSW RFAs and covered:

a. Biodiversity
b. Old Growth
c. Wilderness
d. Endangered species
e. National Estate values
f. World Heritage values
g. Indigenous Heritage
h. Social values
i. Economic values and industry development opportunities in forested areas
j. Ecologically sustainable management

These matters were subsequently incorporated into paragraph (a) of the definition of 'Regional Forest Agreement' or 'RFA' in section 4 of the *Regional Forest Agreements Act 2002* (Cth) (RFA Act). The RFA Act gives effect to certain obligations of the Commonwealth under the RFAs and certain aspects of the *National Forest Policy Statement* (Cth) (NFPS).

The full definition of an RFA is as follows:

> RFA or Regional Forest Agreement means an agreement that is in force between the Commonwealth and a State in respect of a region or regions, being an agreement that satisfies all the following conditions:
>
> *a) the agreement was entered into having regard to assessments of the following matters that are relevant to the region or regions:*
>
> *i. environmental values, including old growth, wilderness, endangered species, national estate values and world heritage values*
> *ii. indigenous heritage values*
> *iii. economic values of forested areas and forest industries*
> *iv. social values (including community needs)*
> *v. principles of ecologically sustainable management.*

b) the agreement provides for a comprehensive, adequate and representative reserve system;

c) the agreement provides for the ecologically sustainable management and use of forested areas in the region or regions;

d) the agreement is expressed to be for the purpose of providing long-term stability of forests and forest industries;

e) the agreement is expressed to be a Regional Forest Agreement.

With the Eden RFA (which was the first of the three NSW RFAs) due to expire in August 2019, the Australian and NSW governments committed to renew the agreements for 20 years from their current expiry date. The parties are committed that the renewed RFAs will continue to provide for a comprehensive, adequate and representative reserve system, and for the ecologically sustainable management and use of forested areas in the region. The parties are also committed to ensuring that the renewed RFAs will be expressed to be for the purposes of providing long-term stability of forests and forest industries, and will be referred to as Regional Forest Agreements.

Assessments of those matters which are listed in para (a) of the definition of 'RFA' in the *Regional Forest Agreements Act 2002* were initially undertaken prior to entering into the RFAs through the CRA process that preceded the signing of the NSW RFAs from August 1999. Paragraph D of the Recitals in the Eden RFA specifically refers to the agreement being entered into having regard to "studies and projects carried out in relation to all of the following matters relevant to the region" and it lists exactly the matters referred to in para (a) of the definition of 'RFA' in the RFA Act.

The purpose of this report is to provide an update on the matters listed in para (a) of the definition of the RFA in order to support the decision by the parties to enter into the proposed renewal of the RFA. This assessment considers the likely applicability of the findings of the CRAs to the proposed term of the renewed RFAs, the current status of the values based on additional information derived from various sources published since the governments entered into the agreement, and the likely impact on those values of the proposed renewal of the NSW RFAs. This document summarises the above consideration by reference to each of the listed matters.

For the purposes of this report, 'ecologically sustainable management' in para (a) of the definition of 'RFA' in the RFA Act is taken to be synonymous with Ecologically Sustainable Forest Management as used in the NSW RFAs. In Australia, the internationally-agreed Montréal Process Criteria and Indicators for reporting on sustainable forest management are used. The Montréal Process Criteria and Indicators were agreed to be the framework for reporting on sustainability (refer to clause 52 of the current Eden RFA, as an example). The framework for Ecologically Sustainable Forest Management covers all of the matters listed in para (a) of the definition of 'RFA' in the RFA Act, and therefore provides the performance criteria for the assessment in this report.

All of the evaluation processes and reviews described in this report were commissioned through statutory or other governmental process. The outcomes and findings of all of the

processes have been considered through the formal, independent five-yearly reviews of the NSW RFAs undertaken jointly by the Australian and NSW governments.

The Australian and NSW governments have duly taken account of the outcomes of these reviews and assessment processes, by providing formal responses to each of the five-yearly reviews and by agreeing to implement further measures consistent with the adaptive management and continual improvement commitments in the NSW RFAs, and sustainable management principles.

This report shows that the Australian and NSW governments have, through a comprehensive and diverse range of processes, had ongoing regard to the listed matters in para (a) of the definition of 'RFA' in the RFA Act relevant to the region.

The report also provides an assessment of the state of the values using the latest available information from a variety of sources within the context of:

- continuing NSW Regional Forest Agreements, noting policy commitments of both governments
- the most recent joint government response to the latest independent five-yearly review of the NSW Regional Forest Agreements
- NSW Forest Management Framework.

Further detail on how NSW Forest Management Framework adapts to new information and decisions of government can be found in NSW Forest Management Framework document (2018) (Department of Primary Industries, 2018).

This document takes data from published sources and assimilates it to provide information, over time, about relevant NSW RFA matters.

It is not a replacement for other reviews that have been done relating to NSW RFAs or which have included Montréal Process indicators. Rather it draws on these sources to illuminate the state of the matters and indicators as they have changed over the life of the current NSW RFAs.

Background

RFAs are a means of balancing environmental, economic and social uses and values of key native forest regions across Australia. They are derived from the National Forest Policy Statement (NFPS) and are formalised in the RFA Act.

Forest operations undertaken in accordance with an RFA do not require additional approvals under Part 3 of the EPBC Act. The inclusion of RFA provisions within the EPBC Act recognises that in each RFA region a CRA was undertaken to address the environmental, economic and social objectives of the EPBC Act.

Rather than being an exemption from the EPBC Act requirements, the establishment of RFAs constitutes a form of assessment and approval.

The exemption from Part 3 of the EPBC Act recognises that RFAs have established comprehensive reserve networks, and that forestry operations must adhere to the principles of Ecologically Sustainable Forest Management (ESFM) including the application of forest

management strategies, usually through prescriptions, and adaptive management to protect matters of national environmental significance (MNES).

The management of MNES within RFA regions is consistent with the objectives of the EPBC Act, but there are different implementation mechanisms.

Additionally, RFAs do not exempt forestry operations from obligations in state-based legislation for the protection threatened species and communities.

The three NSW RFAs were originally established for a period of 20 years and are now approaching their expiry dates:

- The Eden RFA signed on the 26 August 1999 expires 2019
- The North East RFA signed on 31 March 2000 expires 2020
- The Southern RFA signed on 24 April 2001 expires 2021.

The NSW RFAs established an agreed framework for the ecologically sustainable forest management and use of forests in those regions. In particular, the NSW RFAs:

- identify areas required for the purposes of a CAR reserve system and provide for the conservation of those areas
- provide for the ecologically sustainable management and use of forested areas in those regions
- are for the purpose of providing long-term stability of forests and forest industries
- have regard to studies and projects carried out in relation to:
  - environmental values, including old growth, wilderness, endangered species, National Estate values and World Heritage values
  - Aboriginal heritage values
  - economic values of forested areas and forest industries
  - social values (including community needs)
  - the principles of ecologically sustainable forest management (ESFM).

The Australian and NSW governments have committed to:

- Renewing each of the NSW RFAs for a further term of 20 years
- establishing a 'rolling' life for each Regional Forest Agreement by including a provision to extend its term for a further five years based upon successful completion and implementation of each independent five-yearly review of the Regional Forest Agreement.

The Australian and NSW governments are therefore working to renew the NSW RFAs for a period of 20 years from their current expiry date.

In renewing the NSW RFAs, the Australian and NSW governments seek to maintain the objectives of the agreement. The governments are also seeking to negotiate a range of other minor improvements to the NSW RFAs to address some of the issues raised by various consultative reviews, consistent with continual improvement.

These improvements include:

- Streamlined and strengthened review and reporting arrangements

- Graduated dispute resolution
- Better handling of forest management complaints
- Improved communication and consultation between the Australian and NSW governments.

RFAs and RFA regions

RFA regions

Section 41 of the EBPC Act defines four NSW RFA regions:

(a) the area delineated as the Eden RFA region on the map of that New South Wales Region dated 13 May 1999 and published by the Bureau of Resource Sciences

(b) the area delineated as the Lower North East RFA region on the map of that New South Wales Region dated 13 May 1999 and published by the Bureau of Resource Sciences

(c) the area delineated as the Upper North East RFA region on the map of that New South Wales Region dated 13 May 1999 and published by the Bureau of Resource Sciences

(d) the area delineated as the South Region on the map of the South CRA Region dated August 1997 and published by the State forest GIS Branch of the organisation known as State Forests of New South Wales

RFAs

There are three NSW RFAs:

- Eden RFA
- Southern RFA
- North Eastern RFA.

For historic reasons, the North Eastern RFA covers two RFA regions. These are the Upper North Eastern (UNE) and Lower North Eastern (LNE) RFA regions.

Conversely, the Eden RFA directly covers the Eden RFA region, and the Southern RFA covers the Southern RFA region.

Method

Underpinning the NFPS, the RFA Act, and the RFAs themselves are the principles of ecologically sustainable forest management (ESFM). These principles can be directly mapped to the criteria established in the Montréal Process. The Montréal Process indicators relating to these principles are used in a range of RFA and other reporting, and are used in this document as measures to demonstrate the accumulated changes over time to relevant NSW RFA matters.

The relationship between the Montréal Process indicators, RFAs, CRAs and this assessment of Matters is shown in **Figure 0.1**.

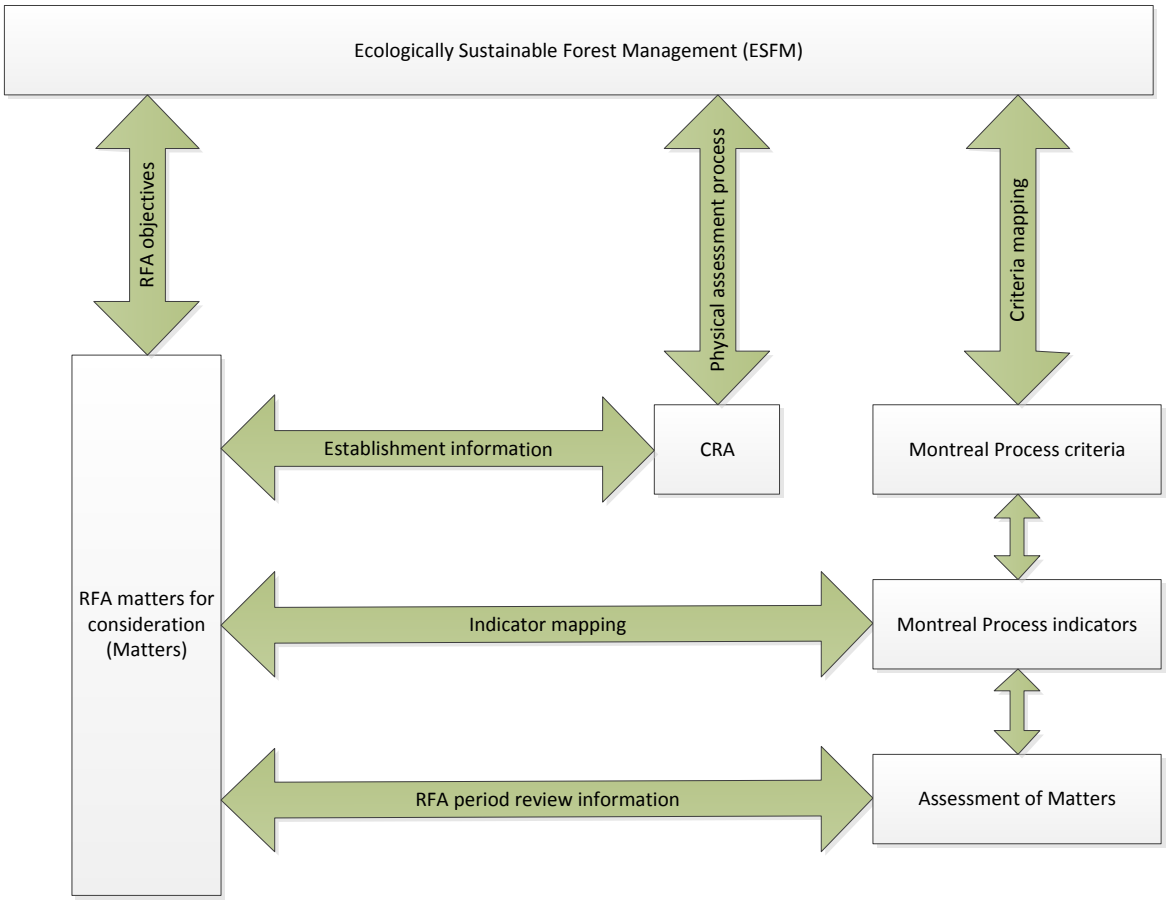

Figure 0.1 RFA baseline and tracking measures

This Assessment of Matters uses published data from various sources which also report using Montréal Process Indicators, such as NSW RFA annual reports and reviews, NSW Forest Agreement annual reports and national State of the Forests reporting. This provides consistency over time to compare the relative measures.

Mapping of the Montréal Process criteria against the principles of ESFM is shown in

Table 0.1.

Table 0.1 Comparison of Montréal Process Criteria with the principles of Ecologically Sustainable Forest Management used in NSW RFAs

Montréal Process Criteria for Sustainable Forest Management	Principles of Ecologically Sustainable Forest Management
Criterion 1. Conservation of biological diversity	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate Principle 4: Apply precautionary principles for prevention of environmental degradation
Criterion 2. Maintenance of productive capacity of forest ecosystems	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate Principle 5: Apply best available knowledge and adaptive management processes
Criterion 3. Maintenance of ecosystem health and vitality	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate
Criterion 4. Conservation and maintenance of soil and water resources	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate
Criterion 5. Maintenance of forest contribution to global carbon cycles	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate Principle 5: Apply best available knowledge and adaptive management processes
Criterion 6. Maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs	Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native

Montréal Process Criteria for Sustainable Forest Management	Principles of Ecologically Sustainable Forest Management
of societies	forest estate Principle 2: Ensure public participation, access to information, accountability and transparency in the delivery of ESFM.
Criterion 7. Legal, institutional and economic framework for forest conservation and sustainable management	Principle 2: Ensure public participation, access to information, accountability and transparency in the delivery of ESFM. Principle 3: Ensure legislation, policies, institutional framework, codes, standards and practices related to forest management require and provide incentives for ecologically sustainable management of the native forest estate. Principle 5: Apply best available knowledge and adaptive management processes

Table 0.2shows the relationship between individual indicators under the Montréal Process criteria, and RFA matters for consideration in the RFA Act.

Where possible, and appropriate, this document provides indicator information at discrete points over the life of current NSW RFAs at an RFA regional level.

Some data is not available, or is not meaningful at the regional level (for example national export policy settings). In these cases information may be presented on a state or national basis.

Where information has not been reported over time, or has not been reported on a consistent basis, notes to this effect are included under the individual indicators.

Table 0.2 Relationship between listed Matters in the RFA Act and Montréal Process indicators

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
1.1 Ecosystem diversity					
1.1a Area of forest by forest type and tenure					
1.1b Area of forest by growth stage					
1.1c Area of forest in protected area categories					
1.1d Fragmentation of forest cover					
1.2 Species diversity					
1.2a Forest-dwelling species for which ecological information is available					
1.2b The status of forest-dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment					
1.2c Representative species from a range of habitats monitored at scales relevant to regional forest					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
management					
1.3 Genetic diversity					
1.3a Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species					
1.3b Native forest and plantations of indigenous species which have genetic resource conservation mechanisms in place					
2 Maintenance of productive capacity of forest ecosystems					
2.1a Native forest available for wood production, area harvested and growing stock of merchantable and non-merchantable tree species					
2.1b Age class and growing stock of plantations					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
2.1c Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations					
2.1d Annual removal of non-wood products compared to the level determined to be sustainable					
2.1e The area of native forest harvested and the proportion of that effectively regenerated and the area of plantation clear-fell harvested and the proportion of that effectively					
3 Maintenance of ecosystem health and vitality					
3.1a Scale and impact of agents and processes affecting forest health and vitality					
3.1b Area of forest burnt by planned and unplanned fire					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
4 Conservation and maintenance of soil and water resources					
4.1a Area of forest land managed primarily for protective function					
4.1b Management of the risks of soil erosion and the risks to soil physical properties, water quantity and water quality in forests					
5 Maintenance of forests' contribution to global carbon cycles					
5.1a Total forest ecosystem biomass and carbon pool					
6.1 Production and consumption					
6.1a Value and volume of wood and wood products					
6.1b Values, quantities and use of non-wood forest products					
6.1c Value of forest based services					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
6.1d Production and consumption and import/export of wood, wood products and non-wood products					
6.1e Degree of recycling of forest products					
6.2 Investment in the forest sector					
6.2a Investment and expenditure in forest management					
6.2b Investment in extension and use of new and improved technologies					
6.3 Recreation and tourism					
6.3a Area of forest available for general recreation/tourism					
6.3b Range and use of recreational/tourism activities available					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
6.4 Cultural, social and spiritual needs and values					
6.4a Area of forest to which Indigenous people have use rights that protect their special values and are recognized through formal and informal management regimes					
6.4b Registered places of non-indigenous cultural values in forests that are formally managed to protect those values					
6.4c The extent to which indigenous values are protected, maintained and enhanced through indigenous participation in forest management					
6.4d The importance of forests to people					
6.5 Employment and community needs					
6.5a Direct and indirect employment in the forest sector					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
6.5b Wage rates and injury rates within the forest sector					
6.5c Resilience of forest dependent communities to changing social and economic conditions					
6.5d Resilience of forest dependent indigenous communities to changing social and economic conditions					
7 Legal, institutional and economic framework for forest conservation and sustainable management					
7.1a Extent to which the legal and policy framework supports the conservation and sustainable management of forests					
7.1b Extent to which the institutional framework supports the conservation and sustainable management of forests					
7.1c Extent to which the economic framework supports the conservation and sustainable management of forests					

Montréal Process Indicator	Relevant matter in para (a) of the definition of 'RFA' in the RFA Act (best match(es) shown as shaded boxes)				
	4(a)i environmental values, (including old growth, wilderness, endangered species, national estate values and world heritage values)	**4(a)ii** indigenous heritage values	**4(a)iii** economic values of forested areas and forest industries	**4(a)iv** social values (including community needs)	**4(a)v** principles of ecologically sustainable management
7.1d Capacity to measure and monitor changes in the conservation and sustainable management of forests					
7.1e Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services					

Linkages to other Processes

A number of processes have produced complementary information aimed at reporting on sustainable management of forest ecosystems. These include the reporting against Montréal Process Criteria and Indicators such as Australia's State of the Forests reporting, and Australian and New South Wales State of the Environment reporting, and NSW reports such as the former Department of Environment and Climate Change's State of the Parks Report and the former Forest NSW's Social, Environmental and Economic Report

In a separate process New South Wales also reports on NSW Forest Agreements and Integrated Forestry Operations Approvals as required by the *Forestry and National Park Estate Act 1998* (NSW). The review of Forest Agreement/Integrated Forestry Operations Approvals includes consideration of the ESFM criteria and indicators specified in each NSW Forest Agreement, being identical to the sustainability indicators referred to in the NSW RFAs.

In addition, the Commonwealth Government, as a signatory to the Montréal Process, also reports under Montréal Process obligations.

MontréalProcess Implementation Group for Australia (MIG) indicators

Under the RFAs, reporting against criteria and indicators is carried out in accordance with *A Framework of Regional (Sub-national) Level Criteria and Indicators of Sustainable Forest Management in Australia*[1], developed by the Montréal Process Implementation Group for Australia (MIG). The 1998 indicators current at the signing of the NSW RFAs were updated in 2007 in *Australia's Sustainable Forest Management Framework of Criteria & Indicators 2007 – Policy Guideline*. This provided the seven criteria and 44 indicators currently in use. Mapping of these to the international criteria is shown in Appendix 1.

[1] Department of Primary Industries and Energy 1998

1.Environmental Values

The purpose of this Section is to report on the environmental values that are specifically listed in para (a)(i) of the definition of 'RFA' in the *Regional Forest Agreement Act 2002* (Cth): old growth, wilderness, endangered species, national estate values and world heritage values. Biodiversity values and wetland values have also been included under the 'environmental values' heading.

This section includes the following Montréal Process indicators:

- Indicator 1.1b – Area of forest by growth stage
- Indicator 1.2b – Status of forest dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment
- Indicator 6.4b – Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values
- Indicator 1.1a – Area of forest by forest type and tenure
- Indicator 1.1c – Area of forest in protected area categories
- Indicator 1.2a – Forest dwelling species for which ecological information is available
- Indicator 1.2c – Representative species from a range of habitats monitored at scales relevant to regional forest management
- Indicator 1.3a – Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species
- Indicator 4.1a – Area of forest land managed primarily for protective functions
- Indicator 4.1b – Management of the risk of soil erosion in forests.

Information is drawn from the original documentation produced as part of the CRA process, subsequent reports (including State of the Forest Reports, State of the Environment reports, statutory independent five-yearly reviews of NSW RFAs required under the RFAs and other relevant data).

Old Growth Values

Old growth forest is defined in the *National Forest Policy Statement*(NFPS) as ecologically mature forest where the effects of disturbances are now negligible[2] (Commonwealth of Australia 1992). The long-term protection of old growth forest is important because of its aesthetic, cultural and nature conservation values and the absence of disturbance.

Indicator 1.1b – Area of forest by growth stage

This indicator measures the change in area of forest by growth stage to reflect how ecological processes and species associated with those processes change as forests grow. The age and size of trees is important in maintaining forest biodiversity.

[2] The full NFPS definition is *forest that is ecologically mature and has been subjected to negligible unnatural disturbance such as logging, roading and clearing. The definition focuses on forest in which the upper stratum or overstorey is in the late mature to overmature growth phases.*

Data tables associated with the NSW RFAs report a total of 2.54 million hectares of old growth forest across the four NSW RFA regions[3]. The spatial data available from the associated CRA process identified a total of 2.47 million hectares of old-growth forest. The difference, 70 thousand hectares, all in the Lower North East RFA region, cannot be identified spatially.

Along with other environmental values, old growth forests were one of the criteria for designing the CAR reserve system under the NSW RFAs. Of the 2.54 million hectares of old growth forest identified as part of the CRA process in the four NSW RFA regions, a total of 1.1 million hectares (45 per cent) was protected under formal reservation (the NSW National Parks and Wildlife Service (NPWS) estate) before the NSW RFAs were signed. By mid-2001, after all three NSW RFAs came into effect, a total of 1.9 million hectares (78 per cent) of the old-growth forest identified in the CRA spatial datasets was protected under the CAR reserve system (which includes Formal Reserves, Informal Reserves, and Regional Prescriptions for forest management on public land). By mid-2016 a total of 2.0 million hectares (80 per cent) of old-growth forest identified in the CRA spatial datasets was protected under the CAR Reserve system.[4].

All old growth forests are excluded from forestry operations in NSW RFA regions through prescriptions in the Integrated Forestry Operations Approvals (IFOAs).

Table 1.1 below summarises the extent of old-growth forest in the NSW RFA regions. Four additional tables (**Table 1.2**-**Table 1.5**) show the extent of old-growth forest in each RFA region, by Forest Ecosystem, and the extent in protected areas at various time points before and after the respective RFAs were signed, including the most recent area as at 30 June 2016.

It should be noted that the old-growth forest area identified during the CRA process between 1995-2000 has not been updated since, and therefore does not take into account any old-growth forest that has subsequently been subjected to disturbance such as fire, or any additional areas of old-growth forest subsequently identified. Changes in the area figures are due solely to changes of old-growth forest area in protected areas.

[3] Public land only. The North East NSW RFA covers the Upper North East and Lower North East RFA regions. Hence there are four RFA regions and three RFAs in NSW.
[4] Data provided by ABARES

Table 1.1 Old-growth forest in NSW RFA regions identified in the CRA spatial datasets, by RFA region, and the changes in area in the CAR reserve system over time

RFA region	Area ('000 hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
Upper North East								
Total old-growth forest	654	127	442	446	447	**447**	207	68
As proportion of total old-growth forest in RFA region (%)	100	19	68	68	68	**68**	32	
Lower North East[4]								
Total old-growth forest	959	533	863	867	869	**869**	91	91
As proportion of total old-growth forest in RFA region (%)	100	52	90	90	91	**91**	9	
Southern NSW								
Total old-growth forest	754	407	545	556	561	**574**	180	76
As proportion of total old-growth forest in RFA region (%)	100	54	73	74	74	**76**	24	
Eden								
Total old-growth forest	103	47	75	75	75	**76**	27	74
As proportion of total old-growth forest in RFA region (%)	100	46	73	73	73	**74**	26	
All RFA regions								
Total old-growth forest	**2,470**	**1,114**	**1,925**	**1,944**	**1,953**	**1,965**	504	80
As proportion of total old-growth forest in all RFA regions (%)	100	44	78	79	79	**80**	20	

Note: Totals may not tally due to rounding. [1] Area derived by ABARES from spatial data associated with old-growth CRA reports published in 1998-2000. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate plus Flora Reserves established under the Forestry Act (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (1999-2001), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the public land component of CAR reserve system.

[4] Area and proportion values for the Lower North East RFA region derived from spatial data do not include 70 thousand hectares of old-growth forest reported in the RFA data tables that cannot be identified spatially.

Table 1.2 Old-growth forest in the Upper North East RFA region identified in the CRA spatial dataset, by Forest Ecosystem, and the changes in areas in the CAR reserve system over time

	Area (hectares)							
		Old-growth forest in protected areas, by time period						
Old-growth Forest Ecosystem	**Total old-growth forest[1]**	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**	**Old-growth forest not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
OG 2 Alpine Gum	251	35	190	189	189	**194**	57	77
OG 3 Baileys Stringybark	21,733	9,193	14,388	14,761	14,919	**14,918**	6,815	69
OG 10 Black Sallee	4	4	4	4	4	**4**	0	100
OG 12 Blue Mountain Ash	106	0	105	105	105	**105**	1	99
OG 14 Brown Barrell	28	15	18	18	18	**18**	10	64
OG 15 Brown Barrell-Gum	141	56	91	91	91	**91**	50	65
OG 17 Candlebark	497	0	135	135	135	**135**	362	27
OG 19 Central Mid Elevation Sydney Blue Gum	1,131	11	880	882	882	**884**	247	78
OG 20 Clarence Lowland Needlebark Stringybark	5,847	1,429	4,832	4,838	4,840	**4,841**	1,006	83
OG 21 Lowlands Grey Box	2,642	27	129	171	315	**314**	2,328	12
OG 23 Coast Range Bloodwood-Mahogany	1,951	337	1,446	1,456	1,456	**1,456**	495	75
OG 24 Clarence Lowlands Spotted Gum	32,921	1,921	14,097	14,260	14,463	**14,444**	18,477	44
OG 25 Coast Range Spotted Gum-Blackbutt	107	8	50	50	50	**50**	57	47
OG 26 Coastal Flooded Gum	2,108	678	1,986	1,987	1,987	**1,986**	122	94
OG 27 Coastal Sands Blackbutt	2,240	2,155	2,186	2,186	2,186	**2,186**	54	98
OG 29 Corkwood-Crabapple and Mixed Stringybarks	2,891	21	2,677	2,679	2,679	**2,676**	215	93
OG 30 Diehard Stringybark-New England Blackbutt	151	45	94	94	94	**94**	57	62
OG 31 Dorrigo White Gum	2,802	277	2,216	2,216	2,216	**2,216**	586	79
OG 32 Dry Foothills Blackbutt-Turpentine	1,043	99	815	816	816	**817**	226	78
OG 33 Dry Foothills Spotted Gum	39,933	2,644	26,621	27,234	27,236	**27,166**	12,767	68
OG 34 Dry Grassy Blackbutt-Tallowwood	1,148	142	840	847	847	**843**	305	73

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	At 30 June 2016[3]		
OG 35 Dry Grassy Stringybark	40,942	8,219	30,491	30,591	30,591	**30,635**	10,307	75
OG 36 Dry Grassy Tallowwood-Grey Gum	572	2	386	387	387	**387**	185	68
OG 37 Dry Heathy Blackbutt-Bloodwood	14,649	222	8,469	8,745	8,758	**8,757**	5,892	60
OG 38 Dry Heathy New England Blackbutt	2,760	923	2,609	2,608	2,608	**2,614**	146	95
OG 39 Dry Heathy New England Stringybarks	1,099	1,080	1,099	1,099	1,099	**1,099**	0	100
OG 40 Dry Heathy Sandstone Blackbutt	7,877	2,982	5,066	5,297	5,298	**5,298**	2,579	67
OG 41 Dry Open New England Blackbutt	52,032	9,800	37,582	37,616	37,616	**37,808**	14,224	73
OG 42 Dry Redgum-Bloodwood-Apple	221	1	221	221	221	**221**	0	100
OG 43 Dry Silvertop Stringybark-Apple	9,893	4,182	7,999	7,999	7,999	**7,999**	1,894	81
OG 44 Dry open Redgum-Broad Leaved Apple	8,373	4,523	6,949	6,969	6,969	**6,967**	1,406	83
OG 45 Dunns White Gum	108	18	95	94	94	**95**	13	88
OG 46 Eastern Red Gums	1,436	405	1,349	1,348	1,348	**1,350**	86	94
OG 47 Escarpment Redgum	6,571	617	3,981	4,017	4,031	**4,027**	2,544	61
OG 48 Escarpment Scribbly Gum-Apple	3,205	80	2,670	2,690	2,690	**2,667**	538	83
OG 50 Wet Bangalow-Brushbox	3,452	1,599	2,972	2,977	2,980	**2,981**	471	86
OG 52 Foothill Grey Gum-Ironbark-Spotted Gum	12,588	3,335	7,540	7,590	7,594	**7,600**	4,988	60
OG 53 Gorge Grey Box	8,325	4,515	6,940	6,986	6,988	**6,987**	1,338	84
OG 54 Grey Box-Red Gum-Grey Ironbark	4,836	996	1,634	1,711	1,752	**1,752**	3,084	36
OG 55 Foothills Grey Gum-Spotted Gum	1,495	85	971	979	979	**975**	520	65
OG 56 Granite Mallee	1,417	1,266	1,369	1,388	1,388	**1,407**	10	99
OG 57 Highland Granite Stringybarks	1,795	1,227	1,783	1,783	1,783	**1,783**	12	99
OG 58 Gorge Grey Gum	4,198	2,454	3,346	3,350	3,353	**3,354**	844	80
OG 59 Gorge Ironbark-Grey Gum	27,179	5,466	19,100	19,257	19,259	**19,259**	7,920	71

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
OG 60 Grassy New England Blackbutt-Tallowwood-Blue Gum	19,173	2,262	16,190	16,252	16,252	**16,232**	2,941	85
OG 61 Grey Box-Ironbark	42	21	23	23	23	**23**	19	55
OG 62 Grey Box-Northern Grey Gum	13	1	12	12	12	**12**	1	92
OG 63 Grey Gum-Stringybark	9,212	3,541	7,091	7,152	7,152	**7,146**	2,066	78
OG 65 Heathy Scribbly Gum	3,179	1,891	2,749	2,752	2,752	**2,752**	427	87
OG 67 High Elevation Ferny Blackbutt	1,990	47	1,732	1,734	1,734	**1,732**	258	87
OG 68 High Elevation Messmate-Brown Barrell	105	87	87	87	87	**87**	18	83
OG 69 High Elevation Moist Open Tallowwood-Blue Gum	1,513	107	1,329	1,325	1,325	**1,325**	188	88
OG 70 High Elevation Open Spotted Gum	15,622	820	9,212	9,860	9,877	**9,880**	5,742	63
OG 71 Ironbark	472	52	181	182	182	**181**	291	38
OG 72 Low Relief Coastal Blackbutt	37	2	31	31	31	**31**	6	84
OG 73 Lowland Red Gum	8,679	1,271	4,221	4,287	4,326	**4,317**	4,362	50
OG 74 Lowlands Scribbly Gum	1,396	836	1,326	1,326	1,326	**1,327**	69	95
OG 75 Lowlands Spotted Gum-Box	1,288	3	464	470	485	**485**	803	38
OG 76 Coastal Mallee	261	234	247	247	247	**247**	14	95
OG 78 Mann River Wet New England Blackbutt	4,280	2,305	4,115	4,115	4,115	**4,115**	165	96
OG 79 Manna Gum-Stringybark	63	40	55	55	55	**62**	1	98
OG 80 Manna Gum	164	3	123	123	123	**123**	41	75
OG 81 Messmate	1,770	379	1,044	1,045	1,045	**1,053**	717	59
OG 83 Mid Elevation Wet Blackbutt	218	0	207	206	206	**208**	10	95
OG 84 Mid North Coast Wet Brushbox-Tallowwood-Blue Gum	3,152	24	2,930	2,939	2,939	**2,929**	223	93
OG 85 Mixed Moist Hardwood	62	0	50	51	51	**50**	12	81
OG 86 Mixed New England Stringybarks	1,094	8	840	841	841	**839**	255	77

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
OG 87 Mixed Tableland Stringybark-Gum Open Forest	1,005	17	424	423	423	**424**	581	42
OG 88 Moist Escarpment New England Blackbutt	7,451	4,617	7,277	7,275	7,275	**7,276**	175	98
OG 89 Moist Foothills Spotted Gum	14,111	816	10,684	10,775	10,775	**10,788**	3,323	76
OG 90 Moist Messmate-Gum	10,614	484	9,866	9,881	9,881	**9,889**	725	93
OG 91 Moist Open Escarpment White Mahogany	807	52	712	713	713	**714**	93	88
OG 92 Moist Shrubby Stringybark-Gum	1,313	8	1,221	1,222	1,222	**1,221**	92	93
OG 93 Montane Stringybark-Gum	7,165	780	2,931	2,925	2,925	**3,107**	4,058	43
OG 95 Northern Moist Blackbutt	1,585	435	1,440	1,450	1,450	**1,450**	135	91
OG 97 Needlebark Stringybark-Large Fruited Blackbutt	5,360	348	3,977	3,994	3,994	**3,992**	1,368	74
OG 98 New England Peppermint	1,459	18	1,398	1,396	1,396	**1,395**	64	96
OG 99 New England Stringybark-Blakelys Red Gum	6,653	2,460	4,731	4,731	4,733	**4,733**	1,920	71
OG 100 Northern Grassy Sydney Blue Gum	3,262	917	2,762	2,770	2,771	**2,767**	495	85
OG 101 Northern Open Grassy Blackbutt	4,816	1,479	2,938	2,963	2,963	**2,958**	1,858	61
OG 102 Northern Ranges Dry Tallowwood	11,285	1,361	5,448	5,529	5,601	**5,596**	5,689	50
OG 103 Northern Wet Brushbox	4,739	924	3,750	3,764	3,771	**3,768**	971	80
OG 104 Northern Wet Tallowwood-Blue Gum	9,762	3,756	8,258	8,268	8,270	**8,274**	1,488	85
OG 105 Nymboida Tallowwood-Turpentine	1,284	0	1,259	1,263	1,263	**1,263**	21	98
OG 106 Open Coastal Brushbox	1,860	344	1,454	1,458	1,458	**1,465**	395	79
OG 109 Open Shrubby Brushbox-Tallowwood	7,011	1,544	4,817	4,893	4,896	**4,894**	2,117	70
OG 110 Open Silvertop Stringybark-Blue Gum	1,881	282	1,663	1,664	1,664	**1,674**	207	89
OG 111 Open Silvertop Stringybark-Tallowwood	2,144	2	1,794	1,801	1,801	**1,786**	358	83
OG 113 Peppermint	2,641	1,591	1,977	1,974	1,974	**1,988**	653	75
OG 114 Peppermint-Mountain/Manna Gum	3,069	726	1,025	1,026	1,026	**1,099**	1,970	36

Old-growth Forest Ecosystem	Area (hectares)							
		Old-growth forest in protected areas, by time period						
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**	**Old-growth forest not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
OG 115 Red Bloodwood	15	11	14	14	14	**14**	1	93
OG 116 Red Gum-Stringybark	2,610	211	402	411	414	**413**	2,197	16
OG 117 Red Mahogany	649	593	633	635	635	**634**	15	98
OG 118 Richmond Range Spotted Gum	2,011	3	499	507	536	**536**	1,475	27
OG 119 Richmond Range Spotted Gum-Box	3,694	22	1,308	1,323	1,336	**1,344**	2,350	36
OG 122 Rough-barked Apples	900	181	860	863	863	**863**	37	96
OG 123 Roundleaved Gum	6,897	1,280	5,340	5,348	5,348	**5,413**	1,484	78
OG 124 Roundleaved Gum-Turpentine	7	0	6	6	6	**6**	1	86
OG 126 Sandstone Spotted Gum-Blackbutt	1,378	87	724	728	732	**733**	645	53
OG 127 Sherwood Needlebark Stringybark	3,736	556	1,099	1,103	1,108	**1,100**	2,636	29
OG 128 Silverleaved Ironbark	978	1	55	53	53	**55**	923	6
OG 129 Smoothbarked Apple	203	191	201	201	201	**201**	2	99
OG 131 Snow Gum	121	110	119	119	119	**120**	1	99
OG 132 Snow Gum -Mountain/Manna Gum	1,827	288	1,164	1,170	1,170	**1,184**	643	65
OG 135 South Coast Tallowwood-Blue Gum	1,282	23	1,161	1,162	1,162	**1,162**	120	91
OG 138 Steel Box/Craven Grey Box	16	0	5	5	6	**6**	10	38
OG 139 Stringybark-Apple	12,648	1,407	5,365	5,466	5,558	**5,553**	7,095	44
OG 140 Stringybark-Mallee	1,842	1,731	1,836	1,836	1,836	**1,836**	6	100
OG 142 Swamp Mahogany	100	84	85	85	85	**85**	15	85
OG 145 Sydney Peppermint-Stringybark	120	18	34	34	34	**34**	86	28
OG 146 Tallowwood	5,277	2,766	4,568	4,589	4,589	**4,589**	688	87
OG 147 Turpentine	338	76	255	274	275	**275**	63	81
OG 148 Very Wet New England Blackbutt-Tallowwood	1,240	1,034	1,210	1,216	1,216	**1,216**	24	98

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
OG 149 Mallee-Peppermint mosaic	700	34	351	351	351	**363**	337	52
OG 150 Washpool Brushbox-Tallowwood	5,047	3,335	4,898	4,899	4,899	**4,898**	149	97
OG 152 Wet Bloodwood-Tallowwood	4,400	720	2,941	2,967	2,985	**2,983**	1,417	68
OG 153 Wet Coastal Tallowwood-Brushbox	187	13	119	119	119	**119**	68	64
OG 154 Wet Flooded Gum-Tallowwood	675	82	479	486	488	**487**	188	72
OG 155 Wet Foothills Blackbutt-Turpentine	1,196	8	1,083	1,088	1,088	**1,085**	111	91
OG 157 Wet Shrubby Brushbox-Tallowwood	2,333	112	2,060	2,060	2,060	**2,061**	272	88
OG 158 Wet Spotted Gum-Tallowwood	800	609	784	788	788	**784**	16	98
OG 162 Whitetopped Box	4	0	4	4	4	**4**	0	100
OG 163 Yellow Box-Blakely's Red Gum	722	56	370	371	371	**375**	347	52
OG 174 Orange Gum-Tumbledown Gum-Apple	1,659	0	177	178	179	**179**	1,480	11
OG 175 Orange Gum-New England Blackbutt-Tumbledown Gum	1,623	234	861	867	868	**870**	753	54
OG 176 Orange Gum-Ironbark	2,303	232	512	520	520	**527**	1,776	23
OG 177 Outcrop Orange Gum-New England Blackbutt	1,696	4	921	921	921	**931**	765	55
OG 178 Outcrop Black Cypress-Tumbledown Gum	110	0	4	5	5	**4**	106	4
OG 179 Yellow Box-Broad-leaved Stringybark	867	0	727	730	730	**727**	140	84
OG 180 Western New England Blackbutt	7,856	0	3,251	3,254	3,254	**3,251**	4,605	41
OG 181 Stringybark-Gum	24,411	0	18,150	18,150	18,150	**18,150**	6,261	74
OG 182 Apple-Black Cypress	703	0	211	211	211	**211**	492	30
OG 183 Red Gum-Apple	18	0	1	1	1	**1**	17	6
OG 184 Tumbledown Gum-Ironbark	8,089	0	3,955	3,955	3,955	**3,955**	4,134	49
OG 185 Orange Gum-Black Cypress	2,417	0	1,337	1,338	1,338	**1,337**	1,080	55
OG 186 Open Tumbledown Gum-Black Cypress-Orange Gum	938	146	455	455	455	**464**	474	49

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 189 Silverleaved Ironbark-Cypress	6,734	53	114	114	114	**114**	6,620	2
OG 190 Yellow Box-Grey Box-Red Gum	1,661	207	332	335	335	**336**	1,325	20
OG 194 Round-leaved Gum wet heath	3,008	0	2,258	2,260	2,260	**2,259**	749	75
OG 195 Apple-Manna Gum woodland	1,584	206	948	948	949	**951**	633	60
OG 196 Broad-leaved Stringybark-Apple Box	4,319	278	3,119	3,135	3,135	**3,139**	1,180	73
OG 197 Broad-leaved Stringybark	153	19	72	72	72	**76**	77	50
OG 198 Silvertop Stringybark	41	0	14	14	14	**14**	27	34
OG 200 Broad-leaved Stringybark-Ribbon Gum	87	0	4	4	4	**4**	83	5
Total old-growth forest	**653,990**	**127,010**	**441,941**	**445,742**	**446,663**	**447,168**	**206,822**	**68**
As proportion of total old growth forest (%)	100	19	68	68	68	**68**	32	

[1] Area derived by ABARES from spatial data associated with North East region old-growth CRA report 1999. Figures for individual Forest Ecosystems are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the North East RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval for the Upper North East Region. Together these components constitute the CAR reserve system on public land.

Note: Totals may not tally due to rounding

Table 1.3 Old-growth forest in the Lower North East RFA region identified in the CRA spatial dataset, by Forest Ecosystem, and the changes in areas in the CAR reserve system over time

Old-growth Forest Ecosystem	Area (hectares)							
		Old-growth forest in protected areas, by time period						
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**	**Old-growth forest not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
OG 2 Alpine Gum	783	109	572	621	621	**621**	162	79
OG 3 Baileys Stringybark	62	88	20	20	62	**62**	0	100
OG 6 Barrington Dry Shrubby New England Blackbutt-Blue Gum	601	144	568	570	570	**570**	31	95
OG 7 Barrington Moist Blue Gum-White Mahogany	1,719	308	1,308	1,396	1,399	**1,404**	315	82
OG 8 Barrington Wet New England Blackbutt-Blue Gum	5,206	1,355	4,448	4,479	4,479	**4,494**	712	86
OG 10 Black Sallee	1	1	1	1	1	**1**	0	100
OG 11 Blackbutt-Sydney Peppermint-Smoothbarked Apple	360	206	336	336	336	**336**	24	93
OG 12 Blue Mountain Ash	1	NR	1	1	1	**1**	0	100
OG 13 Blue-leaved Stringybark	15	0	15	15	15	**15**	0	100
OG 14 Brown Barrell	239	27	206	206	206	**206**	33	86
OG 15 Brown Barrell-Gum	1,716	480	1,267	1,417	1,417	**1,422**	294	83
OG 17 Candlebark	1	0	1	1	1	**1**	0	100
OG 19 Central Mid Elevation Sydney Blue Gum	5,300	456	4,442	4,494	4,494	**4,491**	809	85
OG 20 Clarence Lowland Needlebark Stringybark	11	15	3	3	11	**11**	0	100
OG 21 Lowlands Grey Box	829	404	586	607	607	**607**	222	73
OG 23 Coast Range Bloodwood-Mahogany	439	0	428	428	428	**428**	11	97
OG 25 Coast Range Spotted Gum-Blackbutt	NR	0	NR	NR	NR	**NR**	NR	NR
OG 26 Coastal Flooded Gum	267	26	188	189	189	**187**	80	70
OG 27 Coastal Sands Blackbutt	4,966	5,609	4,575	4,575	4,899	**4,899**	67	99
OG 28 Cool Moist Messmate	1,454	192	1,107	1,110	1,110	**1,109**	345	76
OG 29 Corkwood-Crabapple and Mixed Stringybarks	1,367	87	1,206	1,208	1,208	**1,199**	168	88

Old-growth Forest Ecosystem	Area (hectares)							
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 30 Diehard Stringybark-New England Blackbutt	21,799	7,771	19,960	20,111	20,111	**20,106**	1,693	92
OG 31 Dorrigo White Gum	146	21	89	89	89	**89**	57	61
OG 32 Dry Foothills Blackbutt-Turpentine	3,763	568	2,616	2,632	2,632	**2,622**	1,141	70
OG 33 Dry Foothills Spotted Gum	1,651	811	1,061	1,025	1,025	**1,017**	634	62
OG 34 Dry Grassy Blackbutt-Tallowwood	4,036	1,004	2,328	2,378	2,378	**2,374**	1,662	59
OG 35 Dry Grassy Stringybark	37,472	12,253	27,586	27,864	27,864	**27,836**	9,636	74
OG 36 Dry Grassy Tallowwood-Grey Gum	32,666	2,532	22,417	22,633	22,664	**22,595**	10,071	69
OG 37 Dry Heathy Blackbutt-Bloodwood	713	699	607	606	671	**672**	41	94
OG 38 Dry Heathy New England Blackbutt	324	72	303	304	304	**303**	21	94
OG 39 Dry Heathy New England Stringybarks	NR	0	NR	NR	NR	**NR**	NR	NR
OG 41 Dry Open New England Blackbutt	9,238	2,259	6,814	6,833	6,833	**6,829**	2,409	74
OG 42 Dry Redgum-Bloodwood-Apple	24,064	8,531	16,874	17,233	17,233	**17,208**	6,856	72
OG 43 Dry Silvertop Stringybark-Apple	8,981	3,803	6,403	6,451	6,451	**6,451**	2,530	72
OG 44 Dry open Redgum-Broad Leaved Apple	2,091	854	1,331	1,361	1,361	**1,361**	730	65
OG 46 Eastern Red Gums	1	1	1	1	1	**1**	0	100
OG 47 Escarpment Redgum	1,894	358	1,494	1,525	1,533	**1,527**	367	81
OG 48 Escarpment Scribbly Gum-Apple	2,941	1,486	2,329	2,347	2,349	**2,349**	592	80
OG 49 Escarpment Tallowwood-Bloodwood	17,423	3,794	14,292	14,476	14,476	**14,452**	2,971	83
OG 50 Wet Bangalow-Brushbox	1,138	439	1,033	1,037	1,037	**1,036**	102	91
OG 51 Eurabbie	157	9	141	152	152	**152**	5	97
OG 53 Gorge Grey Box	4,851	2,333	3,462	3,534	3,534	**3,532**	1,319	73
OG 54 Grey Box-Red Gum-Grey Ironbark	7,553	6,550	7,020	7,056	7,056	**7,055**	498	93
OG 55 Foothills Grey Gum-Spotted Gum	111	33	73	53	53	**53**	58	48

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 56 Granite Mallee	1,232	407	892	891	897	**897**	335	73
OG 57 Highland Granite Stringybarks	206	157	171	171	171	**171**	35	83
OG 58 Gorge Grey Gum	40	19	26	26	26	**26**	14	65
OG 60 Grassy New England Blackbutt-Tallowwood-Blue Gum	16,535	4,549	12,995	13,219	13,219	**13,209**	3,326	80
OG 63/217 Grey Gum-Stringybark	34,740	30,054	32,446	32,565	32,565	**32,565**	2,175	94
OG 65 Heathy Scribbly Gum	9,487	6,957	9,264	9,273	9,273	**9,269**	218	98
OG 67 High Elevation Ferny Blackbutt	9,253	2,914	8,305	8,363	8,372	**8,362**	891	90
OG 68 High Elevation Messmate-Brown Barrell	2,113	64	1,550	1,809	1,809	**1,801**	312	85
OG 69 High Elevation Moist Open Tallowwood-Blue Gum	11,728	3,472	10,105	10,293	10,293	**10,290**	1,438	88
OG 70 High Elevation Open Spotted Gum	1	0	0	0	0	**0**	1	0
OG 71 Ironbark	24,384	21,155	23,542	23,562	23,893	**23,871**	513	98
OG 72 Low Relief Coastal Blackbutt	162	28	50	51	54	**54**	108	33
OG 73 Lowland Red Gum	140	16	129	129	129	**131**	9	94
OG 74 Lowlands Scribbly Gum	5,063	4,677	4,359	4,359	4,958	**4,958**	105	98
OG 76 Coastal Mallee	40	108	39	39	40	**40**	0	100
OG 79 Manna Gum-Stringybark	79	65	69	68	68	**69**	10	87
OG 80 Manna Gum	814	38	653	651	651	**647**	167	79
OG 81 Messmate	2,817	241	2,021	2,025	2,025	**2,022**	795	72
OG 82 Messmate-Mountain Gum Forest	1,949	1,091	1,521	1,521	1,521	**1,611**	338	83
OG 83 Mid Elevation Wet Blackbutt	949	281	860	865	875	**880**	69	93
OG 84 Mid North Coast Wet Brushbox-Tallowwood-Blue Gum	9,275	2,075	8,312	8,385	8,389	**8,385**	890	90
OG 85 Mixed Moist Hardwood	NR	0	NR	NR	NR	**NR**	NR	NR
OG 87 Mixed Tableland Stringybark-Gum Open Forest	1,657	278	1,329	1,328	1,328	**1,357**	300	82

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 88 Moist Escarpment New England Blackbutt	12,187	3,247	11,457	10,576	10,576	**10,563**	1,624	87
OG 89 Moist Foothills Spotted Gum	235	20	136	142	143	**138**	97	59
OG 90 Moist Messmate-Gum	5	0	4	4	4	**4**	1	80
OG 91 Moist Open Escarpment White Mahogany	19,070	5,287	15,956	16,483	16,483	**16,477**	2,593	86
OG 92 Moist Shrubby Stringybark-Gum	109	5	91	93	93	**92**	17	84
OG 93 Montane Stringybark-Gum	457	121	385	385	385	**385**	72	84
OG 94 Mountain Gum-Brown Barrell	1,826	695	1,822	1,822	1,822	**1,822**	4	100
OG 97 Needlebark Stringybark-Large Fruited Blackbutt	22	0	16	16	16	**16**	6	73
OG 98 New England Peppermint	594	511	580	580	580	**580**	14	98
OG 99 New England Stringybark-Blakely's Red Gum	10,323	4,566	7,173	7,321	7,321	**7,318**	3,005	71
OG 105 Nymboida Tallowwood-Turpentine	61	0	47	47	47	**46**	15	75
OG 106 Open Coastal Brushbox	10,714	821	8,125	8,163	8,182	**8,169**	2,545	76
OG 107 Open Messmate-New England Blackbutt	4,109	557	4,013	4,031	4,031	**4,027**	82	98
OG 108 Open Ribbon Gum	8,403	990	7,210	7,219	7,219	**7,218**	1,185	86
OG 109 Open Shrubby Brushbox-Tallowwood	462	212	397	404	405	**404**	58	87
OG 110 Open Silvertop Stringybark-Blue Gum	13,100	2,981	11,083	11,197	11,197	**11,192**	1,908	85
OG 111 Open Silvertop Stringybark-Tallowwood	899	105	811	814	814	**812**	87	90
OG 113 Peppermint	4,163	1,788	3,546	3,550	3,550	**3,541**	622	85
OG 114 Peppermint-Mountain/Manna Gum	1,367	600	1,267	1,267	1,267	**1,264**	103	92
OG 115 Red Bloodwood	NR	4	NR	NR	NR	**NR**	NR	NR
OG 116 Red Gum-Stringybark	4	2	1	1	1	**1**	3	25
OG 122 Rough-barked Apples	377	426	344	345	353	**350**	27	93
OG 123 Roundleaved Gum	28	3	16	16	16	**16**	12	57

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 124/233 Roundleaved Gum-Turpentine	2,064	1,861	1,975	1,975	1,975	**1,975**	89	96
OG 129 Smoothbarked Apple	1,655	1,051	1,599	1,601	1,703	**1,601**	54	97
OG 130 Smoothbarked Apple-Sydney Peppermint-Stringybark	954	20	509	521	706	**643**	311	67
OG 131 Snow Gum	2,856	1,545	2,679	2,779	2,779	**2,782**	74	97
OG 132 Snow Gum -Mountain/Manna Gum	5,377	2,521	4,658	5,200	5,200	**5,199**	178	97
OG 133 Snow Gum-Black Sallee	7	7	7	7	7	**7**	0	100
OG 134 South Coast Shrubby Grey Gum	4,203	529	2,641	2,711	2,752	**2,742**	1,461	65
OG 135 South Coast Tallowwood-Blue Gum	6,205	684	4,810	4,831	4,831	**4,818**	1,387	78
OG 137 Southern Wet Sydney Blue Gum	5,215	2,071	4,116	4,211	4,211	**4,184**	1,031	80
OG 138 Steel Box/Craven Grey Box	38	0	27	38	38	**38**	0	100
OG 139 Stringybark-Apple	30,925	14,707	23,114	23,489	23,489	**23,485**	7,440	76
OG 140 Stringybark-Mallee	270	143	265	265	265	**265**	5	98
OG 142 Swamp Mahogany	189	97	159	159	182	**182**	7	96
OG 145 Sydney Peppermint-Stringybark	8,696	8,183	8,591	8,594	8,594	**8,592**	104	99
OG 146 Tallowwood	583	247	364	373	373	**373**	210	64
OG 147 Turpentine	18	3	6	18	18	**18**	0	100
OG 148 Very Wet New England Blackbutt-Tallowwood	1,604	375	1,567	1,575	1,576	**1,573**	31	98
OG 149 Mallee-Peppermint mosaic	1,258	307	839	840	840	**839**	419	67
OG 153 Wet Coastal Tallowwood-Brushbox	269	70	118	119	119	**118**	151	44
OG 154 Wet Flooded Gum-Tallowwood	140	11	73	72	77	**77**	63	55
OG 155 Wet Foothills Blackbutt-Turpentine	4,140	1,311	3,298	3,313	3,360	**3,349**	791	81
OG 156 Wet New England Blackbutt-Silvertop Stringybark	3,682	1,375	3,456	3,462	3,462	**3,459**	223	94
OG 157 Wet Shrubby Brushbox-Tallowwood	9,497	1,575	8,408	8,530	8,556	**8,541**	956	90

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
OG 162 Whitetopped Box	345	47	324	331	331	**332**	13	96
OG 163 Yellow Box-Blakely's Red Gum	47	3	28	28	28	**28**	19	60
OG 164 Agricultural Plantations-Orchards and Vineyards	1	NR	0	0	0	**0**	1	0
OG 172 Sand Ridge	1	NR	1	1	1	**1**	0	100
OG 174 Orange Gum-Tumbledown Gum-Apple	6	68	0	0	0	**0**	6	0
OG 175 Orange Gum-New England Blackbutt-Tumbledown Gum	101	73	43	43	43	**43**	58	43
OG 176 Orange Gum-Ironbark	16	1	8	8	8	**8**	8	50
OG 177 Outcrop Orange Gum-New England Blackbutt	24	2	17	17	17	**17**	7	71
OG 178 Outcrop Black Cypress-Tumbledown Gum	1	0	0	0	0	**0**	1	0
OG 179 Yellow Box-Broad-leaved Stringybark	NR	1	NR	NR	NR	**NR**	NR	NR
OG 182 Apple-Black Cypress	77	41	30	30	30	**30**	47	39
OG 183 Red Gum-Apple	1,312	1,450	1,305	1,304	1,304	**1,305**	7	99
OG 184 Tumbledown Gum-Ironbark	NR	0	NR	NR	NR	**NR**	NR	NR
OG 186 Open Tumbledown Gum-Black Cypress-Orange Gum	110	13	50	50	50	**50**	60	45
OG 189 Silverleaved Ironbark-Cypress	2	0	0	0	0	**0**	2	0
OG 190 Yellow Box-Grey Box-Red Gum	184	181	181	181	181	**181**	3	98
OG 195 Apple-Manna Gum woodland	66	20	32	32	32	**32**	34	48
OG 196 Broad-leaved Stringybark-Apple Box	125	12	70	70	70	**70**	55	56
OG 197 Broad-leaved Stringybark	19	1	11	11	11	**11**	8	58
OG 198 Silvertop Stringybark	14	3	12	12	12	**12**	2	86
OG 200 Broad-leaved Stringybark-Ribbon Gum	NR	0	NR	NR	NR	**NR**	NR	NR
OG 202 Peppermint-Apple-Turpentine	23,636	21,517	23,504	23,506	23,506	**23,503**	133	99
OG 203 Grey Gum-Stringybark-Apple	27,325	26,816	27,252	27,253	27,253	**27,253**	72	100

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 204 Grey Gum - Scribbly Gum	15,564	15,563	15,556	15,555	15,555	**15,556**	8	100
OG 205 Peppermint-Silvertop Ash-Stringybark	879	881	876	876	876	**876**	3	100
OG 206 Apple-Grey Gum-Turpentine	12,117	10,071	11,920	11,927	11,927	**11,922**	195	98
OG 207 Hunter Spotted Gum-Ironbark	32	4	31	31	31	**31**	1	97
OG 208 Hunter Roughbarked Apple- Red Gum	718	517	665	665	665	**665**	53	93
OG 209 Yellow Bloodwood-Stringybark	28,806	28,119	28,653	28,652	28,652	**28,652**	154	99
OG 210 Yellow Bloodwood-Ironbark	14,868	13,391	14,769	14,767	14,767	**14,769**	99	99
OG 211 Apple-Turpentine	15,125	10,396	15,055	15,055	15,055	**15,055**	70	100
OG 212 Yellow Bloodwood-Narrowleaved Apple	37,683	32,180	37,593	37,595	37,595	**37,593**	90	100
OG 213 Stringybark-Scribbly Gum Woodland	7,810	7,805	7,802	7,802	7,802	**7,802**	8	100
OG 214 Brown Bloodwood-Dwyers Redgum	1,018	1,003	1,007	1,007	1,007	**1,007**	11	99
OG 215 Brown Bloodwood-Ironbark	9,684	9,693	9,656	9,656	9,656	**9,656**	28	100
OG 216 Sandstone Ironbark	7,683	7,558	7,561	7,561	7,561	**7,561**	122	98
OG 217 combined into OG 63/217								
OG 218 Ironbark-Stringybark	4,022	5,211	3,992	3,992	3,992	**3,992**	30	99
OG 219 Brown Bloodwood	3,667	3,560	3,574	3,574	3,574	**3,574**	93	97
OG 220 Yellow Bloodwood-Stringybark-Narrowleaved Apple	26,306	22,185	26,205	26,204	26,204	**26,205**	101	100
OG 221 Apple-Red Bloodwood-Peppermint-Turpentine	14,209	13,267	14,111	14,110	14,110	**14,111**	98	99
OG 222 Stringybark-Mallee Woodland	5,938	5,936	5,932	5,932	5,932	**5,932**	6	100
OG 223 Dwarf Apple Forest	13,652	9,708	13,601	13,602	13,602	**13,601**	51	100
OG 225 Wyong Apple-Scribbly Gum	27	0	27	27	27	**27**	0	100
OG 226 Mahogany-Banksia Heath	5,368	5,198	5,322	5,322	5,322	**5,322**	46	99
OG 227 Turpentine-Myrtle	10,146	9,893	10,096	10,098	10,098	**10,098**	48	100

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 228 Turpentine-Oak-Myrtle	7,208	7,132	7,156	7,153	7,153	**7,157**	51	99
OG 229 Roughbarked Apple-Forest Oak	17,090	16,606	16,991	16,991	16,991	**16,991**	99	99
OG 230 Watagan Blackbutt-Blue Gum	616	243	537	540	540	**537**	79	87
OG 231 Watagan Blue Gum	525	166	503	503	503	**503**	22	96
OG 232 Watagan Spotted Gum-Ironbark-White Mahogany	209	69	172	188	188	**188**	21	90
OG 233 combined into OG 124/233								
OG 234 Grey Gum - Grey Myrtle	17,144	16,458	16,922	16,913	16,913	**16,922**	222	99
OG 235 Wet Roundleaved Gum Forest	1,922	1,882	1,908	1,908	1,908	**1,908**	14	99
OG 236 Bangalay-Blue Gum	6,991	3,771	6,890	6,892	6,892	**6,890**	101	99
OG 237 Wollemi Manna Gum	1,874	1,878	1,873	1,873	1,873	**1,873**	1	100
OG 238 Tablelands Grey Gum-Scribbly Gum	194	194	194	194	194	**194**	0	100
OG 239 Wollemi Roughbarked Apple	2,148	1,636	2,089	2,090	2,090	**2,089**	59	97
OG 240 Roughbarked Apple-Redgum	91	80	91	91	91	**91**	0	100
OG 241 Ironbark-Redgum	182	173	172	172	172	**172**	10	95
OG 242 Hunter Grey Box	3,899	4,280	3,841	3,841	3,841	**3,841**	58	99
OG 243 Grey Gum-Mugga Ironbark	1,764	1,716	1,724	1,724	1,724	**1,724**	40	98
OG 244 White Box-Grey Gum	314	454	308	308	308	**308**	6	98
OG 245 Grey Box	529	515	506	506	506	**506**	23	96
OG 246 Scribbly Gum-Redgum Woodland	1,427	1,392	1,401	1,401	1,401	**1,401**	26	98
OG 247 Coastal Bastard Mahogany Forest	2,727	1,868	2,675	2,675	2,722	**2,675**	52	98
OG 248 Apple-Forest Oak	1,904	1,795	1,866	1,866	1,866	**1,866**	38	98
OG 249 White Box-Ironbark-Red Gum	2,004	2,176	1,952	1,952	1,952	**1,952**	52	97
OG 250 Banksia Heath-Scribbly Gum-Apple	98	19	97	97	97	**97**	1	99

Old-growth Forest Ecosystem	Area (hectares)							
		Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
Total old-growth by Forest Ecosystem	**878,968**	**532,859**	**782,649**	**786,895**	**788,847**	**788,362**	**90,606**	**90**
Other old-growth forest datasets								
High conservation old-growth forest	80,260	NR	80,260	80,260	80,260	**80,260**	0	100
Total old-growth forest	**959,228**	**532,859**	**862,909**	**867,155**	**869,107**	**868,622**	**90,606**	**91**
As proportion of total old growth forest (%)	100	52	90	90	91	**91**	9	

[1] Area derived by ABARES from spatial data associated with North East region old-growth CRA report 1999. Figures for individual Forest Ecosystems are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the North East RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Figures are derived from the total old-growth extent of 1.03 million hectares reported in the North East RFA which uses information not available for this analysis. Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval for the Upper North East Region. Together these components constitute the CAR reserve system on public land. Area values do not include 70 thousand hectares of old-growth forest reported in the RFA data tables that cannot be identified spatially.

Notes: Totals may not tally due to rounding

NR = Not recorded

High conservation old growth forest figures are from IFOA studies rather than the CRA process.

Table 1.4 Old-growth forest in the Southern RFA region identified in the CRA spatial data, by Forest Ecosystem, and the changes in areas in the CAR reserve system over time

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 001 Southern Coastal Hinterland Intermediate Altitude Shrub Dry Forest - *Eucalyptus sieberi*	18,285	9,359	16,135	16,423	16,423	**16,426**	1,859	90
OG 002 Hinterland Heath Shrub Dry Forest - *Corymbia gummifera/Syncarpia glomulifera*	30,174	14,401	21,091	21,294	21,294	**21,230**	8,944	70
OG 003 Northern Hinterland Shrub Dry Forest - *Syncarpia glomulifera*/E. scias	6,595	4,962	6,099	6,086	6,086	**6,086**	509	92
OG 004 Northern Gorge Heath Shrub Dry Forest - *E. punctata/E. agglomerata*	12,035	8,819	9,213	9,310	9,310	**9,310**	2,725	77
OG 005 Northern Coastal Lowlands Shrub/Grass Dry Forest - mixed tree species	1,531	167	938	1,113	1,113	**983**	548	64
OG 007 Southern Coastal Hinterland Shrub/Tussock Grass Dry Forest - *E. sieberi*	2,231	382	1,422	1,460	1,460	**1,443**	788	65
OG 008 Far Southern Coastal Shrub Dry Forest - *E. sieberi*	43	21	20	20	20	**20**	23	47
OG 009 Coastal Lowlands Cycad/Shrub Dry Forest - *Corymbia maculata*	8,592	950	3,524	3,683	3,683	**3,605**	4,987	42
OG 010 Southern Coastal Lowlands Shrub/Grass Dry Forest - *E. globoidea/E. longifolia*	2,640	52	1,058	1,100	1,100	**908**	1,732	34
OG 011 Coastal Shrub/Grass Dry Forest - *E. botryoides/E. globoidea/Imperata cylindrica*	57	38	39	39	39	**39**	18	68
OG 012 Coastal Hinterland (Buckenboura) Shrub/Cycad Dry Forest - *Corymbia gummifera*	289	0	284	284	284	**284**	5	98
OG 013 Southern Escarpment Foothills Rainshadow Dry Grass Forest - *E. agglomerata*	2,136	1,565	1,602	1,602	1,602	**1,602**	534	75
OG 014 Northern Coastal Hinterland Shrub/Grass Dry Forest - *E. fibrosa/Corymbia maculata*	1,355	611	711	1,173	1,173	**1,173**	182	87
OG 015 Central and North East Tableland Dry Shrub Forest - *E. sieberi*	13,328	9,203	10,966	11,144	11,144	**11,144**	2,184	84
OG 016 North East Tableland Dry Shrub/Tussock Grass Forest - *E. agglomerata*	6,322	4,036	5,540	5,562	5,607	**5,607**	715	89
OG 018 Southern Coastal Hinterland Shrub/Vine/Grass Moist Forest - *E. cypellocarpa/E. muelleriana*	24,891	9,836	18,512	18,755	18,755	**18,762**	6,129	75
OG 019 Coastal Escarpment and Hinterland Shrub/Fern Dry Forest - *E. muelleriana*	30,584	14,630	23,714	24,019	24,019	**24,010**	6,574	79
OG 021 Northern Coastal Hinterland Moist Shrub Forest - *C. maculata/E. pilularis*	12,193	4,051	7,008	7,136	7,136	**7,109**	5,084	58
OG 028 OG Coastal Sands Shrub/Fern Forest - *E. botryoides/Banksia serrata*	615	97	334	334	334	**334**	281	54
OG 029 OG Northern Coastal Sands Shrub/Fern Forest - *E. pilularis/Banksia serrata*	2,099	1,288	1,477	1,486	1,510	**1,506**	593	72

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 035 South Coast Byadbo Acacia Scrubs - *Acacia sylvestris*	17	16	17	17	17	**17**	0	100
OG 038 Tableland Dry Heath Shrub/Herb/Grass Woodland - *Calytrix tetragona* (*E.goniocalyx*)	4	0	4	4	4	**4**	0	100
OG 040 Coastal Hinterland (Deua NP) Dry Shrub Forest (rhyolite) - *E. stenostoma*	947	953	947	947	947	**947**	0	100
OG 043 Western Slopes Riparian Moist Sedge Woodland - *E. camaldulensis*	37	0	0	0	0	**0**	37	0
OG 047 Far Southern Hinterland Herb/Grass Moist Forest - *E. maidenii/E. globoidea*	11	9	10	10	10	**10**	1	91
OG 048 Coastal Lowlands Riparian Herb/Grass Forest - various eucs	719	154	391	400	400	**400**	319	56
OG 049 Southern Hinterland Shrub/Herb/Grass Riparian Forest - *Angophora floribunda/E. elata/Acacia mearnsii*	4,167	2,954	3,522	3,516	3,516	**3,519**	648	84
OG 050 Southern Escarpment Herb/Grass Dry Forest- Angophora floribunda/*E.tereticornishe*	6,641	2,696	3,930	4,047	4,047	**4,047**	2,594	61
OG 051 Araluen Acacia Herb/Grass Dry Forest - *E. melliodora/E. maidenii*	1,461	1	494	660	660	**660**	801	45
OG 055 Eastern Tableland Fern/Herb/Grass Moist Forest - *E. fastigata*	10,919	2,719	7,185	7,008	7,008	**7,012**	3,907	64
OG 056 Tableland and Escarpment Moist Herb/Fern Grass Forest - *E. radiata/E. viminalis/*	9,838	1,626	5,639	6,130	6,130	**5,965**	3,873	61
OG 057 Southern Escarpment Shrub/Fern/Herb Moist Forest - *E. cypellocarpa* incl. *E.fastigata* & *E.obliqua*	19,595	13,951	17,347	18,135	18,135	**18,199**	1,396	93
OG 058 Tableland and Escarpment Wet Layered Shrub Forest - *E. fastigata/Olearia argophylla/Dicksonia antarctica*	10,688	7,349	10,234	10,256	10,256	**10,256**	432	96
OG 059 Eastern Tableland and Escarpment Shrub/Fern Dry Forest - *E. radiata/E. sieberi/Leucopogon lanceolatus*	4,292	703	2,199	2,887	2,887	**2,877**	1,415	67
OG 061 Southern Escarpment Edge Moist Shrub Forest - *E. fraxinoides*	748	553	721	718	718	**718**	30	96
OG 062 Southern Escarpment Edge Moist Shrub/Fern Forest - *E. fraxinoides/E. cypellocarpa*	2,028	1,048	1,772	1,765	1,765	**1,765**	263	87
OG 064 Southern East Tableland Edge Shrub/Grass Dry Forest - *E.dalrympeana/E.radiata*	189	0	178	179	179	**177**	12	94
OG 066 Eastern Tablelands Shrub/Grass Moist Forest - *E. dalrympleana/E. radiata/Poa sieberiana*	3,504	1,061	3,125	3,126	3,126	**2,982**	522	85
OG 068 North East Tablelands Shrub/Herb/Grass Dry Forest - *E. pauciflora/E. viminalis/Lomandra longifolia*	1,253	184	211	250	250	**250**	1,003	20

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 070 Western Escarpment Dry Shrubland - *E. dives/Xanthorhoea australis/Platylobium formosum*	557	416	415	415	415	**415**	142	75
OG 071 Western Tableland Dry Shrubland - *E. macrorhyncha/Leptospermum brevipes*	303	174	299	167	167	**299**	4	99
OG 072 Tablelands Dry Shrub Forest - *E. dives/E. radiata/Bursaria lasiophylla*	204	85	97	97	97	**97**	107	48
OG 073 Tableland Dry Shrub/Grass Forest - *E. pauciflora/E. viminalis/Acacia dealbata/Themeda australis*	7,633	132	1,378	1,638	1,638	**1,642**	5,991	22
OG 074 South Eastern Tablelands Dry Shrub/Grass/Herb Forest - *E. bridgesiana/E. pauciflora/E.* rubida/*Acaena novae-zealandiae*	12,715	2,216	3,860	4,668	4,668	**4,668**	8,047	37
OG 075 Tablelands Shrub/Tussock Grass Forest - *E. dives/Chionchloa pallida*	13,860	10,643	11,466	11,422	11,422	**11,497**	2,363	83
OG 076 Tablelands Shrub/Grass Dry Forest - *E. rubida/E. pauciflora/Themeda australis*	7,561	2,667	2,871	2,871	2,871	**2,871**	4,690	38
OG 077 Lower Snowy Dry Shrub/Tussock Grass Forest - *E. goniocalyx/Chionochloa pallida*	27,956	21,560	24,927	24,927	24,927	**24,927**	3,029	89
OG 078 Lower Snowy Dry Shrub/Herb Woodland - *E. albens/Callitris glauciphylla/Acacia deanei*	18,872	17,608	18,186	18,186	18,186	**18,186**	686	96
OG 079 Montane Dry Shrub/Tussock Grass Forest - *E. nortonii/Cassinia longifolia/Chionochloa pallida*	419	227	240	240	240	**240**	179	57
OG 081 Eastern Dry Shrub/Herb/Grass Forest - *E. bridgesiana/E. dives/Bursaria spinosa/Poa sieberiana*	3,524	0	0	0	0	**0**	3,524	0
OG 082 Western Montane Acacia Fern/Herb Forest - *E. viminalis/E. robertsonii/Cassinia aculeata/Pteridium esculentu*m	26,607	22,999	23,930	23,612	23,612	**24,137**	2,470	91
OG 083 Montane Riparian Moist Shrub/Grass/Herb Forest - *E. dalrympleana/E. robertsonii/Acacia melanoxylon/Microlaena stipoides*	321	98	172	172	172	**172**	149	54
OG 085 Montane Riparian Moist Shrub/Sedge/Grass Forest - *E. dalrympleana/E. viminalis/Leptospermum lanigerum/Poa helmsii*	412	389	411	411	411	**411**	1	100
OG 086 Western Montane Moist Shrub Forest - *E.delegatensis/E. pauciflora/Polyscias sambucifolia/Tasmania lanceolata*	1,359	1,329	1,339	1,339	1,339	**1,339**	20	99
OG 087 Western Escarpment Moist Shrub/Herb/Grass Forest - *E. delegatensis/E. dalrympleana/Derwentia derwentiana/Stellaria pungens*	9,502	9,023	9,051	9,058	9,058	**9,071**	431	95

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 088 Western Escarpment Shrub/Grass Forest - *E. chapmaniana/Daviesia latifolia*	189	194	189	189	189	**189**	0	100
OG 089 Eastern Tablelands Acacia/Herb/Grass Forest - *E. dalrympleana/E. viminalis/Acacia melanoxylon/Stellaria pungens*	10,361	628	4,698	5,507	5,507	**5,427**	4,934	52
OG 090 Northern Tablelands Acacia Herb/Grass Dry Forest - *E. bridgesiana/Acacia dealbata/Hydrocotyle laxiflo*ra	84	59	63	63	63	**63**	21	75
OG 091 Burrinjuck Acacia Dry Herb/Grass Forest - *E. bridgesiana/E. bicostata/Acacia dealbata/Poa sieberiana*	930	26	386	253	253	**473**	457	51
OG 092 Tablelands Acacia/Grass/Herb Dry Forest - *E. bridgesiana/E. melliodora/Acacia mearnsii/Microlaena stipoides*	412	34	32	32	32	**32**	380	8
OG 093 Western Tablelands Herb/Grass Dry Forest - *E.robertsonii/Microlaena stipoides*	11,244	2,183	8,387	6,568	6,568	**8,912**	2,332	79
OG 094 South-west Slopes Acacia Dry Herb/Grass Forest - *E. bridgesiana/E. macrorhyncha/Acacia dealbata/Microlaena stipoides*	6,341	0	3,454	2,754	3,357	**4,341**	2,000	68
OG 095 Tableland Acacia Moist Herb Forest - *E. pauciflora/E. dalrympleana/Acacia dealbata/Helichrysum scorpiodes*	9,147	4,237	6,073	5,908	5,908	**6,021**	3,126	66
OG 096 Tableland Tussock Grass/Herb Forest - *E.pauciflora/E.dalrympleana/Poa sieberiana*	26	25	26	26	26	**26**	0	100
OG 097 Montane Acacia/Dry Shrub/Herb/Grass Forest - *E. dalrympleana/E. pauciflora/Acacia dealbata/Stellaria pungens*	20,514	17,764	18,178	18,126	18,126	**18,178**	2,336	89
OG 098 Western Montane Moist Shrub Forest - *E. pauciflora/E. dalrympleana/Daviesia ulicifolia/Lomandra longifolia*	20,349	16,796	17,254	17,214	17,214	**17,254**	3,095	85
OG 099 Montane Dry Shrub/Herb/Grass Forest - *E. pauciflora/Leucopogon hookeri/Stellaria pungens*	6,442	6,083	6,113	6,113	6,113	**6,113**	329	95
OG 100 ACT Montane Dry Shrub/Grass Forest - *E. pauciflora/Acacia dealbata/Poa induta*	2,494	560	557	557	557	**557**	1,937	22
OG 101 Western Montane Dry Shrub/Herb/Grass Forest - *E. dalrympleana/E. pauciflora/Daviesia latifolia/Coprosma hirtella/Stellaria pungens*	6,833	5,821	5,983	5,915	5,915	**5,993**	840	88
OG 102 Western Montane Dry Fern/Grass Forest - *E. dalrympleana/E. pauciflora/Poa sieberiana/Asperula scoparia*	1,415	1,013	1,402	1,402	1,402	**1,402**	13	99

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 103 Western Montane Dry Fern/Grass Forest - *E. dives/E. dalrympleana/E. robertsonii/Pteridium* esculentum/*Poa sieberiana*	14,492	9,361	11,408	10,648	10,648	**11,455**	3,037	79
OG 104 Tableland Acacia/Herb/Grass Forest - *E. robertsonii/E. dalrympleana/Acacia dealbata/Platylobium formosum/Senecio* sp.	12,011	9,715	10,744	10,767	10,767	**10,999**	1,012	92
OG 106 Montane Dry Shrub/Tussock Forest - *E.robertsonii/E. dalrympleana/Platylobium formosum/Tetratheca bauerifolia*	8,411	8,168	8,172	8,172	8,172	**8,172**	239	97
OG 107 Tableland Montane Dry Shrub Forest - *E.dalrympleana/E. dives/Hibbertia obtusifolia*	5,889	1,978	2,732	2,732	2,732	**2,732**	3,157	46
OG 108 Western Tablelands Dry Herb/Grass Forest - *E. macrorhyncha/E. dives/Hibbertia obtusifolia/Poa sieberiana*	34,153	12,943	27,443	25,136	27,246	**30,525**	3,628	89
OG 109 Tablelands Dry Shrub/Tussock Grass Forest - *E. dives/E. mannifera/E. macrorhyncha/Hibbertia* obtusifolia/*Chionochloa pallida*	8,788	1,814	2,977	4,007	4,007	**4,052**	4,736	46
OG 110 Tablelands Dry Shrub/Grass Forest - *E. dives/E. mannifera/E. macrorhycha/Platylobium formosum*	8,836	1,971	5,042	5,175	5,175	**5,242**	3,594	59
OG 112 Eastern Tablelands Dry Shrub Forest - *E. sieberi/E. dives/Brachyloma daphnoides/Poa sieberiana*	1,094	0	508	550	550	**550**	544	50
OG 113 North East Tablelands Dry Shrub/Grass Forest - *E. mannifera/E. dives/Brachyloma daphnoides/ Dianella revoluta*	9,456	3,168	4,345	4,976	4,991	**4,991**	4,465	53
OG 114 Tablelands Dry Shrub/Tussock Grass Forest - *E.macroryncha/E.rossii/E. goniocalyx/Chionochloa pallida*	5,487	960	1,607	1,607	1,607	**1,607**	3,880	29
OG 115 South East Tablelands Dry Shrub/Tussock Grass Forest - *E. rossii/E. mannifera/Pultenaea procumbens/Chionochloa pallida*	21,465	2	2,242	4,054	4,054	**4,054**	17,411	19
OG 116 Western Slopes Herb/Grass Woodland - *E. blakelyi/Microlaena stipoides/Hydrocotyle laxiflora*	465	0	55	55	55	**219**	246	47
OG 118 Western Slopes Dry Grass Forest - *E. sideroxylon/E. blakelyi/E. goniocalyx/Elymus scaber*	196	0	11	86	86	**86**	110	44
OG 119 Western Tablelands Dry Shrub/Grass Forest - *E. macrorhyncha/E. polyanthemos/Hibbertia* obtusifolia/*Gonocarpus tetragynus*	10,766	0	5,004	4,067	5,353	**6,719**	4,047	62
OG 120 Western Slopes Shrub/Herb/Grass Dry Forest - *E. macrorhyncha/E. albens/Hydrocotyle*	1,198	0	439	439	531	**531**	667	44

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
laxiflora/Microlaena stipoides								
OG 121 Western Slopes Grass/Herb Dry Forest - *E. macrorhyncha/E. goniocalyx/Gonocarpus tetragynus/Poa sieberiana*	25,253	5,057	14,620	14,980	15,939	**18,197**	7,056	72
OG 123 Montane Wet Heath/Bog - *Baeckea utilis/Hakea micranthis*	30	33	30	30	30	**30**	0	100
OG 124 Western Montane Wet Heath/Herb Grass Woodland - *E. pauciflora/Epacris breviflora*	125	51	55	24	24	**55**	70	44
OG 128 Sub-alpine Dry Shrub/Herb Woodland - *E. niphophila*	19,910	18,167	18,156	18,156	18,156	**18,156**	1,754	91
OG 129133 Alpine Wet Herbfield & Sub-alpine Wet Herb / Grassland / Bog	63	66	63	63	63	**63**	0	100
OG 130 Sub-alpine Shrub/Grass Woodland - *E. niphophila*	38,423	38,166	38,389	38,186	38,186	**38,396**	27	100
OG 131 Sub-alpine Herbfield	43	42	43	43	43	**43**	0	100
OG 137 Coastal Escarpment Moist Shrub/Fern Forest - *E. sieberi/E. piperita/Gleichenia dicarpa*	5,525	4,174	5,136	5,136	5,136	**5,137**	388	93
OG 138 Northern Plateau and Escarpment Heath Shrub Dry Forest - *E. sieberi/E. consideniana*	10,205	8,038	9,531	9,544	9,544	**9,543**	662	94
OG 139 Northern Coastal Hinterland Heath Shrub Dry Forest - *C. gummifera/E. sclerophyll*	17,539	10,615	15,062	15,148	15,148	**15,113**	2,426	86
OG 146 Tableland Dry Herb/Grass Woodland - *E. pauciflora/E. stellulata/Asperula scoparia*	56	57	56	56	56	**56**	0	100
OG 147 Tablelands Moist Sedge/Herb/Grassland	3	0	0	0	0	**0**	3	0
OG 157 ACT/Monaro Dry Grassland - *Bothriochloa macra/Chrysocephalum apiculatum*	1	1	1	1	1	**1**	0	100
OG 158 Monaro Dry Grassland - *Austrostipa* spp/ *Danthonia* ssp	26	0	13	13	13	**13**	13	50
OG 160 Northern Slopes Dry Grass Woodland - *E. blakelyi/E. melliodora/Danthonia racemosa/Austrostipa scabra* ssp *falcata*	156	33	66	33	33	**65**	91	42
OG 171 Coastal Shrub/Grass Forest - *E. tereticornis*	669	658	660	660	660	**660**	9	99
OG 174 Shoalhaven Gorge Forest - *E. tereticornis / E.melliodora*	7,975	5,108	6,416	6,416	6,763	**6,763**	1,212	85
OG 175 Northern Coastal Lowlands Swamp Forest - *E. robusta*	56	1	37	37	37	**37**	19	66
OG 176 Morton Plateau Mallee Swamp Low Forest	771	758	771	771	771	**771**	0	100
OG 179 Eastern Deua dry shrub Forest - *Angophora costata*	2,007	495	1,935	1,935	1,935	**1,935**	72	96

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 181 North-eastern Tablelands Gully Fern Forest - *E.elata / Calochlaena dubia*	82	0	0	2	2	**2**	80	2
OG 192 South West Slopes Tall Shrubland Low Forest - *E.dwyeri-Acacia doratoxylon*	82	0	0	0	0	**0**	82	0
Total old-growth forest by Forest Ecosystem	**753,346**	**407,034**	**552,819**	**555,633**	**561,114**	**573,309**	**180,037**	**76**
Old-growth with no forest ecosystem class	563	NR	301	303	303	**303**	260	**54**
Total old-growth forest	**753,909**	**407,034**	**544,740**	**555,936**	**561,417**	**573,612**	**180,297**	**76**
As proportion of total old growth forest (%)	100	54	73	74	74	**76**	24	

[1] Area derived by ABARES from spatial data associated with Southern region old-growth CRA report 1998. Figures for individual Forest Ecosystems are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the Southern RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2001), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval for the Upper North East Region. Together these components constitute the CAR reserve system on public land.

Note: Totals may not tally due to rounding

Table 1.5 Old-growth forest in the Eden RFA region identified in the CRA spatial dataset, by Forest Ecosystem, and the changes in areas in the CAR reserve system over time

Old-growth Forest Ecosystem	Area (hectares)							
		Old-growth forest in protected areas, by time period						
	Total old-growth forest[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]	**Old-growth forest not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
OG 9 Mountain Wet Layered Forest (*Eucalyptus nitens*)	444	56	435	435	435	**435**	9	98
OG 10 Mountain Wet Layered Forest (*E. fastigata*)	3,895	2,016	3,473	3,473	3,473	**3,472**	423	89
OG 11 Tantawangalo Wet Shrub Forest	206	13	205	205	205	**205**	1	100
OG 12 Mountain Wet Fern Forest	592	150	511	511	511	**511**	81	86
OG 13 Hinterland Wet Fern Forest	9,360	5,587	7,773	7,772	7,772	**7,831**	1,529	84
OG 14 Hinterland Wet Shrub Forest	3,917	1,809	2,590	2,607	2,605	**2,645**	1,272	68
OG 15 Mountain Wet Herb Forest	5,804	2,347	4,733	4,733	4,733	**4,731**	1,073	82
OG 16 Basalt Wet Herb Forest	1,668	184	1,030	1,037	1,037	**1,039**	629	62
OG 17 Flats Wet Herb Forest	280	94	177	177	177	**175**	105	63
OG 18 Brogo Wet Vine Forest	407	133	250	250	250	**250**	157	61
OG 19 Bega Wet Shrub Forest	2,552	536	1,279	1,279	1,279	**1,280**	1,272	50
OG 20 Bega Dry Grass Forest	299	29	256	256	256	**256**	43	86
OG 21 Candelo Dry Grass Forest	253	56	211	211	211	**211**	42	83
OG 24 Subalpine Dry Shrub Forest	7,484	963	1,572	1,624	1,624	**1,623**	5,861	22
OG 25 Sandstone Dry Shrub Forest	177	176	177	177	177	**177**	0	100
OG 26 Tableland Dry Shrub Forest	1,472	371	1,062	1,062	1,062	**1,063**	409	72
OG 27 Waalimma Dry Grass Forest	68	0	46	46	46	**46**	22	68
OG 28 Wog Dry Grass Forest	119	11	119	119	119	**119**	0	100
OG 29 Nalbaugh Dry Grass Forest	205	5	173	173	173	**173**	32	84
OG 30 Wallagaraugh Dry Grass Forest	74	14	46	46	46	**46**	28	62
OG 31 Hinterland Dry Grass Forest	4,993	974	3,947	3,946	3,946	**3,948**	1,045	79

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	At 30 June 2016[3]		
OG 32 Coastal Dry Shrub Forest (*E. longifolia*)	2,424	911	1,705	1,705	1,705	**1,837**	587	76
OG 33 Coastal Dry Shrub Forest (*E. muelleriana*)	2,839	1,441	2,319	2,338	2,338	**2,341**	498	82
OG 34 Brogo Dry Shrub Forest	2,843	1,268	1,852	1,852	1,851	**2,010**	833	71
OG 35 Escarpment Dry Grass Forest	4,971	1,532	3,096	3,096	3,096	**3,097**	1,874	62
OG 36 Dune Dry Shrub Forest	117	37	105	105	105	**105**	12	90
OG 37 Coastal Dry Shrub Forest (*Angophora floribunda*)	2,799	1,256	1,775	1,773	1,773	**1,777**	1,022	63
OG 41 Mountain Dry Shrub Forest (*E. fraxinoides*)	353	166	321	321	321	**321**	32	91
OG 42 Coastal Dry Shrub Forest (*E. obliqua*)	1,778	773	1,355	1,355	1,355	**1,365**	413	77
OG 43 Mountain Dry Shrub Forest (*E. cypellocarpa*)	516	416	467	467	467	**467**	49	91
OG 44 Foothills Dry Shrub Forest	748	320	661	661	661	**660**	88	88
OG 45 Mountain Dry Shrub Forest (*E. sieberi*)	346	224	311	311	311	**311**	35	90
OG 46 Lowland Dry Shrub Forest	4,687	2,341	2,984	2,982	2,982	**3,056**	1,631	65
OG 47 Eden Dry Shrub Forest	4,332	2,812	3,541	3,541	3,541	**3,597**	735	83
OG 48 Bega Dry Shrub Forest	776	575	710	710	710	**722**	54	93
OG 49 Coastal Dry Shrub Forest (*E. agglomerata*)	3,380	1,573	2,232	2,232	2,229	**2,237**	1,143	66
OG 50 Genoa Dry Shrub Forest	849	705	760	760	760	**760**	89	90
OG 58 Swamp Forest	121	51	114	114	114	**116**	5	96
OG 71 Monaro Basalt Grass Woodland	388	36	356	356	356	**356**	32	92
OG 72 Numeralla Dry Shrub Woodland	2,214	290	305	335	335	**335**	1,879	15
OG 73 Monaro Dry Grass Forest	732	0	297	486	486	**486**	246	66
OG 79 Timbillica Dry Shrub Forest	1,525	274	1,188	1,188	1,188	**1,192**	333	78
OG 81 Wadbilliga Dry Shrub Forest	11,100	10,921	11,010	11,010	11,010	**11,010**	90	99
OG 82 Wadbilliga Range Ash Forest	398	398	398	398	398	**398**	0	100

Old-growth Forest Ecosystem	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Total old-growth forest[1]	Old-growth forest in protected areas, by time period					Old-growth forest not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
OG 84 Wadbilliga Range Wet Forest	1,269	1,134	1,144	1,144	1,144	**1,144**	125	90
OG 85 Wadbilliga Gorge Dry Forest	2,016	1,693	1,864	1,864	1,864	**1,864**	152	92
OG 86 Wadbilliga River Valley Forest	534	361	486	486	486	**486**	48	91
Total old-growth forest by Forest Ecosystem	**98,324**	**47,032**	**71,421**	**71,729**	**71,723**	**72,286**	**26,038**	**74**
Old-growth with no forest ecosystem class	4,360	NR	3,556	3,564	3,563	3,581	779	82
Total old growth forest	**102,684**	**47,032**	**74,977**	**75,293**	**75,286**	**75,867**	**26,817**	**74**
As proportion of total old-growth forest (%)	100	46	73	73	73	**74**	26	

[1] Area derived by ABARES from spatial data associated with Eden region old-growth CRA report 1998. Figures for individual Forest Ecosystems are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the Eden RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves of public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (1999), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval for the Upper North East Region. Together these components constitute the CAR reserve system on public land.

Note: Totals may not tally due to rounding

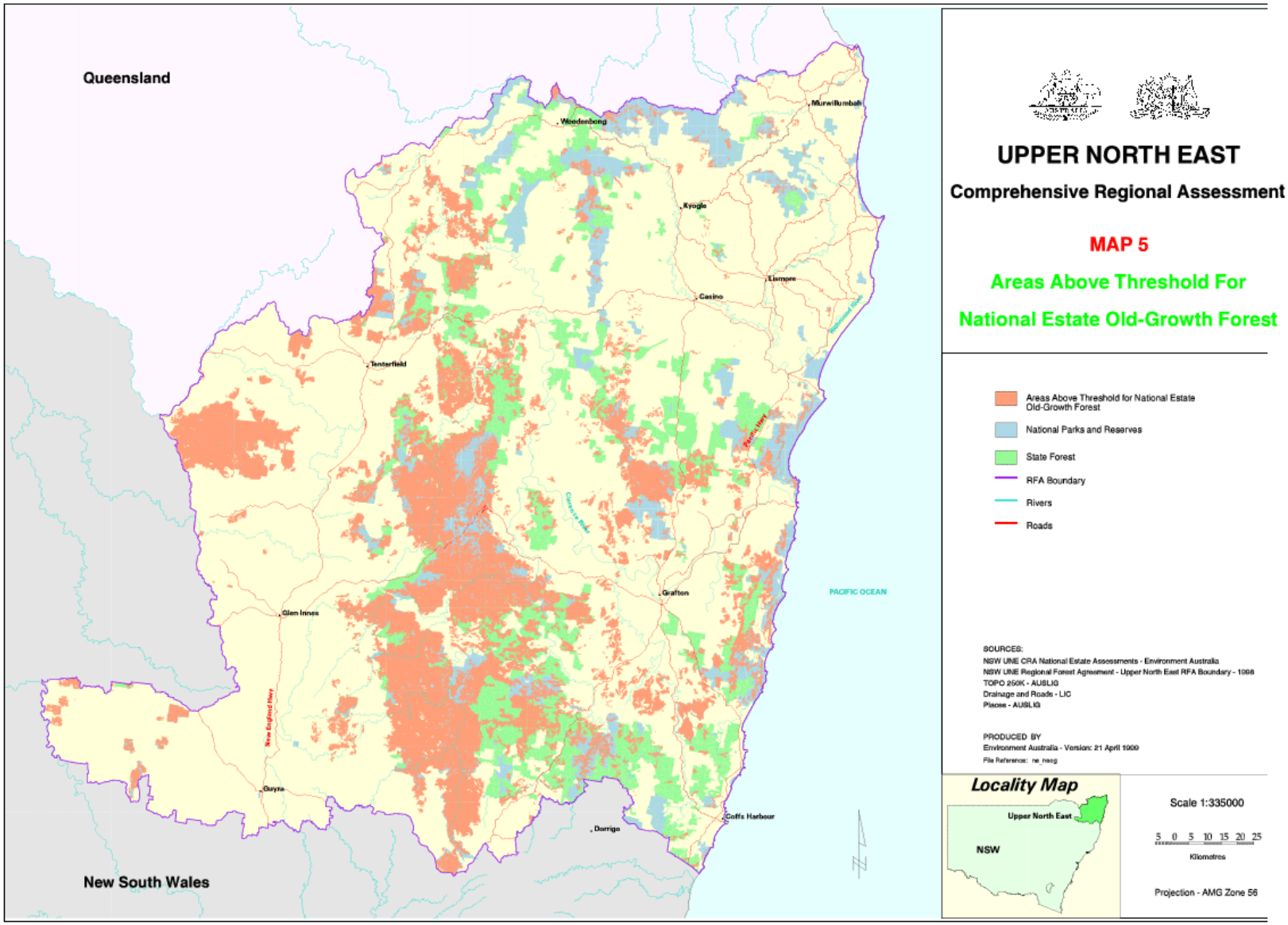

Figure 1.1 Old Growth Forest in the UNE RFA region

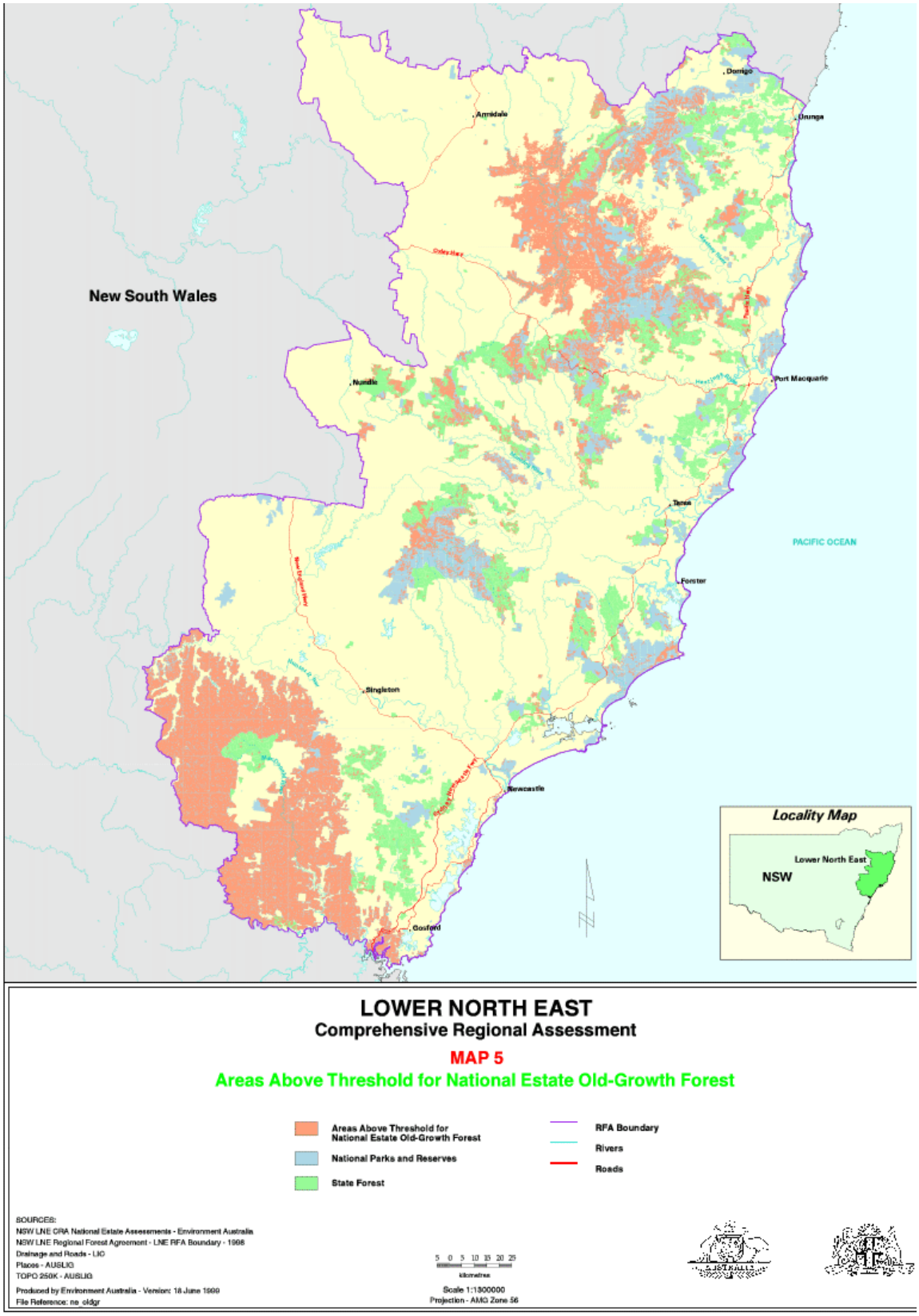

Figure 1.2 Old Growth Forest in the LNE RFA region

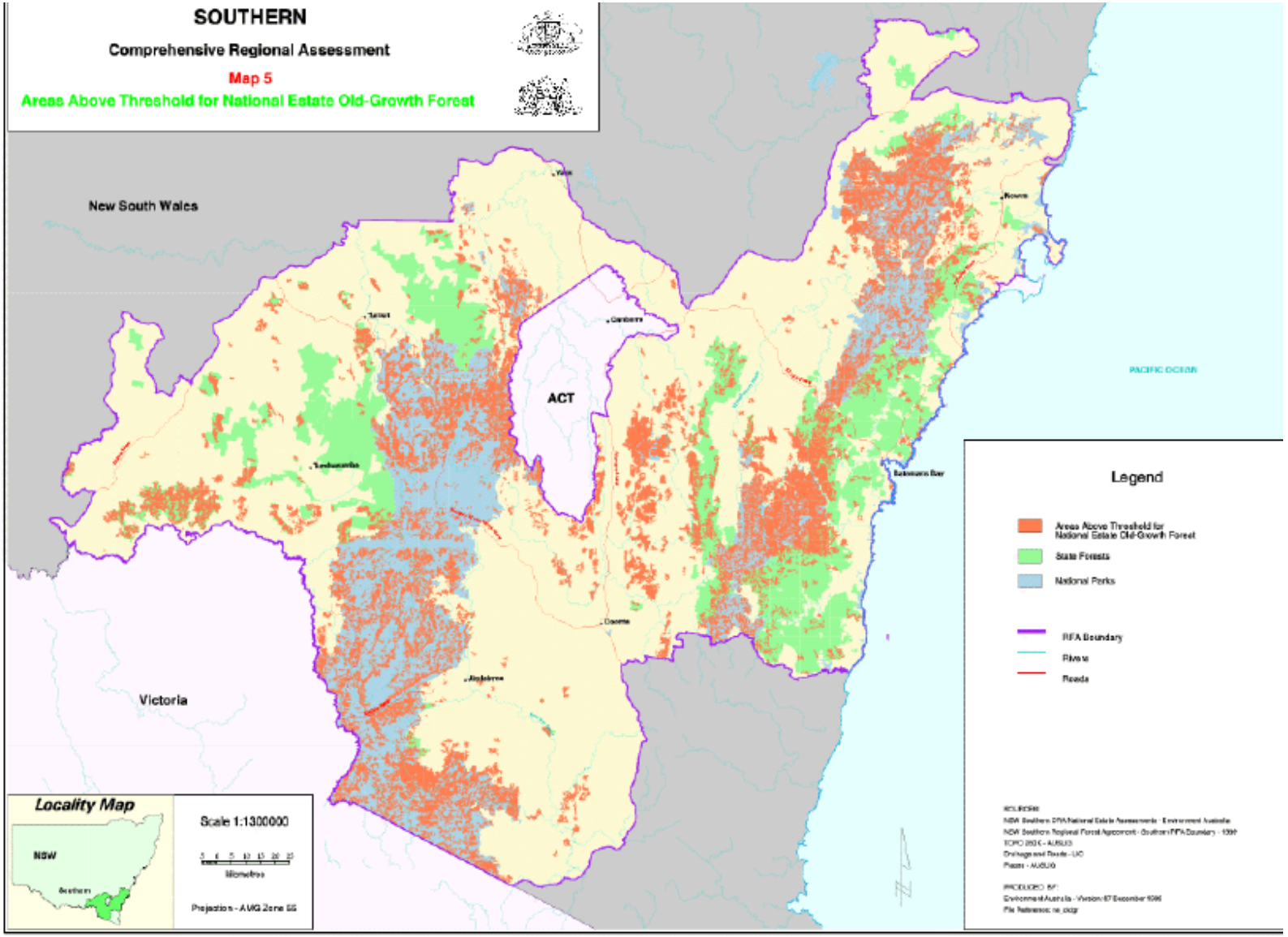

Figure 1.3 Old Growth Forest in the Southern RFA region

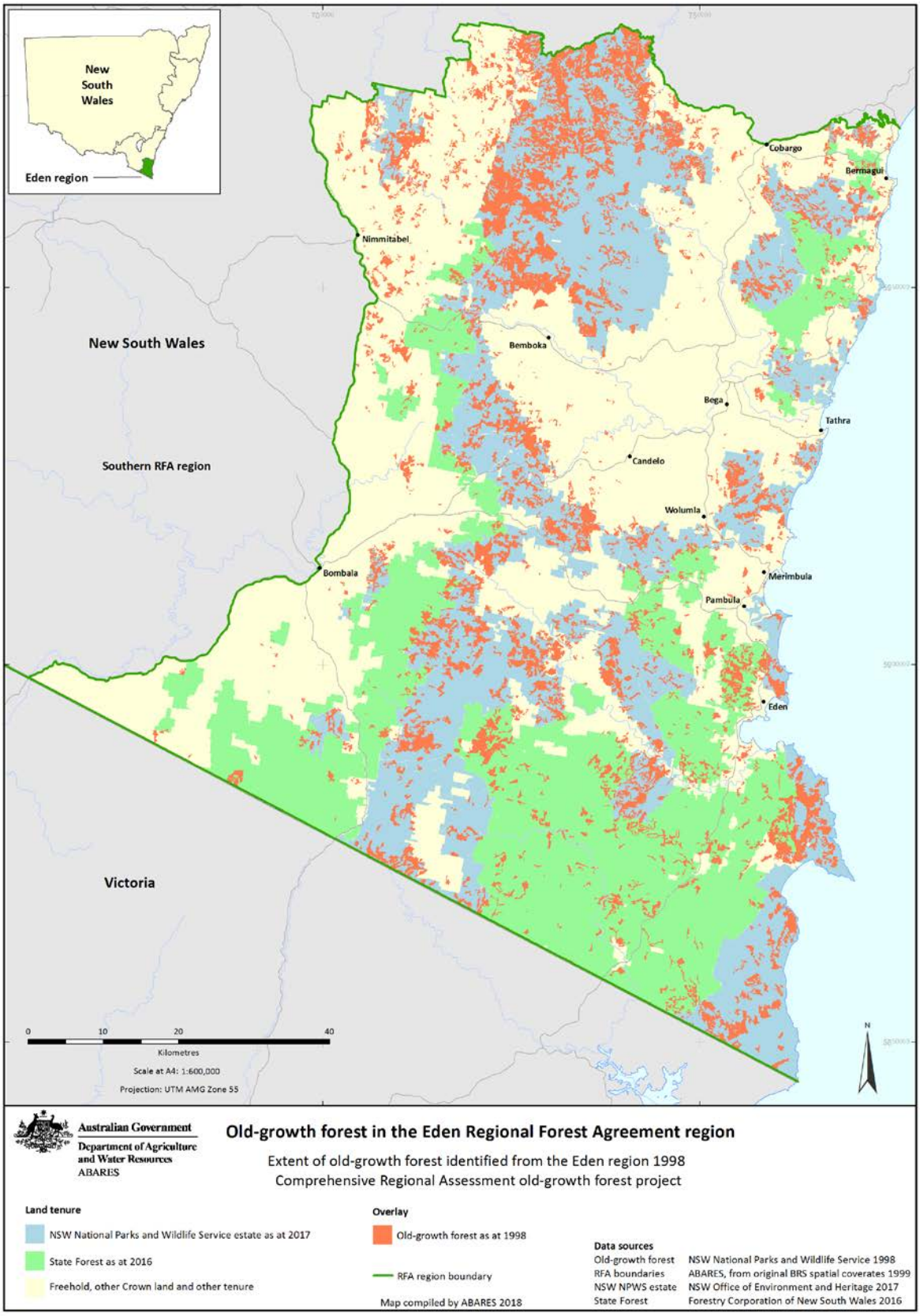

Figure 1.4 Old Growth Forest in the UNE RFA region

Wilderness values

The National Forest Policy Statement/JANIS Criteria defines Wilderness as:

> *Land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement…*[5]

The *Wilderness Act 1987* (NSW) identifies Wilderness as:

> *The area is, together with its plant and animal communities, in a state that has not been substantially modified by humans and their works or is capable of being restored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and appropriate self-reliant recreation.*

The CRA process undertaken between 1995 and 2000 documented three classes of wilderness:

1. Delineated Wilderness: the extent of land that meets National Wilderness Inventory (NWI) criteria for 'high quality wilderness' as defined by the JANIS[6] criteria
2. Identified Wilderness: the extent of land that meets the criteria of the *Wilderness Act 1987* (NSW)
3. Declared Wilderness: the extent of Identified Wilderness that is formally declared for protection under the *Wilderness Act 1987* (NSW). All of this area in NSW RFA regions is also in formal reserves.

Delineated Wilderness was determined for the CRA by a desktop analysis of datasets relating to landscape factors (remoteness, naturalness, size etc.) that relate to the NFPS/JANIS wilderness definition. Delineated Wilderness was the layer used to determine the JANIS reservation targets (90%, or more if practicable) for wilderness in the development of the three NSW RFAs.

Identified Wilderness and Declared Wilderness were determined for the CRA through the process stated in the *Wilderness Act 1987* (NSW). This includes a formal process for the assessment, identification and (for Declared Wilderness) declaration of wilderness in NSW.

The wilderness spatial datasets identified during the CRA process have not been updated since that time. The data presented here therefore do not take into account any additional areas of wilderness subsequently identified, or any areas that are no longer wilderness. Changes in the area figures presented here are solely due to changes in the areas of wilderness that are reserved in formal reserves; areas of wilderness not in formal reserves may be on private land, or in State forest or other crown land.

Wilderness extent and protection in NSW RFA regions

[5] The full NFPS definition is *land that, together with its plant and animal communities, is in a state that has not been substantially modified by, and is remote from, the influences of European settlement or is capable of being restored to such a state; is of sufficient size to make its maintenance in such a state feasible; and is capable of providing opportunities for solitude and self-reliant recreation*.

[6] Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia, a report by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee.

The extent of formally reserved Delineated Wilderness, formally reserved Identified Wilderness, and the International Union for Conservation of Nature (IUCN) Protected Areas Wilderness Category, are each determined through different mechanisms using different definitions of wilderness. The IUCN Wilderness Area is derived from the Commonwealth Department of the Environment and Energy's Collaborative Australian Protected Area Database (CAPAD) so may include wilderness outside formal reserves but otherwise protected through mechanisms recorded in CAPAD, such as informal reserves. Declared Wilderness is a subset of Identified Wilderness.

Figure 1.5 to **Figure 1.12** show the mapped extent of wilderness areas in the four RFA regions.

Delineated Wilderness

A total of 1.7 million hectares of Delineated Wilderness occurs in the NSW RFA regions. Prior to signing of the NSW RFAs, a total of 1.3 million hectares (77 per cent) was protected in formal reserves. After signing of the NSW RFAs, (1999-2001), and as at 30 June 2016, a total of 1.6 million hectares (92 per cent) is protected in formal reserves.

Identified Wilderness

A total of 1.5 million hectares of Identified Wilderness occurs in the NSW RFA regions. Prior to signing of the NSW RFAs, a total of 1.2 million hectares (83 per cent) was protected in formal reserves. After signing of the NSW RFAs, and as at 30 June 2016, a total of 1.4 million hectares (93 per cent) is protected in formal reserves.

Declared Wilderness

A total of 0.93 million hectares of the area of Identified Wilderness in the NSW RFA regions is Declared Wilderness. Prior to signing of the NSW RFAs, a total of 0.92 million hectares was protected in formal reserves. After signing of the NSW RFAs, and as at 30 June 2016, a total of 0.93 million hectares is protected in formal reserves.

Table 1.6 summarises the extent of these three wilderness classes in the NSW RFA regions and the extent that was reserved at various time points before and after the respective RFAs were signed, including the latest area reserved.

International Union for Conservation of Nature wilderness

The IUCN defines Wilderness as:

> *Protected areas that are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.*

The IUCN Protected Areas Category Ib: Wilderness Area is reported through CAPAD. The 2016 CAPAD identified 1.4 million hectares of Category Ib: Wilderness Area across the four NSW RFA regions.

Table 1.7 shows the extent of IUCN Wilderness Area by RFA region, and the extent of formally reserved wilderness within the three types of wilderness identified during the CRA process, as at 30 June 2016 and by RFA region[7].

[7] All figures are for total land area, and include forest and non-forest areas in RFA regions.

Table 1.6 Wilderness area in NSW RFA regions identified in the CRA spatial datasets, by RFA region, and the changes in area in reserves over time

Wilderness classification and RFA region	Area ('000 hectares)							Proportion of total wilderness reserved as at 30 June 2016 (%)
		Area of wilderness in formal reserves, by time period[1]					Wilderness not reserved as at 30 June 2016	
	Total wilderness	Pre-RFA[2]	At 30 June 2001	At 30 June 2006	At 30 June 2011	At 30 June 2016		
Delineated Wilderness (National Wilderness Inventory criteria)[3]								
Upper North East	302	121	249	250	250	**250**	52	83
Lower North East	495	389	455	456	456	**456**	39	92
Southern	860	741	808	808	808	**808**	52	94
Eden	91	86	90	90	90	**90**	1	99
All RFA regions[4]	**1,748**	**1,338**	**1,602**	**1,604**	**1,604**	**1,604**	**144**	**92**
Proportion of total wilderness (%)	100	77	92	92	92	92	8	
Identified Wilderness (*Wilderness Act 1987* (NSW) criteria)[5]								
Upper North East	316	199	271	275	275	**275**	41	87
Lower North East	490	416	447	449	449	**449**	42	92
Southern	556	514	534	534	534	**534**	22	96
Eden	129	114	126	126	126	**126**	3	98
All RFA regions[4]	**1,491**	**1,243**	**1,378**	**1,383**	**1,383**	**1,383**	**108**	**93**
Proportion of total wilderness (%)	100	83	92	93	93	93	7	

Table 1.6 (continued) Wilderness area in NSW RFA regions identified in the CRA spatial datasets, by RFA region, and the changes in area in reserves over time

Wilderness classification and RFA region	Area ('000 hectares)							Proportion of total wilderness reserved as at 30 June 2016 (%)
		Area of wilderness in formal reserves, by time period					Wilderness not reserved as at 30 June 2016	
	Total wilderness	Pre-RFA	At 30 June 2001	At 30 June 2006	At 30 June 2011	At 30 June 2016		
Declared Wilderness (*Wilderness Act 1987* (NSW))[5]								
Upper North East	160	159	160	160	160	**160**	0	100
Lower North East	229	222	225	225	225	**225**	3	99
Southern	481	480	480	480	480	**480**	0	100
Eden[5]	57	57	57	57	57	**57**	0	99
All RFA regions[4]	**927**	**918**	**922**	**922**	**923**	**923**	**4**	**100**
Proportion of total wilderness (%)	100	99	100	100	100	100	0	

Notes:

1. Derived from spatial data for reserves on the national parks estate.
2. Area derived by ABARES from the formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the NSW RFA Scoping Agreement circa 25 January 1996.
3. Derived from National Wilderness Inventory spatial data.
4. Totals may not tally due to rounding
5. Derived from spatial data for reserves on the national parks estate.
6. Area derived by ABARES from the formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the NSW RFA Scoping Agreement circa 25 January 1996.
7. Area derived by ABARES from spatial data associated with wilderness CRA reports from 1998-2000.
8. No spatial data for Declared Wilderness in the Eden region was available for this analysis. Area figure was derived from the Eden wilderness CRA report (NSW NPWS, *Wilderness Assessment – Eden Region A Report undertaken for the NSW CRA/RFA Steering Committee project number NE 25/*EH, 1998, Sydney). Area has been carried across each time period without accounting for potential changes in reservation.

Table 1.7 Area in NSW RFA regions in IUCN Category Ib – Wilderness Area, and areas of formally reserved wilderness in various CRA categories, at 30 June 2016

RFA region	Area ('000 hectares)			
	IUCN Category Ib – Wilderness Area	Delineated wilderness in formal reserves	Identified wilderness in formal reserves	Declared wilderness in formal reserves
Upper North East	324	250	275	160
Lower North East	834	456	449	225
Southern	178	808	534	480
Eden	85	90	126	57
Total	**1,421**	**1,604**	**1,383**	**923**

Source: IUCN Wilderness Area derived by ABARES from CAPAD 2016

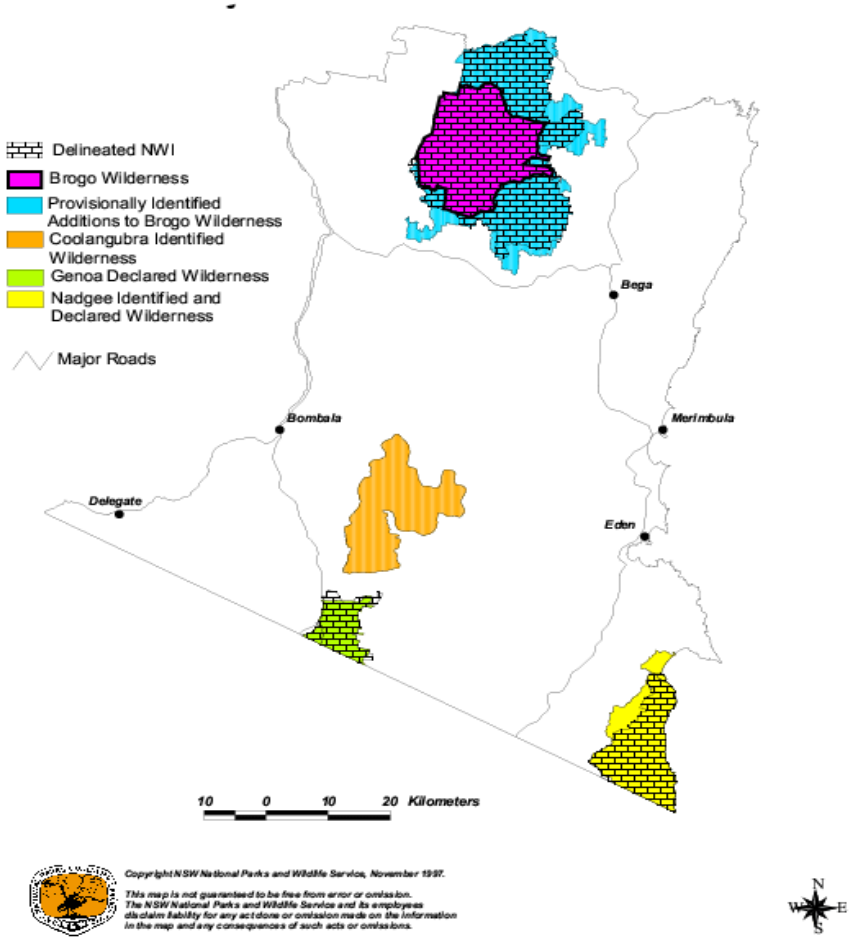

Figure 1.5 Eden RFA region: Provisionally identified and declared wilderness with tenure (May 1998)

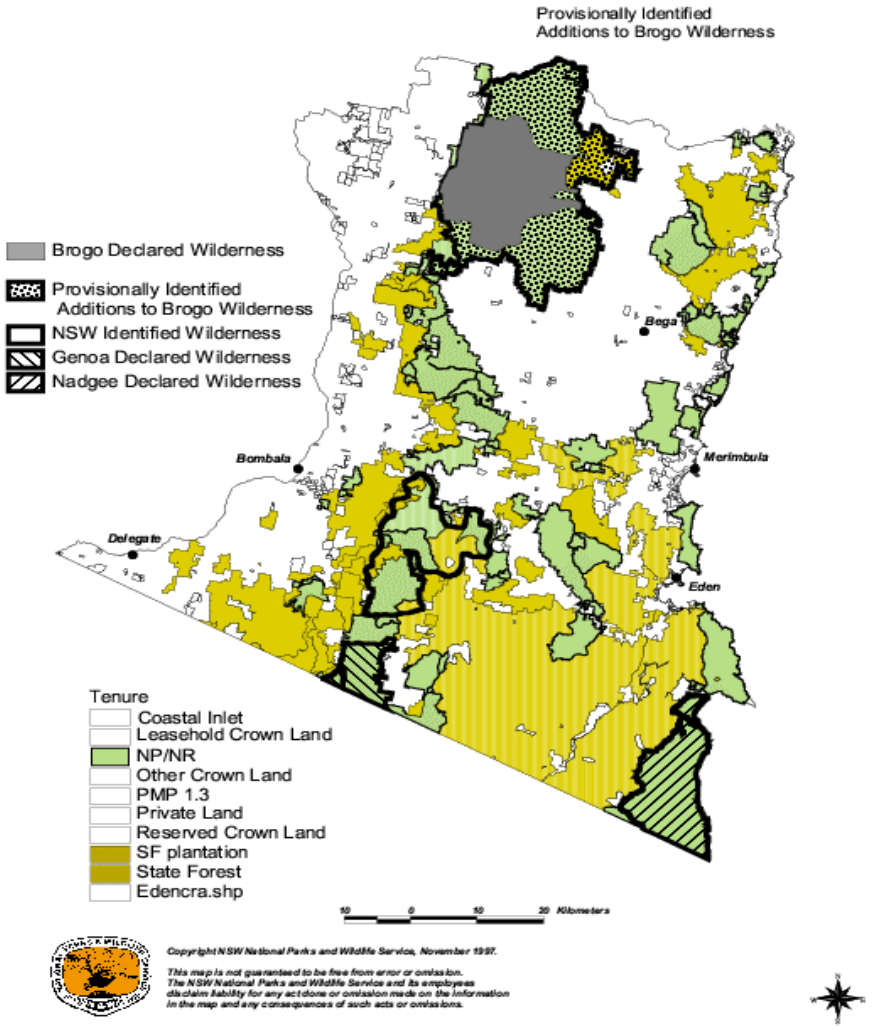

Figure 1.6 Eden RFA region: NSW identified and declared wilderness with delineated NWI (May 1998)

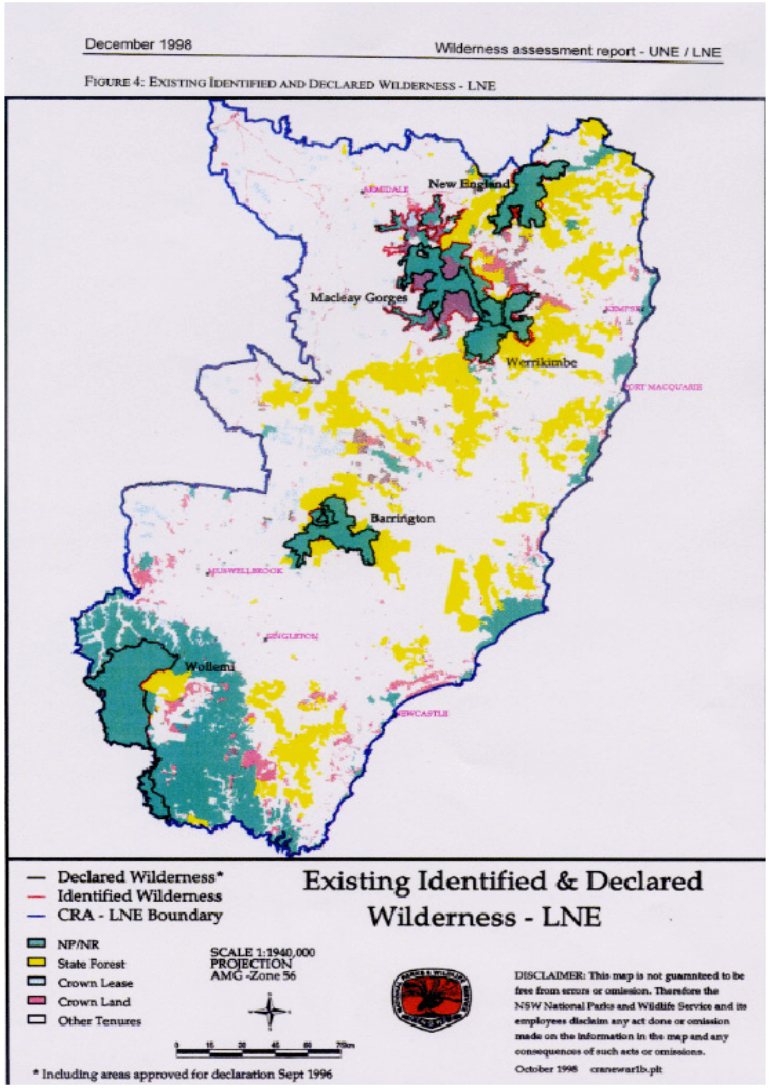

Figure 1.7 Lower North East RFA region: Identified and declared wilderness with tenure (December 1998)

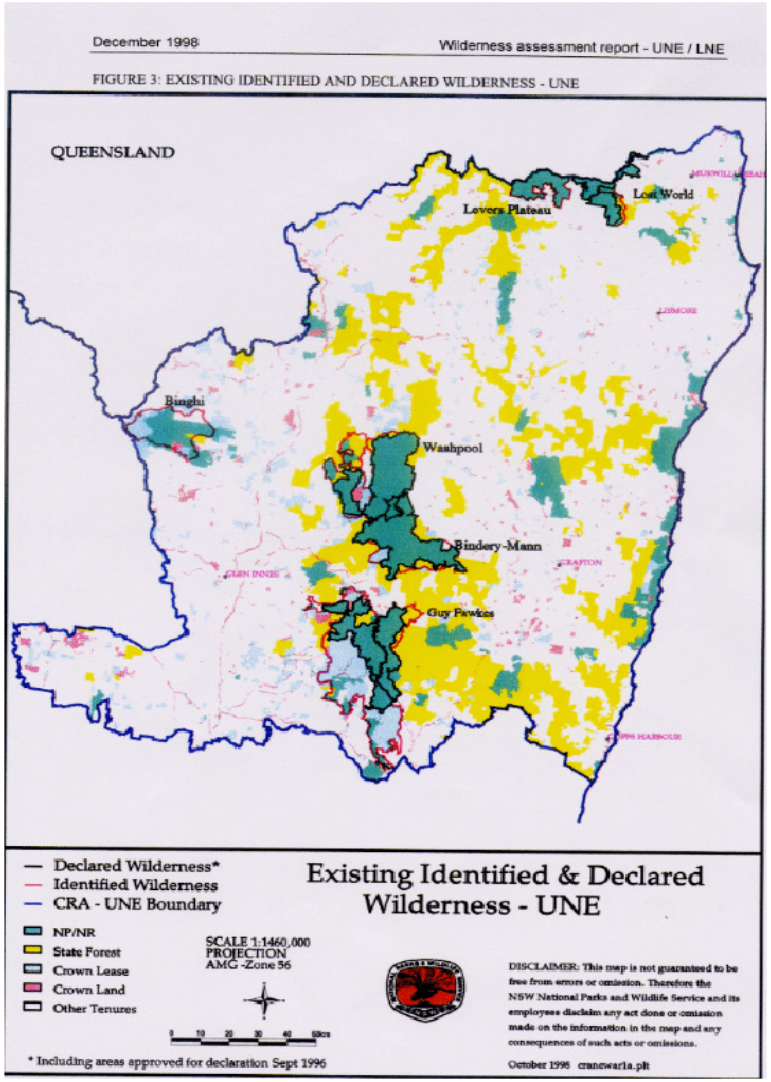

Figure 1.8 Upper North East RFA region: Identified and declared wilderness with tenure (December 1998)

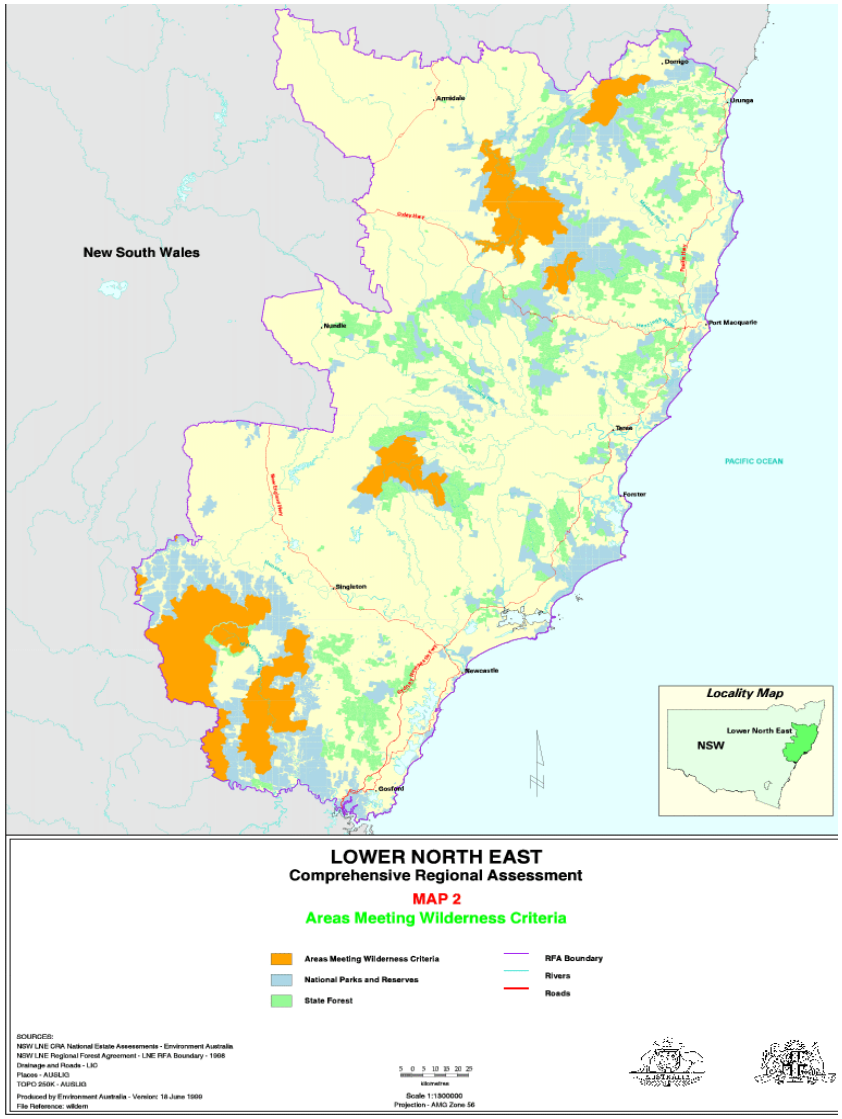

Figure 1.9 Lower North East RFA region: Delineated NWI (December 1998)

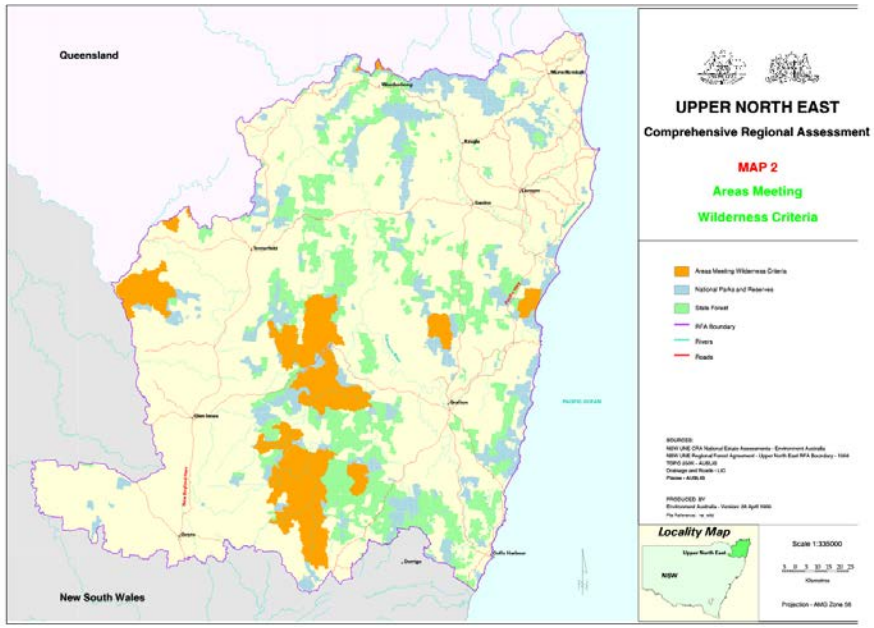

Figure 1.10 Upper North East RFA region: Delineated NWI (December 1998)

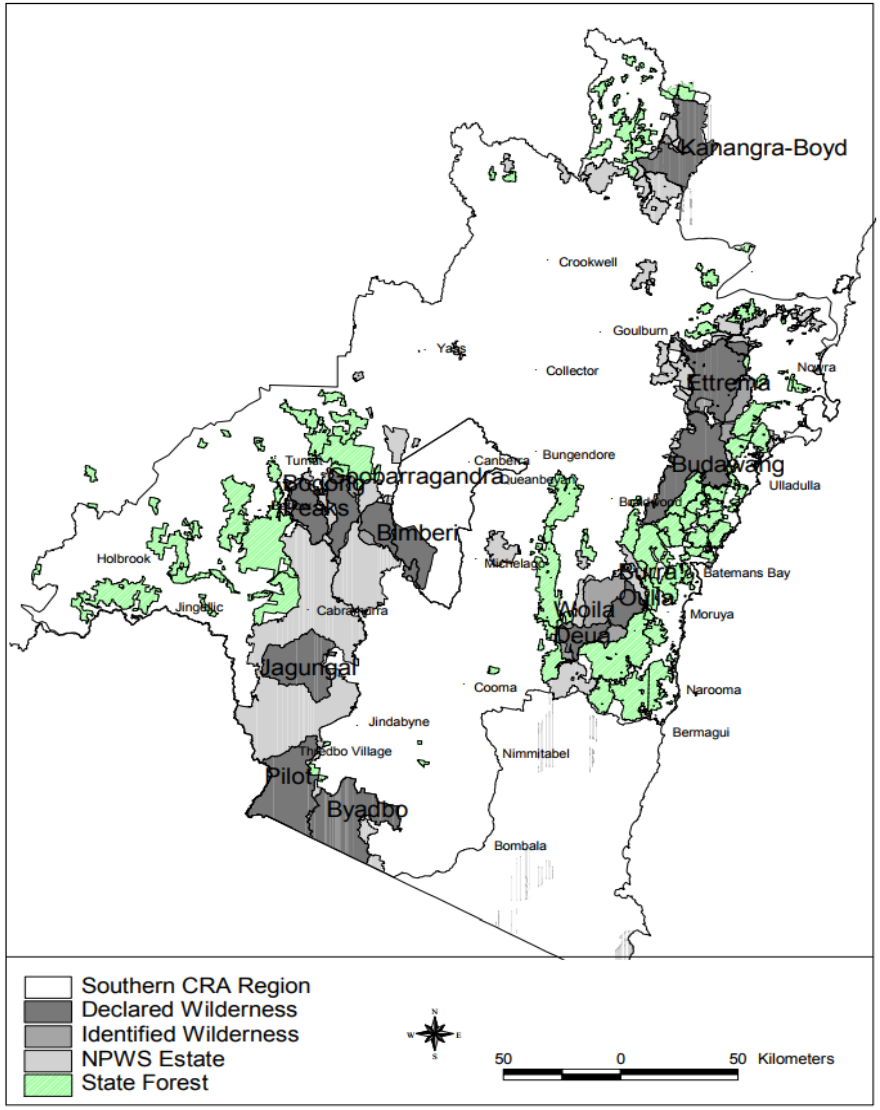

Figure 1.11 Southern RFA region: Identified and declared wilderness with tenure (February 2000)

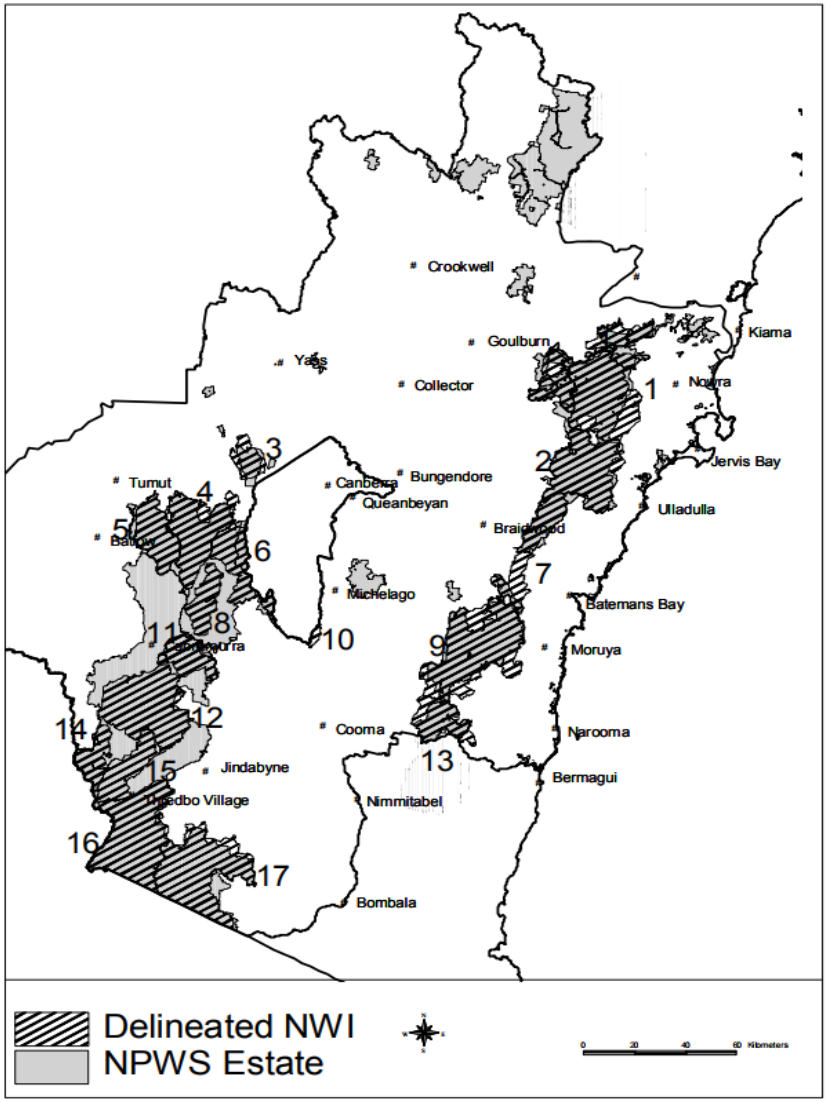

Figure 1.12 Southern RFA region: Delineated NWI (February 2000)

Endangered species values

There are currently 412 threatened species and 8 non-threatened migratory birds listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that are known or likely to occur within the NSW RFA regions (Appendix 2). Almost all listed species (99.5%) have a conservation advice and/or recovery plan to assist recovery. There are also 28 EPBC Act listed threatened ecological communities in the NSW RFA regions (Appendix 2). All have conservation advices, recovery plans or both in place to assist in management and recovery.

There are 13 listed threatening processes affecting threatened species in the NSW RFA regions. National Threat Abatement Plans have been prepared for all listed processes where a plan was considered a feasible, effective or efficient way to abate the processes. This covers 10 of the 13 identified processes.

Since the signing of the first NSW RFA (Eden - 26 August 1999), 81 additional species have been listed as threatened under national legislation.

National Legislation protecting Listed Species and Communities

After the NSW RFAs were signed (1999-2001), new Commonwealth environmental legislation came into force that changed the definition and assessment of threatened species at the national level. The EPBC Act protects Australia's native species and ecological communities by providing for the:

- identification and listing of threatened species and ecological communities
- development of conservation advice and, where appropriate, recovery plans for listed species and ecological communities
- development of a register of critical habitat identification
- recognition of key threatening processes
- development of threat abatement plans where appropriate[8].

Listing and protection processes

The national listing of species and ecological communities follows a rigorous scientific assessment process and involves consultation with stakeholders including scientific experts and the public. Advice on the eligibility of a species or ecological community for listing is provided to the responsible Minister by the independent Threatened Species Scientific Committee.

Listing species or ecological communities recognises their long–term survival is under threat. Once listed a threatened species and ecological community is recognised as a matter of national environmental significance and must be considered in the EPBC Act's assessment and approval provisions.

[8] ABARES, Australia's State of the Forest Report 2013

Conservation advice and recovery plans

Since 2007, a conservation advice is required at the time of listing a threatened species or ecological community. Conservation advices outline the eligibility for listing, and immediate priorities for conservation, research and recovery[9].

For some species and ecological communities, a more comprehensive recovery plan may also be developed to guide recovery action. Recovery plans set out the research and management actions that are necessary to stop the decline of, and support the recovery of, listed threatened species and ecological communities, including the identification of critical habitat[10]. The aim of a recovery plan is to assist the long-term survival in its natural environment of the species or ecological community.

Key threatening processes and threat abatement plans

The listing process for a key threatening processes is similar to the listing of species and ecological communities. A listed key threatening process is not a matter of national environmental significance. Once a key threatening process is listed under the EPBC Act, a threat abatement plan is developed if it is shown to be a 'feasible, effective and efficient way' to abate the threatening process. Threat abatement plans provide for the research, management, and any other actions necessary to reduce the impact of a listed key threatening process on native species and ecological communities.

As with recovery plans, a threat abatement plan can be made by the Minister alone or jointly with relevant states and territories, or the minister can adopt a state or territory plan. Before a plan is made or adopted, there must be public consultation and advice from the Threatened Species Scientific Committee about the plan.

Interaction between the RFAs and the EPBC Act

RFAs provide relevant compliance with requirements within the EPBC Act as they provide for protection of the environment; promote ecologically sustainable development; promote the conservation of biodiversity; and provide for the protection of conservation of heritage.

Section 38 of the EPBC Act streamlines forest planning processes by exempting forest operations in RFA areas from other assessment and approval under the EPBC Act. This means forestry operations that are undertaken in accordance with a RFA do not require approval for the purposes of any provision in Part 3 of the EPBC Act[11]. The exception is forestry operations within World Heritage or Ramsar wetlands sites, where assessment and approval is required. The rationale being the EPBC Act recognises 'that in each RFA region a

[9] DoEE, *Conservation Advices,* www.environment.gov.au/biodiversity/threatened/conservation-advices.html (accessed 24 April 2018).
[10] DoEE, *Recovery Plans*, www.environment.gov.au/biodiversity/threatened/recovery-plans (accessed 24 April 2018)
[11] Explanatory Memorandum, Environment Protection and Biodiversity Conservation Bill 1999 (C'wth), para.[112]

comprehensive assessment has been undertaken to address the environmental, economic and social impacts of forestry operations'[12].

NSW Legislation protecting Listed Species and Communities

When NSW RFAs were signed between 1999 and 2001, NSW threatened species were primarily managed under the *Threatened Species Conservation Act 1995* (NSW) (TSC Act). At this time, and up until 2004, the TSC Act required a recovery plan to be prepared for every threatened species and community listed in the TSC Act.

At a state level, as listings grew, the preparation of individual recovery plans for the large number of species and communities involved proved to be impractical. The costs for preparing recovery plans also varied greatly, estimated to be between $5,000 and $200,000[13], and suggesting inconsistent interpretation of recovery plan requirements. At this point the rate of plan preparation was not keeping pace with new species listings, and government investment in plan preparation was recognised as disproportionate to the investment in recovery and threat abatement actions.

To correct the imbalance between planning and implementation a Priority Action Statement (PAS) was introduced in 2007[14]. While recovery plans continued to be important for high-profile, complex or critically endangered threatened species, around 90% of threatened species in NSW were ultimately managed solely under the PAS.

The PAS contained a list of actions for recovering each threatened species, population and community, and for decreasing each key threat, in NSW. When the PAS was formally approved in 2007, more than 10,000 actions were publicly exhibited. Feedback was used to improve and update the actions.

All PAS actions were documented and made publicly available to support the development and implementation of management programs. Each PAS action was assigned to one of 34 recovery and threat abatement strategies (e.g. habitat management, community liaison). The implementation of PAS actions under each strategy could also be assessed to better understand the types of activities being managed.

In 2017, the *Biodiversity Conservation Act 2016* (NSW) (BC Act) replaced the TSC Act with all current NSW threatened species now listed under the BC Act. Recovery plans do not form part of the BC Act, but existing plans remain a reference source for applicable species.

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[12] Explanatory Memorandum, Environment Protection and Biodiversity Conservation Bill 1999 (C'wth), para.[113]

[13] The conservation and protection of national threatened species and ecological communities, Australian National Audit Office, Department of the Environment and Water Resources, Audit Report No 31, 2007

[14] Review of the NSW Threatened Species Priorities Action Statement, NSW Office of Environment and Heritage, 2013

Under the BC Act, the PAS is replaced by the NSW Biodiversity Conservation Program which outlines current strategies for assisting threatened species, populations and ecological communities.

The Biodiversity Conservation Program (BC Program) consists of:

a. strategies to achieve the objectives of the Program in relation to each threatened species and threatened ecological community
b. a framework to guide the setting of priorities for implementing the strategies
c. a process for monitoring and reporting on the overall outcomes and effectiveness of the Program.

Through the BC Program, the *Saving our Species* program implements strategies through its conservation projects.

Strategies to minimise the impacts of key threatening processes may, but are not required to, be included in the BC Program.

The head of the NSW environment agency is to ensure that a strategy to achieve the objectives of the BC Program in relation to a threatened species or threatened ecological community is included in the BC Program within 2 years after the species or ecological community is listed in the BC Act.

In NSW, the assessment of extinction risk to species and of key threatening processes is undertaken by the NSW Threatened Species Scientific Committee. The NSW Threatened Species Scientific Committee was established under the BC Act and it is an independent committee of scientists appointed by the Minister for the Environment.

The NSW Threatened Species Scientific Committee determines which threatened species, populations of a species and ecological communities should be listed and their risk of extinction and which threats should be listed as key threatening processes using the common assessment method. The common assessment method uses consistent categories and criteria, and is applied at the 'national scale', meaning that all occurrences of the species within Australia are considered in the assessment[15].

Consistent with the BC Program and threat abatement plans under the Saving our Species program, the IFOAs for public lands and Private Native Forestry Codes of Practice (NSW) (PNF Codes) for private lands contain measures designed to mitigate the impact of forestry operations on threatened species and threatened ecological species.

Threatened ecological communities, as listed by the NSW Threatened Species Scientific Committee, are not available for timber harvesting as the *National Parks and Wildlife Act 1974* (NSW) (NPW Act) prohibits the picking or harming of all threatened ecological communities[16]. The current IFOAs do not authorise any forestry operations in threatened

[15] DoEE, *Common Assessment Method*, www.environment.gov.au/biodiversity/threatened/cam (accessed 23 April 2017)

[16] S118A of the NPW Act was revoked in August 2017. The relevant provision is now Clause 2.2 of the BC Act.

ecological communities. As such, the threatened ecological communities mapped by the EPA continue to be unavailable for timber production. Most of these threatened ecological communities have been unavailable for harvesting for over a decade[17].

[17] NSW EPA, Threatened ecological communities mapping, www.epa.nsw.gov.au/your-environment/native-forestry/mapping-research/threatened-ecological-communities-mapping (accessed 30 April 2018)

Indicator 1.2b Status of forest dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment

This indicator measures the conservation status of nationally listed threatened forest dwelling species. Documentation of this information over time allows analysis of changes to species' conservation status indicating the extent to which forest species biodiversity is being maintained.

As of April 2018, there are 412 EPBC Act listed threatened fauna and flora species known or likely to occur within the NSW RFA regions (**Table 1.8**). Appendix 2 details all EPBC listed species which have been recorded within the NSW RFA regions as well as the status of national conservation advices and recovery plans. Appendix 3 details NSW listed threatened species.

Table 1.8 Number of threatened EPBC listed species by RFA region

RFA region	Critically Endangered	Endangered	Vulnerable	Total
Eden	7	30	68	**105**
North East (Upper and Lower)	21	93	180	**294**
Southern	24	60	113	**197**
Total across all RFA regions[1]	**37**	**133**	**242**	**412**

Notes:
[1] Totals are less than the sum of the number for each listed category because many species occur in more than one RFA. Threatened marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Eden RFA

The Eden CRA assessed more than 150 threatened and/or forest dependent flora and 55 fauna species, including the greater glider (*Petauroides volans*), the long footed potoroo (*Potorous longipes*)and the stuttering barred frog(*Mixophyes balbus*). Under the Eden RFA, these species were protected within the CAR reserve system and through prescriptions. For example, the region contains the northern-most occurrence of the endangered long footed potoroo. The Recovery Plan for this species was approved in February 2000 and details specific management actions to assist in recovery. The Eden RFA has assisted in the protection of the long footed potoroo by including almost all of its known habitat within dedicated reserves.

As of April 2018, there were 105 EPBC listed fauna and flora species recorded within the Eden RFA region (**Table 1.9**). Since the signing of Eden RFA on 26 August 1999, 29 species have been added to the threatened species list under the EPBC Act.

Table 1.9 Number of threatened EPBC listed species in the Eden RFA as of April 2018

Type	Critically Endangered	Endangered	Vulnerable	Total
Flora	1	14	32	**47**
Reptile	0	1	2	**3**
Bird	6	8	19	**33**
Mammal	0	4	7	**11**
Frog	0	2	6	**8**
Insect	0	0	0	**0**
Snail	0	0	0	**0**
Freshwater Fish and Crustaceans	0	1	2	**3**
Total	**7**	**30**	**68**	**105**

Notes:
Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Southern RFA

The Southern CRA assessed more than 165 threatened or regionally significant forest-dependent flora species and 69 fauna species. Fauna included the giant burrowing frog (*Heleioporus australiacus*), greater glider(*Petauroides volans*), and tiger quoll (*Dasyurus maculatus*). Flora included the wee jasper grevillea(*Grevillea iaspicula*), and phantom wattle (*Acacia phasmoides*) . Under the RFA, these species were protected within the CAR reserve system and through prescriptions.

As at April 2018, there were 205 listed fauna and flora species recorded within the Southern RFA region, of which 58% are flora species and 42% are fauna species (**Table 1.10**). Since the signing of Southern RFA on 24 April 2001, 58 species have been added to the threatened species list under the EPBC Act.

Table 1.10 Number of threatened EPBC listed species in the Southern RFA as of April 2018

Type	Critically Endangered	Endangered	Vulnerable	Total
Flora	10	39	70	**119**
Reptile	0	3	3	**6**
Bird	8	9	23	**40**
Mammal	0	4	9	**13**
Frog	2	3	6	**11**
Insect	1	0	0	**1**
Snail	0	0	0	**0**
Freshwater Fish and Crustaceans	3	2	2	**7**
Total	**24**	**60**	**113**	**197**

Notes:
Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

North East RFA

The North East CRA assessed more than 109 threatened flora and 144 fauna species. Fauna included the barking owl(*Ninox connivens*), masked owl (*Tyto novaehollandiae)*, southern barred frog(*Mixophyes balbus)*, and yellow bellied glider (*Petaurus australis*). Flora included the hairy quandong (*Elaeocarpus williamsianus*) and species of green hood orchid. Under the RFA, these species are protected within the CAR reserve system and through prescriptions.

As at April 2018, there were 302 listed fauna and flora species recorded within the North East RFA regions, of which 69.5% are flora species and 30.5% are fauna species (**Table 1.11**). Since the signing of North East RFA on 31 March 2000, 59 species have been added to threatened species list under the EPBC Act.

Table 1.11 Number of threatened EPBC listed species in the North East RFA as of April 2018

Type	Critically Endangered	Endangered	Vulnerable	Total
Flora	11	69	130	**210**
Reptile	1	0	9	**10**
Bird	6	12	23	**41**
Mammal	0	3	10	**13**
Frog	0	4	6	**10**
Insect	1	1	0	**2**
Snail	1	1	0	**2**
Freshwater Fish and Crustaceans	1	3	2	**6**
Total	**21**	**93**	**180**	**294**

Notes:
Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Status of Listed Species recovery plans and conservation advice

Of the 412 listed threatened species known or likely to occur within the NSW RFA regions (Appendix 2), 410 have either a conservation advice, recovery plan or both to assist in species recovery (**Table 1.12**). National plans are being finalised for the grey-headed flying fox (*Pteropus poliocephalus*) and the long-nosed potoroo (*Potorous longipes*) (found in all three NSW RFA regions). The eight non-threatened listed migratory birds do not require a conservation advice or recovery plan.

Table 1.12 Status of recovery plans and conservation advices for listed threatened species in the NSW RFA regions

	RFA region			
Status of conservation advice and recovery plans	**Eden**	**Southern**	**North East**	**Total[1]**
Both Conservation advice and Recovery plan approved	10	27	59	80
Conservation advice approved, Recovery plan required	15	30	26	38
Conservation advice approved, Recovery plan not required	33	78	147	202
Recovery plan approved, no Conservation advice	45	60	60	90
Recovery plan in development, no Conservation advice	2	2	2	2
Total number of threatened species	**105**	**197**	**294**	**412**

Notes:
Table excludes non-threatened listed migratory birds as conservation advices and recovery plans not required.
Marine mammals, fish, sharks and migratory birds that are restricted to coastal and marine environments are excluded from the list.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Figure 1.13 shows the distribution of threatened forest-dwelling and forest-dependent fauna and flora species across NSW. The number of listed species per unit area is highest in the coastal areas, where species diversity is also high.

Forest-dwelling species are species that occur in forest vegetation types, although they may also occur outside forests. Forest-dependent species are species that require a forest habitat for at least part of their lifecycles[18].

[18] ABARES, State of the Forest Report 2013

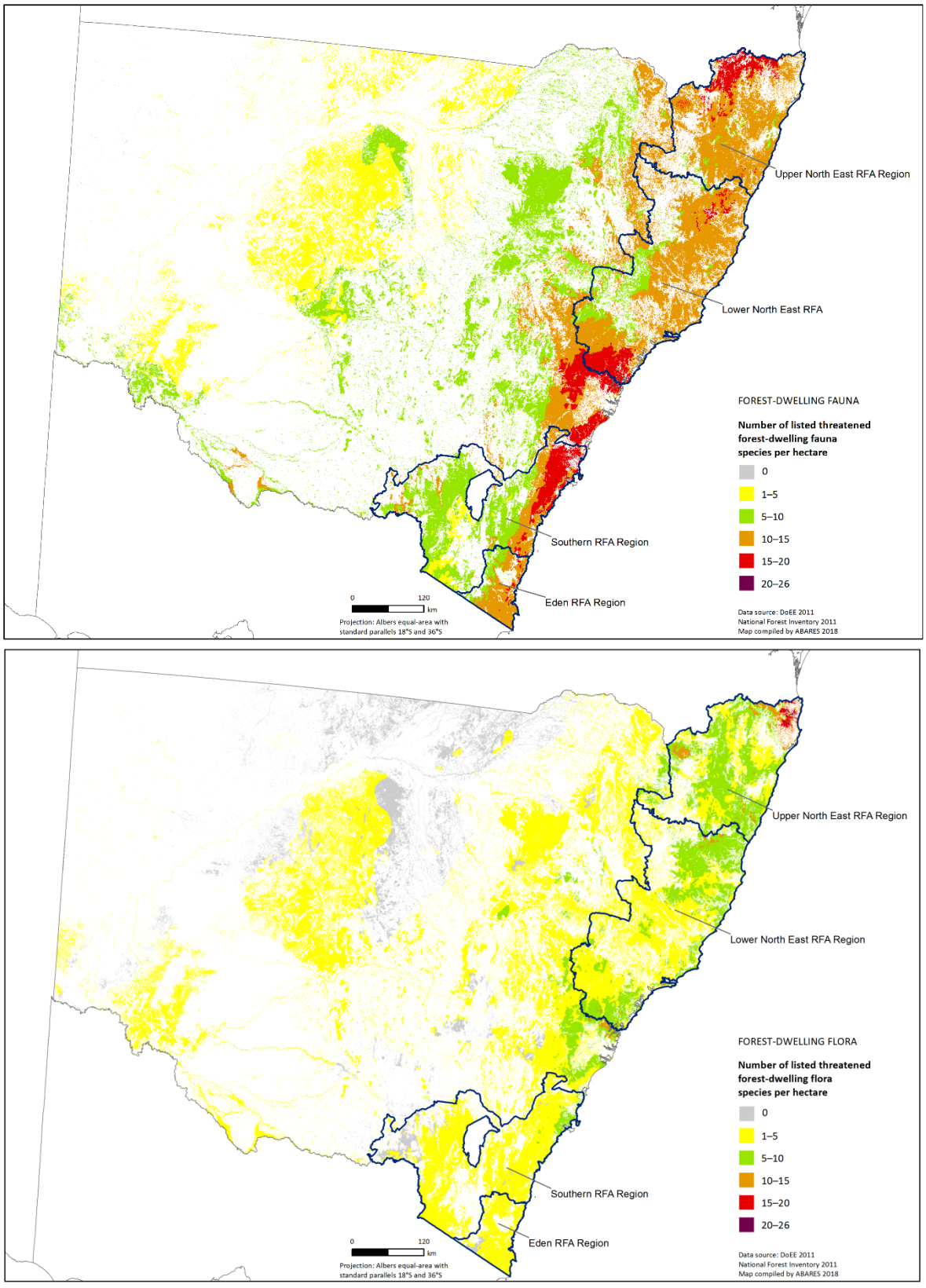

Figure 1.13 Distribution of threatened forest dwelling fauna and flora species in the NSW RFA regions as of 2011

Notes: Map shows the modelled potential coincidence of threatened species listed under the EPBC Act with the 2013 forest extent (National Forest Inventory), including areas where the species are known to occur, areas where they are likely to occur, and areas where they may occur.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

There are 28 ecological communities listed as threatened under the EPBC Act in the NSW RFA regions (**Table 1.13**). All 28 threatened ecological communities were listed between 12 December 2005 and 20 March 2018 after the three NSW RFAs had been signed between 1999 and 2001.

Table 1.13 Number of Threatened Ecological Communities listed under the EPBC Act by RFA regions as at April 2018.

RFA region(s)	Critically Endangered	Endangered	Vulnerable	Total
Eden	5	4	1	10
North East [1]	12	8	1	21
Southern	7	9	1	17
Total[2]	**16**	**11**	**1**	**28**

Notes:
[1] Figures include both Upper and Lower North East RFA regions which are covered by the single North East RFA
[2] Totals are less than the sum of the number for each listed category because many species occur in more than one RFA region.
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Figure 1.14 presents the modelled potential distribution of threatened forest ecological communities, calculated as a summed frequency of the listed threatened forest ecological communities that could occur at a site[19].

[19] As per the State of the Forest Report 2013

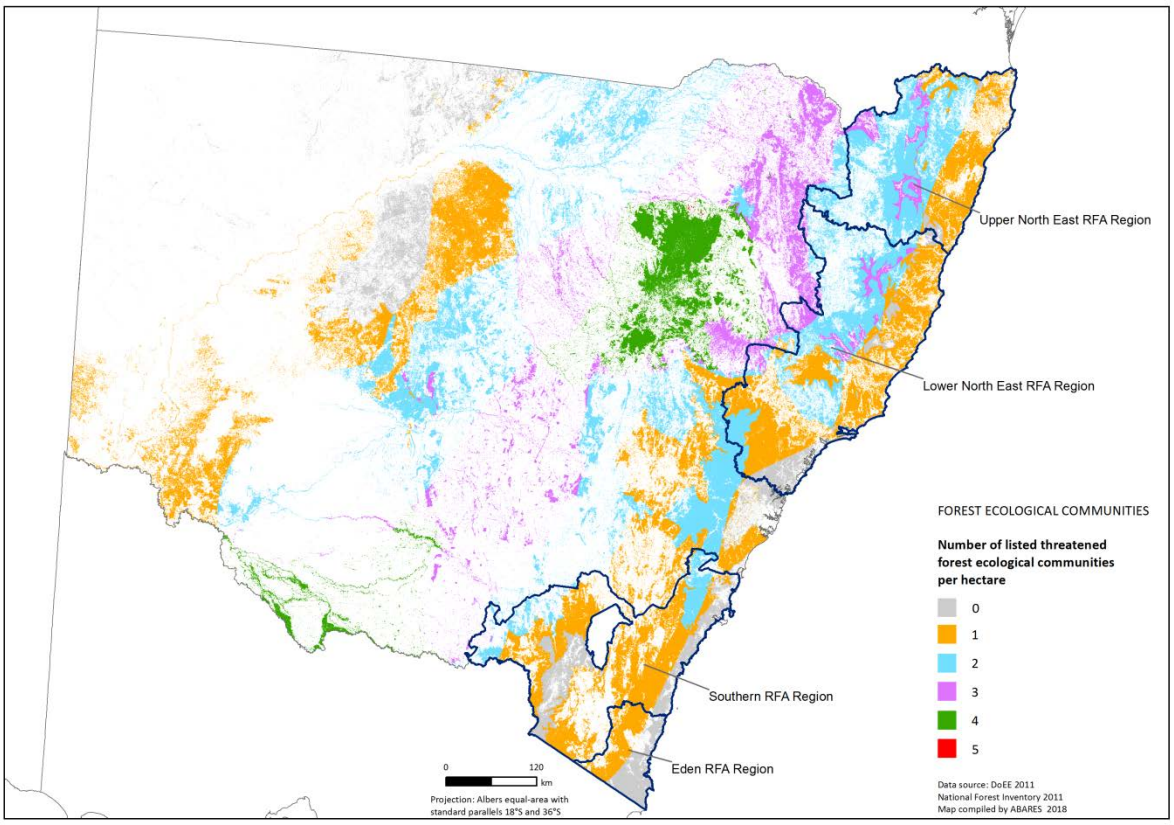

Figure 1.14 Potential distribution of listed ecological communities

Note: Map shows the modelled potential coincidence of threatened ecological communities listed under the EPBC Act with the 2013 forest extent, including areas where the communities are known to occur, areas where they are likely to occur, and areas where they may occur. Some endangered ecological communities are restricted in extent and cannot readily be visualised at the scale of this map.

Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Status of Listed Communities recovery plans and conservation advice

Of the 28 EPBC listed threatened ecological communities within NSW RFA regions (Appendix 2), all have either a conservation advice, recovery plan or both in place to assist in recovery. The Commonwealth Minister for the Environment has determined that for 12 listed communities with conservation advices, recovery plans are also required.

Case Study: Monitoring the response of Koalas to timber harvesting in New South Wales

Koalas (Phascolarctos cinereus) are a cryptic species that are surprisingly difficult to survey, especially in remote, tall forests. This has led to a poor knowledge-base about their status in forested areas distant from population centres. The key threats to Koalas are identified as permanent tree cover loss by land clearing, increased housing around bushland, road traffic, dog attack, prolonged drought and disease (McAlpine et al. 2015). Notwithstanding this, the impact of forest management and timber harvesting on Koalas has been a frequent focus of community discussions about forestry.

In 2015, a joint project between the NSW Department of Primary Industries and the EPA produced a new habitat map to assist with better identifying important Koala habitat in areas proposed for timber harvesting in north east NSW (Law et al. 2017). As part of the field validation of this habitat map, an innovative acoustic method for surveying Koalas was trialled.

The success of this survey method led to new research that has been systematically assessing the status of Koalas in forests and their response to harvesting. Acoustic devices (SongMeters) are set at sites for one week to record male bellows during the breeding seasons. Recordings are scanned by Ecosounds software at the Queensland University of Technology to identify Koala bellows amongst other nocturnal sounds. The key aim of this research is to determine if Koala occupancy varies with harvest intensity and time since harvest.

Acoustic surveys were undertaken between 2015 and 2017, targeting the modelled high quality habitat (Law et al. 2017). This is an extensive area, representing ~ 1.6 million hectares of forested habitat for Koalas in northern NSW. Sites were stratified by known harvest history, including unharvested sites. In total, 170 sites were surveyed making it one of the most comprehensive, regional scale surveys for Koalas in NSW. Preliminary results indicate unexpectedly high occupancy rates (~80 %) across a broad range of forests and amongst all successional ages and harvest intensities. Analysis is proceeding to allow a more comprehensive assessment of the response of Koalas to timber harvesting. Acoustic detection is proving to be a highly successful and efficient technique for recording Koalas in forested areas where traditional surveys have had limited effectiveness. In addition, the three years of data collection will form the basis of an ongoing forest landscape monitoring program for Koalas.

Case Study: Bandicoots on film in forests and heathlands

The southern brown bandicoot (*Isoodon obesulus*) is listed as an endangered species in NSW. Since 2013, infrared cameras have been used to monitor trends in southern brown bandicoot populations in Ben Boyd National Park and Nadgee Nature Reserve in the far south-eastern corner of NSW. Camera monitoring can help establish the impact of environmental management strategies in these reserves, particularly intensive fox control work and ecological burning.

In addition to the target species, the cameras record information about the status of other threatened fauna, including the long-nosed potoroo (*Potorous tridactylus*) and eastern pygmy possum (*Cercatetus nanus*), as well as other species of interest for environmental management, such as the long-nosed bandicoot (*Perameles nasuta*).

Camera monitoring to-date has indicated that the southern brown bandicoot occurs in discrete patches of habitat within each reserve, and has persisted in those patches irrespective of surrounding management activities. This is also the case for the long-nosed bandicoot, which is common and widespread, and the long-nosed potoroo, also relatively widespread. However, monitoring has not been in place for long enough to infer meaningful trends in patterns of occurrence of these species.

Key threatening processes

There are 13 EPBC threatening processes listed under the EPBC Act affecting threatened species in the NSW RFA regions (see **Table 1.14**). The Australian Government has developed threat abatement plans for most of the key threatening processes registered under the EPBC Act.

Table 1.14 Key threatening processes affecting threatened species in NSW RFA regions

EPBC listed key threatening process	Effective listing date	Threat abatement plan date of approval
Competition and land degradation by rabbits	16 July 2000	2016
Competition and land degradation by unmanaged goats	16 July 2000	2008
Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)	16 July 2000	2014
Predation by European red fox	16 July 2000	2008
Predation by feral cats	16 July 2000	2015
Land clearance	4 April 2001	NA - Threat abatement plan not considered a feasible, effective or efficient way to abate the process
Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases	4 April 2001	NA - Commonwealth, States and Territories have actions underway to abate this Key Threatening Process and therefore a threat abatement plan is not considered a feasible, effective or efficient way to abate the process.
Psittacine circoviral (beak-and-feather) disease affecting endangered psittacine species	4 April 2001	2005 (This plan ceased on 1 October 2015, and the Department of Environment and Energy has developed a non-statutory threat abatement advice)
Predation, habitat degradation, competition and disease transmission by feral pigs	6 August 2001	2017
Infection of amphibians with chytrid fungus, resulting in chytridiomycosis	23 July 2002	2016

EPBC listed key threatening process	Effective listing date	Threat abatement plan date of approval
Reduction in biodiversity of Australian native fauna and flora due to the red imported fire ant, *Solenopsis invicta*	2 April 2003	2006 (This plan ceased on 1 October 2016, and may soon be replaced by a new plan)
Biological effects, including lethal toxic ingestion, caused by cane toads (*Bufo marinusa*)	12 April 2005	2011
Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	8 January 2010	NA - In 2009 the Minister for the Environment decided not to have a threat abatement plan for this key threatening process. This decision was reviewed in 2014 and the original decision was upheld.

Note:
NA – Not applicable
Key threatening processes are as listed in the EPBC database.
Source: www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl.

Case Study: Imported red fire ants impact on biodiversity in the NSW RFA regions

The Red Imported Fire Ant (RIFA) is a small colonial ant that is a native of the Pantanal region of Southern Brazil in South America. They damage plants by eating fruit, seeds, tunnelling into stems and girdling seedlings. They also prey heavily on ground invertebrates and attack any slow moving vertebrates such as bird nestlings.[20]

On 28 November 2014, the Commonwealth Department of Agriculture staff at Port Botany detected RIFA during routine surveillance. DNA testing from the one infested site positively confirmed the samples as a new incursion of RIFA into Australia.

Following a successful cross government response, a statistical review of the surveillance conducted at Port Botany concluded that there is a high confidence that there are no further nests within the 2km surveillance zone.

The National Biosecurity Management Group unanimously resolved that movement restrictions at Port Botany could be lifted once prescribed baiting and luring commitments had been fulfilled in 2016.

[20] DoEE, Reduction in impacts of tramp ants on biodiversity in Australian and its territories, www.environment.gov.au/biodiversity/threatened/publications/tap/tramp-ants (accessed 30 April 2018)

Lifting of the movement restrictions allowed businesses and the general public in the Port Botany area to freely move RIFA host material such as soil, plants and timber. This is a significant milestone in the eradication program.[21]

Table 1.15 highlights the EPBC Act listed species found in NSW RFA regions known to be threatened by red imported fire ants. Impacts are being managed by a national threat abatement plan, available on the Department of the Environment and Energy website.

Table 1.15 EPBC listed species at risk from fire ants in NSW RFA regions[22]

Common name	Scientific name	EPBC Listing	RFA region	Reason for risk to fire ants
Plains-wanderer	*Pedionomus torquatus*	Critically Endangered	S	Ground-nesting species.
Eastern Bristlebird	*Dasyornis brachypterus*	Vulnerable	NE	Nest usually near the ground in clumps of grass or small shrubs.
Squatter Pigeon (southern)	*Geophaps scripta scripta*	Vulnerable	NE	Nest in a scrape in the ground.
Black-breasted Button-quail	*Turnix melanogaster*	Vulnerable	NE	Ground birds that live in grasslands (open habitat).
Mallee fowl	*Leipoa ocellata*	Vulnerable	S	This species is a mound-builder and so their eggs and hatching chicks are potentially at risk from fire ant predation.

Notes:
RFA regions: NE – North East, S – Southern, E – Eden
Source: www.environment.gov.au/biodiversity/threatened/key-threatening-processes/reduction-in-native-fauna-and-flora-due-to-red-imported-fire-ant

Case Study: Predation by the European red fox

'Predation by the European red fox (*Vulpes vulpes*) zis listed as a key threatening process under the EPBC Act. Under the EPBC Act, the Australian Government, in consultation with the

[21] www.dpi.nsw.gov.au/biosecurity/insect-pests/fire-ants accessed 29 May 2018
[22] Commonwealth of Australia. 2006. *Threat abatement plan to reduce the impacts of tramp ants on biodiversity in Australia and its territories*, Department of the Environment and Heritage, Canberra

states and territories, developed the Threat Abatement Plan for Predation by the European Red Fox. The threat abatement plan aims to reduce the impact of predation by foxes by:

- Preventing foxes occupying new areas in Australia and eradicating foxes from high-conservation-value 'islands';
- Promoting the maintenance and recovery of native species and ecological communities that area affected by fox predation;
- Improving knowledge and understanding of fox impacts and interactions with other species and other ecological processes;
- Improving the effectiveness, target specificity, integration and humaneness of control options for foxes; and
- Increasing awareness of all stakeholders of the objectives and actions of the threat abatement plan, and of the need to control and manage foxes.

In addition to the national Threat Abatement Plan, the NSW Fox Threat Abatement Plan 2010 establishes priorities for fox control to conserve biodiversity in NSW. At present, intensive across-tenure fox control has been established at more than 50 priority sites over almost 1 million hectares of public and private lands. Monitoring programs have been established to measure the responses of target threatened species, other native fauna and foxes at these sites. Monitoring aims to refine the priorities for control and the methods used over time. The WildCount monitoring program has provided over ten years of monitoring data on the Red Fox, among other animals. WildCount uses motion-sensitive digital cameras at 200 sites across 146 parks and reserves in eastern NSW and looks at trends in occurrence of animals at these sites, to understand if animals are in decline, increasing or stable.

National Estate values

The term *National Estate* refers to places defined in section 4 of the repealed *Australian Heritage Commission Act 1975* (Cth). After the signing of the three NSW RFAs, the *Australian Heritage Commission Act 1975* (Cth) was repealed and the Register of the National Estate was phased out. As a consequence, the RFAs do not reflect the current system of heritage protection under the EPBC Act through the National and Commonwealth Heritage Lists and the *Australian Heritage Council Act 2003* (Cth).

There are 6 places on the National Heritage List and 23 places on the Commonwealth Heritage List within the NSW RFA regions. Most of these places have management plans that outline how the heritage values of the site are protected.

For the past 20 years, the NSW Forest Management Framework has provided for the protection of National Heritage Values of National Heritage Places in accordance with National Heritage Management Principles.

Changes to National Legislation

Closure of the Register of the National Estate

After the NSW RFAs were signed between 1999 and 2001, a new system of national heritage protection was introduced. The Register of the National Estate was a national list of places of natural, historic and Indigenous significance. Each site was identified under the repealed *Australian Heritage Commission Act 1975* (Cth) and the EPBC Act. The Register was maintained by the former Australian Heritage Commission and later the Australian Government between 1975 and 2007.

In 1997, the Council of Australian Governments agreed that it was more appropriate for heritage listing and protection to be the responsibility of the government agencies that were best placed to deliver agreed outcomes. As a result, the *Australian Heritage Commission Act 1975* (Cth) was repealed and the Register of the National Estate was phased out as a statutory list.

The Register was frozen in 2007 and ceased to be a recognised statutory list in February 2012. The Register of the National Estate is maintained on a non-statutory basis as a publicly available archive of information on more than 13,000 places throughout Australia. This list can be publicly accessed on the Australian Heritage Database.

A new national heritage system

The expiration and repeal of parts of the EPBC Act and the *Australian Heritage Council Act 2003* (Cth) relating to the Register of National Estate did not diminish protection of Commonwealth heritage places. These parts were superseded by stronger ongoing heritage protection provisions under national environment law.

National Estate Values are now managed through a combination of the National and Commonwealth Heritage Lists, the NSW Heritage Register and the Heritage Codes of local planning schemes. The National Heritage List includes places of outstanding heritage value

to the nation, and the Commonwealth Heritage List includes heritage places owned or controlled by the Commonwealth.

Commonwealth and National Heritage List assessment

Anyone can nominate a place with significant or outstanding heritage values for the Commonwealth or National Heritage List. The Australian Heritage Council assesses the values of nominated places against set criteria and makes recommendations to the Minister for the Environment about listing. There are two key tools used to assess Commonwealth and National Heritage List nominations: criteria and thresholds. To reach the threshold for the National Heritage List, a place must have 'outstanding' heritage value to the nation. This means that it must be important to the Australian community as a whole. The threshold for inclusion on the Commonwealth Heritage List is local heritage significance.

NSW legislation to protect National Estate Values

The NSW State Heritage Register was created in 1999 and now lists over 1,650 items state-wide, in both private and public ownership. Places identified as being of state significance are protected under the *Heritage Act 1977* (NSW). The *Heritage Act 1977* (NSW) provides for an understanding and conservation of the State's heritage, identification and registration and interim protection of items of state heritage significance, encouraging the adaptive reuse of, and assisting owners with the conservation of items of State heritage significance. This Act constitutes the Heritage Council of New South Wales and confers on it functions relating to the State's heritage.

The State Heritage Register is a list of places and objects of particular importance to the people of NSW. A place or object is state significant if it is important for the whole of NSW. Heritage items may be valued by particular groups in the community, such as Aboriginal communities, religious groups or people with a common ethnic background.

The Heritage Council has developed criteria to help establish whether an item is state significant. Some places and items may not reach the threshold for listing on the State Heritage Register but may be of local heritage significance within a local government area (LGA).

The State Heritage Register lists a diverse range of places, buildings and objects including: Aboriginal places, buildings, objects, monuments, gardens, natural landscapes, archaeological sites, shipwrecks, relics, streets, industrial structures, public buildings, shops, factories, houses, religious buildings, schools, conservation precincts, jetties, bridges and movable items such as church organs and ferries.

The State Heritage Inventory, also maintained by the NPWS, is a list of heritage items in New South Wales including Aboriginal Places, State Heritage Register, Interim Heritage Orders, State Agency Heritage Registers and Local Environmental Plans.

The Heritage Division of the NPWS is directly responsible for maintaining Aboriginal Places and the State Heritage Register.

The NPW Act requires Plans of Management (PoMs) to guide the conservation of biodiversity, rehabilitation of landscapes and the protection of natural and cultural heritage, including protection of world heritage values and management of world heritage properties in a park.

PoMs are maintained by the NPWS, and are legal documents developed to guide how a park will be sustainably managed. They also contain information about the natural environment, Aboriginal heritage, history, and recreational opportunities in a park, and include management principles for use of a park by Aboriginal people for cultural purposes, sustainable visitor or tourist use, natural resource management and land management practices.

NSW Case Study: Sealy Lookout Cultural Shows Highlight Region's Gumbaynggirr Heritage

The Forestry Corporation of NSW (FCNSW) has worked closely with local Aboriginal land councils (LALCs) and traditional owner groups for many years to identify and protect the rich history of Aboriginal cultural heritage in State forests and facilitate access for cultural activities.

In January 2017, a new cultural experience developed by Bularri Muurlay Nyanggan Aboriginal Corporation was announced[23], offering visitors to the award-winning Sealy Lookout and Korora Lookout in Orara East State Forest a unique insight into the region's Aboriginal cultural heritage.

Bularri Muurlay Nyanggan's Clark Webb said "visitors would enjoy more than two hours of songs, dance and bush tucker as well as dreamtime stories about local landforms along a guided walk from Sealy Lookout to Korora Lookout". "The Corporation is focussed on promoting Gumbaynggirr language and culture, and these cultural showcases are a fantastic opportunity for us to share some of our language and heritage with the local community as well as with visitors to our region".

The views from Sealy Lookout and Korora Lookout take in many landforms that have significance in Gumbaynggirr culture, so they are ideal locations to introduce people to our history and share some of our stories about these special places.

Visitors have commented that they had an enjoyable and welcoming experience that provides a unique insight into local Aboriginal language, songs and culture, and that it was a remarkable experience and rare opportunity to embrace Gumbaynggirr culture.

[23] www.forestrycorporation.com.au/about/releases/cultural-shows

Indicator 6.4b Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values

This indicator measures and monitors management regimes for non-Indigenous cultural values, such as historical, research, education, aesthetic, and social heritage values. Maintaining these values is integral to the protection of non-Indigenous peoples values associated with forests.

Across NSW, 2,225,000 hectares of forested land is on sites included in the Non-Indigenous Heritage Sites of Australia dataset[24] (**Figure 1.15**). The current places in NSW RFA regions on the National Heritage List and the Commonwealth Heritage List are provided in **Table 1.16** and **Table 1.17**.

[24] Source: ABARES

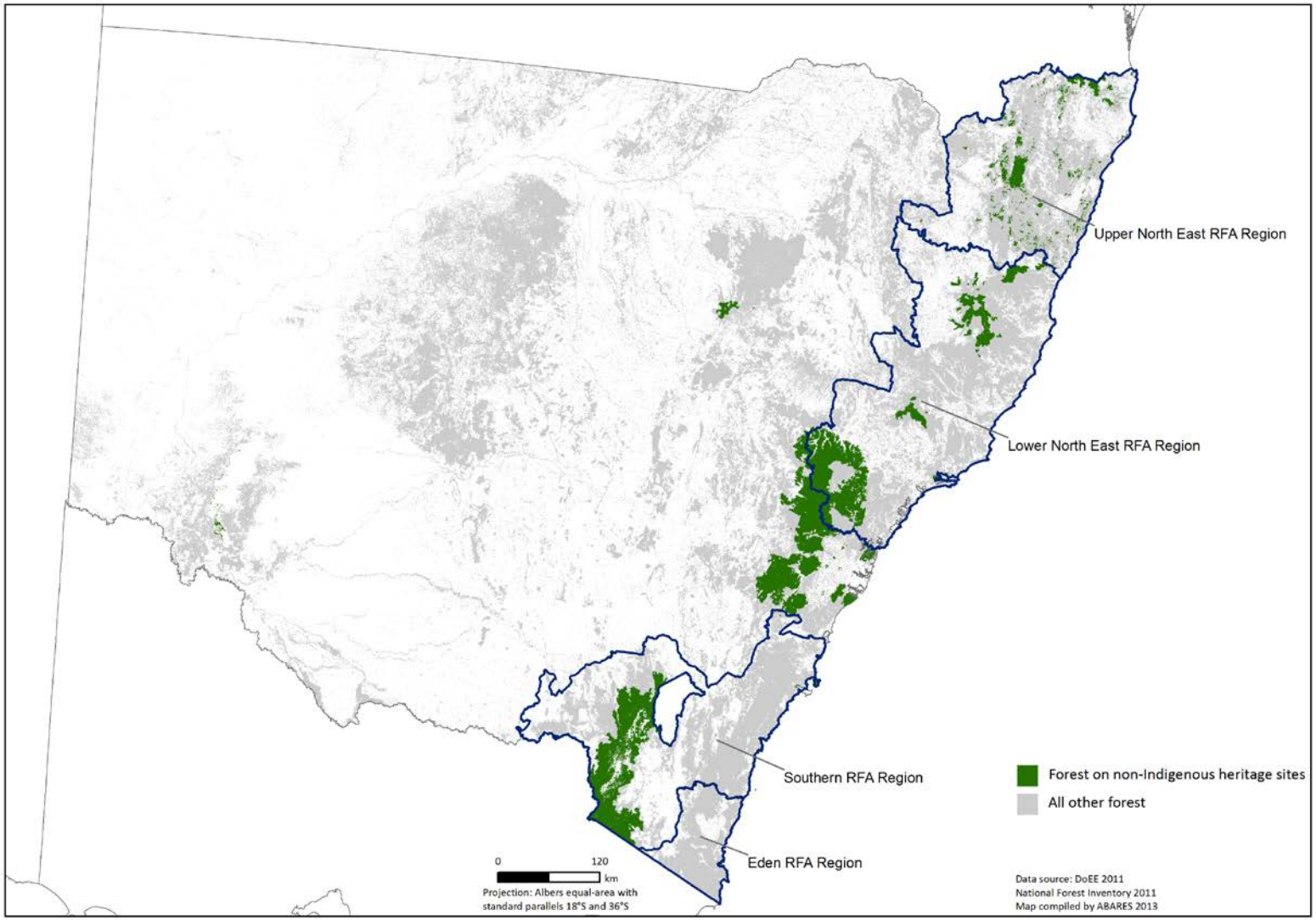

Figure 1.15 Forests on sites included in the Non-Indigenous Heritage Sites of Australia database

Table 1.16: NSW National Heritage List places

Name	Type	RFA area	Listing date
Gondwana Rainforests of Australia*	Natural	NE	21/5/2007
The Greater Blue Mountains Area (GBMWHA)*	Natural	NE, S	21/5/2007
Australian Convict Sites (Old Great North Road)*	Natural	NE	1/8/2007
Snowy Mountains Scheme	Historic	S	14/10/2016
Australian Alps National Parks and Reserves	Natural	S	7/11/2008
Ku-ring-gai Chase National Park, Lion and Spectacle Island Nature Reserves	Natural	NE	15/12/2006

Notes:
RFA region: S – Southern, NE – North East, E – Eden
* Places are also a World Heritage property

Table 1.17: NSW Commonwealth Heritage List places

Place	Type	RFA area	Listing date
Armidale Post Office	Historic	NE	8/11/2011
Beecroft Peninsula	Natural	S	22/06/2004
Bundanon Trust Property	Historic	S	21/09/2015
Fort Wallace	Historic	NE	22/06/2004
Googong Foreshores Cultural and Geodiversity Heritage Areas	Historic	S	3/11/2017
Hunter River Lancers Training Depot	Historic	NE	22/06/2004
Kempsey Post Office	Historic	NE	8/11/2011
Kiama Post Office	Historic	S	8/11/2011
Macksville Post Office	Historic	NE	8/11/2011
Maitland Post Office	Historic	NE	8/11/2011
Murinbin House Group	Historic	NE	22/06/2004

Place	Type	RFA area	Listing date
Muswellbrook Post Office	Historic	NE	8/11/2011
Nobbys Lighthouse	Historic	NE	22/06/2004
Point Perpendicular Light-station	Historic	S	22/06/2004
Scone Post Office	Historic	NE	22/08/2012
Smoky Cape Lighthouse	Historic	NE	22/06/2004
Sugarloaf Point Lighthouse	Historic	NE	22/06/2004
Tumut Post Office	Historic	S	22/08/2012
Williamtown RAAF Base Group	Historic	NE	22/06/2004
Wingham Post Office	Historic	NE	22/08/2012
Yass Post Office	Historic	S	8/11/2011

Notes:
RFA region: S – Southern, NE – North East, E – Eden

World Heritage values

There are three World Heritage properties located within the NSW RFAs regions (**Table 1.18**). These are managed cooperatively by the NSW and Australian Governments in accordance with the Australian World Heritage Intergovernmental Agreement.

All three World Heritage properties have Statements of Outstanding Universal Value that describe the listed World Heritage values of each property. They also have comprehensive management/strategic plans that provide broad management principles for the area, and establish the framework for the integrated management, protection, interpretation and monitoring of the properties.

World Heritage properties are managed separately from processes put in place by the NSW RFAs, and are protected by Part 3 of the EPBC Act. The Australian and NSW Governments will continue to participate in the assessment and protection of any future World Heritage places consistent with the Australian World Heritage Intergovernmental Agreement.

Legislative protection of World Heritage values

The UNESCO World Heritage Convention 1972 establishes a list of places that have natural and/or cultural values of outstanding global significance. As a signatory to the convention, Australia has an obligation to identify, protect and conserve places on the World Heritage List[25].

Under the EPBC Act, World Heritage properties are matters of national environmental significance. The EPBC Act therefore provides protection for World Heritage properties by ensuring that an assessment process is undertaken for proposed actions (including forestry operations) that will, or are likely to, have a significant impact on the World Heritage values of a declared world heritage property. This process allows the Commonwealth Minister for the Environment to grant or refuse approval to take an action, and to impose conditions on the taking of an action within a world heritage property. The EPBC Act also provides for the preparation of management plans which set out the significant heritage aspects of the place and how the values of the site will be managed.

The exemption of forestry operations in RFAs from other Commonwealth assessment and approval requirements under section 38 of the EPBC Act does not apply to operations within World Heritage properties or Ramsar wetland sites[26].

World Heritage listing

To be inscribed on the World Heritage list, properties must demonstrate outstanding universal value and meet at least one of the ten selection criteria. These criteria are based on cultural heritage and natural heritage as defined in the World Heritage Convention.

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[25] DoEE, Australian World Heritage laws, www.environment.gov.au/heritage/laws/world (accessed 26 April 2018)

[26] See section 42 of the EPBC Act.

Only the Australian Government can nominate Australian places for inclusion on the World Heritage List. The World Heritage Committee assesses nominated places against the set criteria and makes the final decision as to the places that are included on the World Heritage List.

NSW World Heritage sites

There are 6 World Heritage properties in NSW, of which three are located in or partly in the North East RFA regions (**Table 1.18**). Both the Greater Blue Mountains Area and Australian Convict Sites (Old Great North Road) World Heritage properties were listed after the signing of the North East RFA on 31 March 2000. There are no World Heritage properties currently within the Southern or Eden RFA regions (**Figure 1.16**).

Table 1.18 World Heritage properties located in NSW RFA regions

World Heritage site	RFA region	Class	Effective Date
1. Gondwana Rainforests of Australia	NE	Natural	17/12/1994
2. The Greater Blue Mountains Area	NE	Natural	3/12/2000
3. Australian Convict Sites (Old Great North Road)	NE	Cultural	31/7/2010

Note: NE includes both Upper and Lower North East RFA regions

The Gondwana Rainforests of Australia

The Gondwana Rainforests of Australia is a serial, cross-jurisdictional site comprising the major remaining areas of rainforest in southeast Queensland and northeast New South Wales. It was added to the World Heritage List in November 1986, under its original name 'Australian East Coast Temperate & Subtropical Rainforest Park'. The Gondwana Rainforests represents outstanding examples of major stages of the Earth's evolutionary history, ongoing geological and biological processes, and exceptional biological diversity. A wide range of plant and animal lineages and communities with ancient origins in Gondwana, many of which are restricted largely or entirely to the Gondwana Rainforests, survive in this collection of reserves. The Gondwana Rainforests also provides the principal habitat for many threatened species of flora and fauna.

Greater Blue Mountains World Heritage Area

The Greater Blue Mountains World Heritage Area (GBMWHA) is a deeply incised sandstone tableland that encompasses 1.03 million hectares of eucalypt-dominated landscape just inland from Sydney. The GBMWHA was inscribed on the World Heritage List in 2000 and included on the National Heritage List on 21 May 2007. Spread across eight adjacent conservation reserves, it constitutes one of the largest and most intact tracts of protected bushland in Australia. It also supports an exceptional representation of the taxonomic, physiognomic and ecological diversity that eucalypts have developed: an outstanding illustration of the evolution of plant life. A number of rare and endemic taxa, including relict

flora such as the Wollemi pine, also occur here. The geology and geomorphology of the area, which includes 300 metre cliffs, slot canyons and waterfalls, provides the physical conditions and visual backdrop to support these outstanding biological values.

Australian Convict Sites (Old Great North Road)

The Old Great Northern Road is part of the Australian Convicts Sites World Heritage property listed in 2010. It is one of the 11 Australian Convict Sites that comprise the World Heritage property. The Old Great North Road is a significant example of major public infrastructure developed using convict labour. Situated in its unaltered natural bushland setting, the Old Great North Road is the best surviving example of an intact convict-built road with massive structural works, which remains undisturbed by later development.

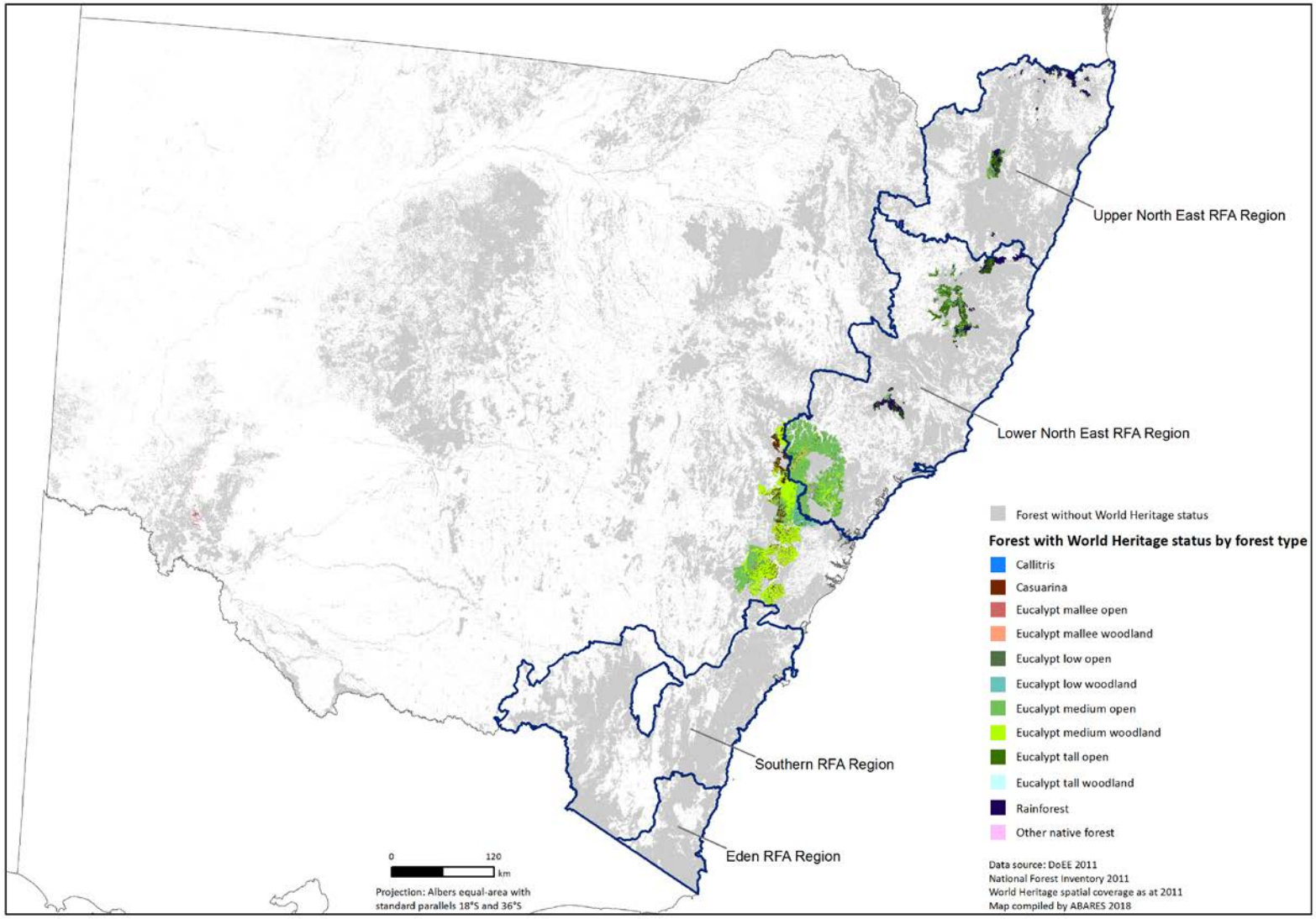

Figure 1.16 Native forest areas with World Heritage status within the NSW RFA regions

Extent of NSW World Heritage sites

Approximately 1,348,000 hectares of NSW's native forests are within World Heritage sites (equivalent to 5.9% of total forest in NSW). NSW has the highest proportion of forest within World Heritage sites of any state or territory in Australia (ABARES 2013).

Table 1.19 Area of native forest in World Heritage areas

Forest type	NSW Area of forest in World Heritage areas ('000 hectares)	Australia Area of forest in World Heritage areas ('000 hectares)
Acacia	0	17
Callitris	1	1
Casuarina	66	93
Eucalypt	1,113	2,637
Eucalypt mallee open	9	9
Eucalypt mallee woodland	8	8
Eucalypt low closed	0	1
Eucalypt low open	8	91
Eucalypt low woodland	35	121
Eucalypt medium closed	0	12
Eucalypt medium open	568	1,152
Eucalypt medium woodland	348	903
Eucalypt tall closed	0	0
Eucalypt tall open	137	308
Eucalypt tall woodland	0	32
Mangrove	0	77
Melaleuca	0	111
Rainforest	135	1,151

Forest type	NSW Area of forest in World Heritage areas ('000 hectares)	Australia Area of forest in World Heritage areas ('000 hectares)
Other native forest	33	201
Total forest in World Heritage areas	**1,348**	**4,286**
Total forest in each jurisdiction	**22,681**	**124,751**
World Heritage area forest as proportion of total forest in each jurisdiction (%)	**5.9**	**3.4**

Note: For this indicator data is only available at the State level.

Biodiversity Values

Biodiversity is the name given to the variety of living things, the different flora, fauna and organisms, the genetic information they contain and the ecosystems they form. Biodiversity values were fundamental in establishing a comprehensive, adequate and representative CAR reserve system under NSW RFAs and were a focus of the related CRAs.

The National Reserve System (NRS) is Australia's network of public, Indigenous and private protected areas over land and inland freshwater. Its focus is to secure long-term protection for samples of Australia's diverse ecosystems and the plants and animals they support. The NRS includes the protected areas and reserves established and effectively managed through the collective efforts of the Australian Government, the states, territories, local government, Indigenous and private landholders and non-government organisations.

Indicators of biodiversity value can include the number and diversity of flora and fauna species, ecological communities and forest types. These indicators take into account the range of flora and fauna species and communities, and the reserves established to protect biodiversity.

Indicator 1.1a Area of forest by forest type and tenure

Area of forest, by forest type

Comprehensive Regional Assessment

The extent of Forest Ecosystems reported in the NSW RFA regions was identified through the CRA process between 1995 and 2000, and has not been updated since that time.[27].

Spatial data and related data tables associated with the NSW RFAs reported a total of 8.32 million hectares of Forest Ecosystems for all NSW RFA regions. By RFA region, 3.17 million hectares are in the Lower North East region, 2.45 million hectares in the Southern region, 2.17 million hectares in the Upper North East region and 533 thousand hectares in the Eden Region (**Table 1.20**).

[27] Further information on the CRA Forest Ecosystems classification and mapping projects for the RFA regions can be found at agriculture.gov.au/forestry/policies/rfa/regions/new-south-wales

Table 1.20 CRA Forest Ecosystem area in NSW RFA regions

Forest category	Area, by RFA region[1] ('000 hectares)				
	Upper North East	Lower North East	Southern	Eden	**Total**
Forest Ecosystems	2,167	3,175	2,446	533	**8,320**

Source: ABARES

Notes:

[1]Area derived by ABARES from spatial data associated with the Forest Ecosystem CRA reports published in 1998-2000 and RFA data tables published in 1999-2001

Totals may not tally due to rounding

Australia's State of the Forests Report 2013

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), under the auspices of the National Forest Inventory (NFI), collects and communicates information on Australia's forests. The NFI collects and collates data from Commonwealth, state and territory government agencies and authorities, and from private land managers. These data are reported nationally, primarily in the Australia's State of the Forests Report (SOFR) series published every five years, most recently *Australia's State of the Forests Report 2013* (SOFR 2013)[28].

Prior to SOFR 2013, national forest area was derived from direct compilation of state and territory datasets of varying scales and completeness, and using different data collection methods, and is not included in this analysis.

For SOFR 2013, the NFI introduced a new, more rigorous and national technique for identifying forest area, called the Multiple Lines of Evidence approach. This technique analyses multiple forest cover datasets from national and state sources, including remotely sensed datasets, to delineate forest extent with improved accuracy. This methodology is different from the process undertaken to assemble the forest coverage for the NSW RFA CRAs, and uses different input datasets with a different time-stamp, so the NFI area figures and the CRA area figures cannot be compared.

For SOFR 2013, the NFI recognised three main categories of forest: 'Native forest', 'Industrial plantation' and 'Other forest'. Native forest comprises eight native forest types named after genus or structural form. Industrial plantation comprises three plantation types and includes only plantations grown on commercial scale for wood production. 'Other forest' includes non-commercial plantations and other forests planted for various purposes. The spatial forest extent dataset prepared for SOFR 2013 was published by ABARES as *Forests of Australia (2013) v2.0*.

[28] MIG (Montréal Process Implementation Group for Australia) & NFISC (National Forest Inventory Steering Committee) 2013, *Australia's State of the Forests Report 2013*. Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES), Canberra

NFI forest extent as prepared for SOFR 2013, by forest type

The NFI forest extent as prepared for SOFR 2013 across the four NSW RFA regions shows a total forest area of 9.59 million hectares, with 9.28 million hectares of Native forest, 286 thousand hectares of Industrial plantation and 30 thousand hectares of Other forest. **Table 1.21** shows the SOFR 2013 forest extent, by forest category for each RFA region. **Table 1.22** shows the SOFR 2013 forest extent, by forest type for each RFA region.

As noted above, differences in forest area figures reported between CRA reports (as sum of the Forest Ecosystem areas, **Table 1.20**) and SOFR 2013 (**Table 1.21** and **Table 1.22**) are the result of different collection and processing methodologies. The native forest area reported in **Table 1.21** and **Table 1.22** does not necessarily represent an actual change in forest area but a realistic indication of the forest area extent within forest ecosystems of the NSW RFA regions.

Table 1.21 NFI forest area as prepared for SOFR 2013 in NSW RFA regions, by NFI forest category

	Area, by RFA region[1] ('000 hectares)				
Forest category	Upper North East	Lower North East	Southern	Eden	**Total**
Native forest	2,435	3,685	2,595	562	**9,278**
Industrial plantations	74	40	133	40	**286**
Other forest	8	17	4	2	**30**
Total forest	**2,518**	**3,742**	**2,732**	**603**	**9,595**

Notes:[1] Area derived by ABARES from *Forests of Australia (2013) v2.0*

Totals may not tally due to rounding

Table 1.22 NFI forest area as prepared for SOFR 2013 in NSW RFA regions, by NFI forest category and forest type

Forest type	Area, by RFA region[1] ('000 hectares)				
	Upper North East	Lower North East	Southern	Eden	**Total**
Acacia	2	10	24	21	**57**
Callitris	97	2	0	0	**99**
Casuarina	6	6	41	34	**87**
Eucalypt	1,892	2,717	2,266	479	**7,354**
Mangrove	1	9	3	1	**13**
Melaleuca	24	40	4	0	**68**
Rainforest	169	321	49	9	**548**
Other native forest	244	581	209	18	**1,051**
Total native forest	**2,435**	**3,685**	**2,595**	**562**	**9,278**
Softwood	15	11	133	38	**197**
Hardwood	57	27	0	2	**86**
Unknown or mixed species	2	1	0	0	**3**
Total Industrial plantations	**74**	**40**	**133**	**40**	**286**
Other forest	**8**	**17**	**4**	**2**	**30**
Total forest	**2,518**	**3,742**	**2,732**	**603**	**9,595**

Notes: [1] Area derived by ABARES from *Forests of Australia (2013) v2.0*

Totals may not tally due to rounding

Area of forest, by tenure

Comprehensive Regional Assessment

Spatial data and related data tables associated with the NSW RFAs reported a total of 8.32 million hectares in Forest Ecosystems for all NSW RFA regions, of which 4.74 million hectares (57 per cent) are on public land and 3.58 million hectares (43 per cent) are on private and leasehold land. **Table 1.23** shows the area of Forest Ecosystems separately by public land and by private and leasehold land for each RFA region.

Table 1.23 CRA Forest Ecosystem area, by tenure in NSW RFA regions

Forest Ecosystem tenure	Area, by RFA region[1] ('000 hectares)					Proportion of total Forest Ecosystem area (%)
	Upper North East	Lower North East	Southern	Eden	**Total**	
Public	973	1,740	1,618	408	**4,739**	57
Private and leasehold	1,194	1,435	828	125	**3,582**	43
Total	2,167	3,175	2,446	533	**8,320**	100

Notes: [1]Area derived by ABARES from spatial data associated with the Forest Ecosystem CRA reports published in 1998-2000 and RFA data tables published in 1999-2001. Based on the best available data at signing of RFA.

Totals may not tally due to rounding

Australia's State of the Forests Report 2013

Australia's SOFR series reports forest tenure, or ownership, by six classes that condense the wide range of state and territory tenure systems. The six classes are:

- Leasehold forest,
- Multiple-use public forest,
- Nature conservation reserve,
- Other Crown land,
- Private forest (including Indigenous), and
- Unresolved tenure.

The spatial forest tenure dataset prepared for SOFR 2013 was published by ABARES as *Forests of Australia (2013) v2.0*.

NFI forest extent as prepared for SOFR 2013, by forest tenure

The NFI forest extent as prepared for SOFR 2013, extracted by the four NSW RFA regions, shows a total forest area of 9.59 million hectares, including 3.97 million hectares in private forest (41 per cent), 3.52 million hectares (37 per cent) in nature conservation reserves, 1.70 million hectares (18 per cent) in multiple-use public forests and 0.38 million hectares (4 per cent) in leasehold forest with negligible areas in other Crown lands and unresolved tenure. **Table 1.24** shows the NFI forest extent as prepared for SOFR 2013, by forest tenure class for each RFA region.

As noted above, differences in forest area figures reported between CRA reports (as sum of the Forest Ecosystem areas, **Table 1.23**) and SOFR 2013 (**Table 1.24**) are the result of different collection and processing methodologies. The native forest area reported in **Table 1.24** does not necessarily represent an actual change in forest area but a realistic indication of the forest area extent within forest ecosystems of the NSW RFA regions.

Table 1.24 NFI forest area as prepared for SOFR 2013 in NSW RFA regions, by forest tenure

Forest tenure class	RFA region ('000 hectares)					Proportion of total RFA forest area (%)
	Upper North East	Lower North East	Southern	Eden	**Total**	
Leasehold forest	130	116	133	6	**384**	4.0
Multiple-use public forest	499	513	477	213	**1,701**	17.7
Nature conservation reserve	650	1,335	1,284	250	**3,519**	36.7
Other Crown land	5	11	3	1	**20**	0.2
Private forest (Including Indigenous)	1,234	1,767	835	134	**3,970**	41.4
Unresolved tenure	1	0	0	0	**1**	0.0
Total forest	**2,518**	**3,742**	**2,732**	**603**	**9,595**	**100.0**

Notes: [1] Area derived by ABARES from *Tenure of Australia's Forests (2013) v2.0*

Totals may not tally due to rounding

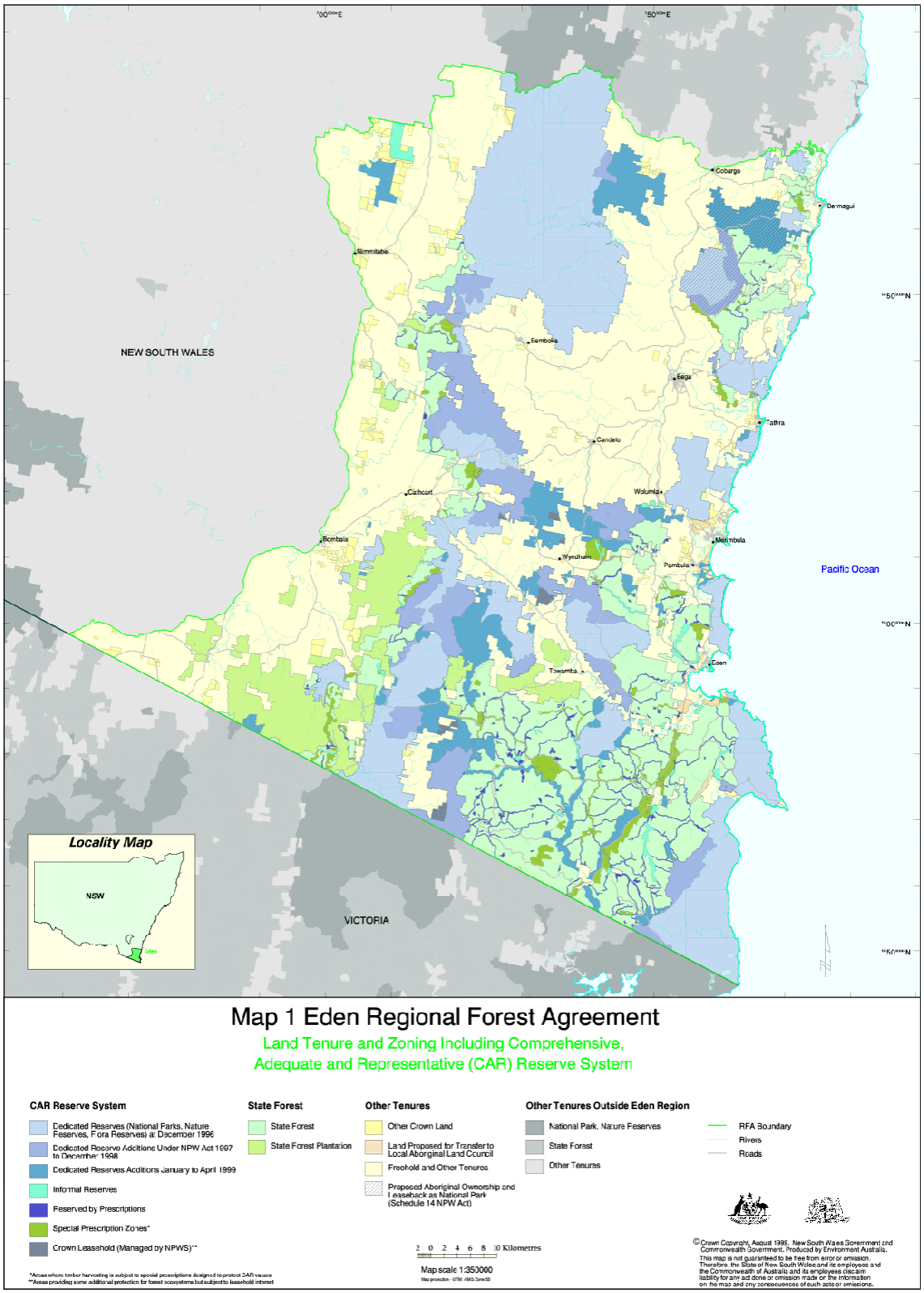

Figure 1.17 Eden RFA region by land type and tenure (from NSW CRA August 1998)

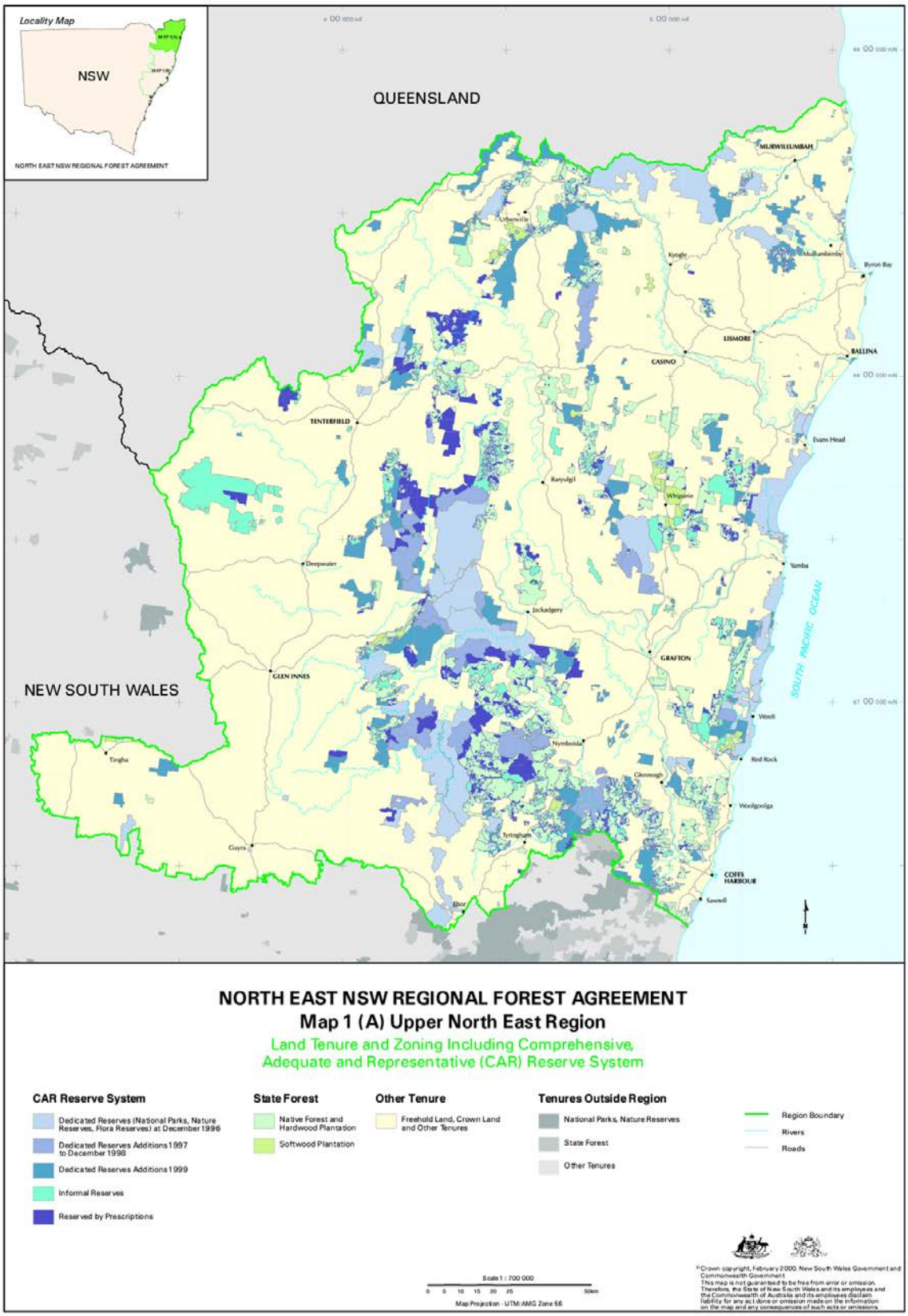

Figure 1.18 UNE RFA region by land type and tenure (from NSW CRA February 2000)

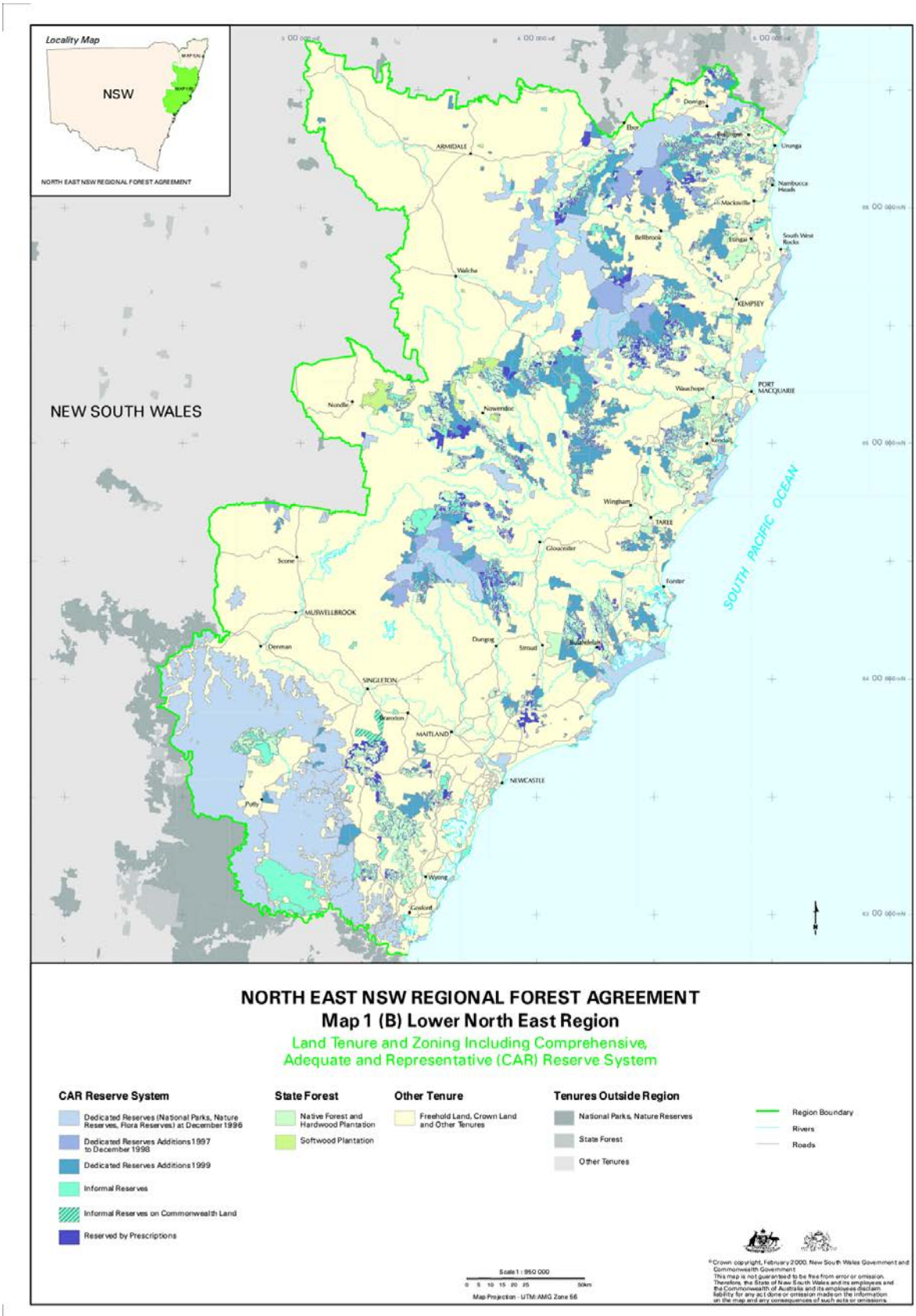

Figure 1.19 LNE RFA region by land type and tenure (from NSW CRA February 2000)

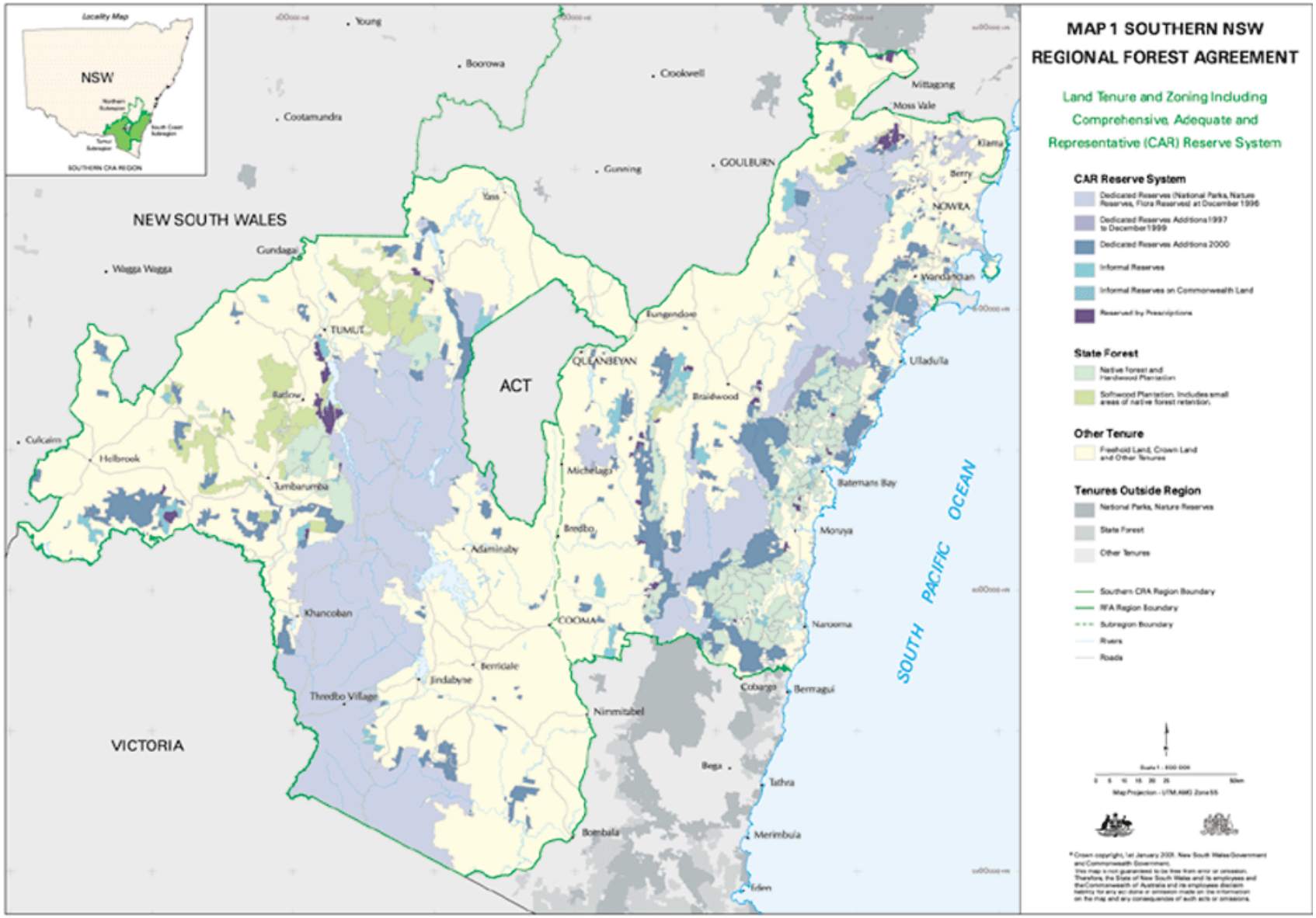

Figure 1.20 Southern RFA region by land type and tenure (from NSW CRA February 2000)

Indicator 1.1c Area of forest in protected area categories

Extent of protected areas in RFA regions

This indicator uses the area and proportion of forest ecosystems reserved through formal and informal processes as a measure of the emphasis placed by society on the preservation of representative ecosystems as a strategy to conserve biodiversity.

Spatial data from the CRA Process shows a total of 15.0 million hectares of land area in the three RFA regions of New South Wales. Prior to the signing of the NSW RFAs, a total of 2.57 millionhectares(17 per cent) of the total land area in toshe RFA regions was protected under formal reservation (the NPWS estate). These data include all land categories, namely Forest Ecosystems, Non-forest Ecosystems. These data exclude areas within the NSW RFA regions that were land not classified as a terrestrial ecosystem such as agricultural land and built up areas.

By mid-2001, after all three NSW RFAs came into effect a total of 4.04 million hectares (27 per cent) of total land in those RFA regions was protected under the CAR reserve system (which includes Formal Reserves, Informal Reserves, and Regional Prescriptions for forest management on public land). This represents an increase on 1.47 million hectares of land in protected areas after all three RFAs came into effect.

By mid-2016, a total of 4.22 million hectares (28 per cent) of the total land in RFA regions was protected under the CAR reserve system. This represents an increase of 182 thousand hectares of land in CAR Reserves across the four RFA regions since all three RFAs came into effect.

Table 1.25 below summarises the extent of land in each RFA region and the extent that was in protected area categories at various time points before and after the respective NSW RFAs were signed, including the most recent area as at 30 June 2016.

Table 1.25 RFA land area, and the changes in area in the CAR reserve system over time

RFA region	Area ('000 hectares)							Proportion in protected areas as at 30 June 2016 (%)
	RFA region in protected areas on public land, by time period						RFA region not in protected areas as at 30 June 2016	
	RFA region Total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	At 30 June 2016[3]		
Upper North East								
Total area	3,910	374	847	871	873	**873**	3,037	22
As proportion of total (%)	100	10	22	22	22	**22**	78	
Lower North East								
Total area	5,789	946	1,478	1,526	1,569	**1,568**	4,222	27
As proportion of total (%)	100	16	26	26	27	**27**	73	
Southern								
Total area	4,516	1,037	1,419	1,435	1,443	**1,474**	3,042	33
As proportion of total (%)	100	23	31	32	32	**33**	67	
Eden								
Total area	814	212	293	295	295	**305**	509	37
As proportion of total (%)	100	26	36	36	36	**37**	63	
All RFA regions								
Total area	**15,029**	**2,568**	**4,038**	**4,126**	**4,179**	**4,220**	**10,809**	**28**
As proportion of total (%)	**100**	**17**	**27**	**27**	**28**	**28**	**72**	

Notes: Totals may not tally due to rounding [1] Area derived by ABARES from spatial data associated with the CRA reports published in 1998-2000. Increasing levels of reservation over time are applied to this area. Figures may differ slightly from original CRA analyses. [2] Area derived by ABARES from spatial data provided by NSW and associated with the CRA reports published in 1998-2000. This data is likely to include some national parks gazetted after the signing of the RFA Scoping Agreement (25 January 1996) and before signing of respective RFAs (1999-2001) which were not reported in the tabular figures in the RFA data tables. Reserves on public land only. [3] Reserves on public land only. Spatial datasets include the NPWS estate (formal reserves) at RFA signing during 1999 to 2001 and continuous since then; informal reserves identified from Forest Management Zone datasets at RFA signing, 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land.

Extent of RFA Forest and Non-Forest Ecosystems in protected areas

Spatial data and related tables associated with the NSW RFAs report a total of 8.55 million hectares of land in terrestrial ecosystems, comprising 8.32 million hectares in Forest Ecosystems and 0.23 million hectares in Non-Forest Ecosystems. These data exclude areas of the RFA regions that were not classified as terrestrial ecosystems, being for example agricultural land and built up areas. The extent of protected area categories in entire RFA regions is captured in the previous analysis ("Extent of RFA region in protected areas").

Of the 8.55 millionhectaresof land in terrestrial ecosystems identified in the four RFA regions, a total of 2.15 millionhectares(25 per cent) was protected under formal reservation (the NPWS estate) before the RFAs were signed. By mid-2001, after all RFAs[29] came into effect, a total of 3.94 millionhectares(46 per cent) of land in Forest and Non-Forest Ecosystems was protected under the CAR reserve system (which includes Formal Reserves, Informal Reserves, and Regional Prescriptions for forest management on public land). By mid-2016 a total of 4.09 millionhectares(48 per cent) of land in terrestrial ecosystems was protected under the CAR reserve system.

Table 1.26 below summarises the extent of terrestrial ecosystems in the NSW RFA regions and the extent that was in protected areas at various time points. Four additional tables (**Table 1.27** - **Table 1.30**) show the extent of all terrestrial ecosystems in each of the individual RFA regions, by individual Forest and Non-Forest Ecosystem, and the area that was in protected areas at various time points before and after the respective NSW RFAs were signed, including the most recent area in the CAR reserve system as at June 2016[30].

[29] The North East NSW RFA covers the Upper North East and Lower North East RFA regions. Hence there are four RFA regions and three RFAs in NSW

[30] The areas of individual terrestrial ecosystems identified during the CRA process have not been updated since that time. The data presented therefore do not take into account any additional area of terrestrial ecosystems subsequently identified, or any areas that no longer form a terrestrial ecosystem, or any areas that have been misclassified into the wrong terrestrial ecosystem. Changes in the area figures presented here are solely due to changes in areas of terrestrial ecosystems that are in protected areas on public land.

Table 1.26 Terrestrial ecosystem areas in NSW RFA regions

As identified in the CRA spatial datasets, by RFA region, and the changes in area in the CAR reserve system over time

RFA region and ecosystem type	Area ('000 hectares)							
		Terrestrial ecosystem in protected areas on public land, by time period						
	Terrestrial ecosystems total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**	**Terrestrial ecosystems not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
Upper North East								
Forest Ecosystems	2,167	221	778	801	802	**802**	1,364	37
Non-Forest Ecosystems	61	23	43	44	44	**45**	16	74
Total terrestrial ecosystems	**2,228**	**244**	**822**	**844**	**846**	**847**	**1,380**	**38**
As proportion of total terrestrial ecosystem area (%)	100	11	37	38	38	**38**	62	
Lower North East								
Forest Ecosystems	3,175	724	1,410	1,453	1,472	**1,478**	1,697	47
Non-Forest Ecosystems	39	23	31	31	31	**32**	7	81
Total terrestrial ecosystems	**3,213**	**747**	**1,441**	**1,484**	**1,503**	**1,510**	**1,704**	**47**
As proportion of total terrestrial ecosystem area (%)	100	23	45	46	47	**47**	53	
Southern								
Forest Ecosystems	2,446	911	1,297	1,312	1,321	**1,351**	1,095	55
Non-Forest Ecosystems	113	92	95	95	95	**95**	18	84
Total terrestrial ecosystems	**2,558**	**1,003**	**1,392**	**1,407**	**1,416**	**1,446**	**1,112**	**57**
As proportion of total terrestrial ecosystem area (%)	100	39	54	55	55	**57**	43	
Eden								
Forest Ecosystems	533	152	280	282	282	**292**	241	55
Non-Forest Ecosystems	18	8	11	11	11	**11**	7	60

RFA region and ecosystem type	Area ('000 hectares)							
		Terrestrial ecosystem in protected areas on public land, by time period						
	Terrestrial ecosystems total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**	**Terrestrial ecosystems not in protected areas as at 30 June 2016**	**Proportion in protected areas as at 30 June 2016 (%)**
Total terrestrial ecosystems	**552**	**160**	**291**	**292**	**292**	**303**	**248**	**55**
As proportion of total terrestrial ecosystem area (%)	100	29	53	53	53	**55**	45	
All RFA regions								
Forest Ecosystems	8,320	2,009	3,765	3,847	3,876	**3,924**	4,396	47
Non-Forest Ecosystems	231	145	179	180	181	**183**	49	79
Total terrestrial ecosystems	**8,551**	**2,154**	**3,945**	**4,027**	**4,057**	**4,107**	**4,445**	**48**
As proportion of total terrestrial ecosystem area (%)	100	25	46	47	47	**48**	52	

Notes:

The areas of Forest Ecosystems and Non-Forest Ecosystems together form the total terrestrial ecosystem area for an RFA region (both classes are reported in both the CRA reports and the RFA data tables). The remaining land area (being agricultural, horticultural and urban land and the like) is not reported in the CRA reports of the RFA data tables, and contains small additional areas of reserve.

[1] Area derived by ABARES from spatial data associated with the Forest Ecosystem CRA reports published in 1998-2000. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the RFA data tables (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. Spatial datasets include the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (1999-2001), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land.

Totals may not tally due to rounding

Table 1.27 Terrestrial ecosystem areas in the Upper North East RFA region

as identified in the CRA spatial data, by changes in area in the CAR reserve system over time

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
Forest Ecosystem								
2 Alpine Gum	1,329	123	365	368	368	**368**	961	28
3 Baileys Stringybark	34,931	9,515	15,396	16,197	16,379	**16,385**	18,546	47
10 Black Sallee	6	6	6	6	6	**6**	0	100
12 Blue Mountain Ash	121	0	118	117	117	**117**	4	97
14 Brown Barrell	166	15	30	30	30	**30**	136	18
15 Brown Barrell-Gum	1,004	132	184	184	184	**184**	820	18
16 Bull Oak	2	0	2	2	2	**2**	0	100
17 Candlebark	1,961	0	253	253	253	**253**	1,708	13
18 Casuarina Woodland	43	6	11	11	11	**11**	32	26
19 Central Mid Elevation Sydney Blue Gum	6,786	40	1,766	1,793	1,793	**1,793**	4,993	26
20 Clarence Lowland Needlebark Stringybark	10,817	2,113	6,763	7,134	7,136	**7,136**	3,681	66
21 Lowlands Grey Box	23,913	32	422	531	757	**761**	23,152	3
22 Coast Cypress Pine	82	47	69	69	69	**69**	13	84
23 Coast Range Bloodwood-Mahogany	5,919	456	2,394	2,666	2,666	**2,666**	3,253	45
24 Clarence Lowlands Spotted Gum	174,787	2,335	20,343	22,120	22,404	**22,441**	152,346	13
25 Coast Range Spotted Gum-Blackbutt	743	9	136	138	138	**138**	605	19
26 Coastal Flooded Gum	9,426	1,194	4,157	4,198	4,200	**4,200**	5,226	45
27 Coastal Sands Blackbutt	3,101	2,798	2,889	2,889	2,889	**2,889**	212	93

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
29 Corkwood-Crabapple and Mixed Stringybarks	6,093	24	3,905	3,938	3,938	**3,938**	2,155	65
30 Diehard Stringybark-New England Blackbutt	1,062	71	153	154	154	**154**	908	15
31 Dorrigo White Gum	3,385	288	2,346	2,346	2,346	**2,346**	1,039	69
32 Dry Foothills Blackbutt-Turpentine	7,364	109	1,934	1,967	1,967	**1,967**	5,397	27
33 Dry Foothills Spotted Gum	90,829	2,765	34,339	35,772	35,785	**35,785**	55,044	39
34 Dry Grassy Blackbutt-Tallowwood	6,052	319	1,513	1,544	1,544	**1,544**	4,508	26
35 Dry Grassy Stringybark	69,987	9,268	36,385	36,656	36,656	**36,656**	33,331	52
36 Dry Grassy Tallowwood-Grey Gum	5,564	12	697	704	704	**704**	4,860	13
37 Dry Heathy Blackbutt-Bloodwood	46,630	328	13,005	15,034	15,050	**15,051**	31,579	32
38 Dry Heathy New England Blackbutt	4,276	1,020	3,255	3,249	3,249	**3,249**	1,027	76
39 Dry Heathy New England Stringybarks	1,178	1,155	1,177	1,177	1,177	**1,177**	1	100
40 Dry Heathy Sandstone Blackbutt	19,036	3,431	6,893	7,710	7,711	**7,711**	11,325	41
41 Dry Open New England Blackbutt	121,339	11,662	49,040	49,258	49,262	**49,262**	72,077	41
42 Dry Redgum-Bloodwood-Apple	243	1	237	237	237	**237**	6	98
43 Dry Silvertop Stringybark-Apple	13,041	4,703	9,137	9,143	9,143	**9,143**	3,898	70
44 Dry open Redgum-Broad Leaved Apple	10,484	5,259	7,844	7,868	7,868	**7,868**	2,616	75
45 Dunns White Gum	975	102	632	638	638	**638**	337	65
46 Eastern Red Gums	3,002	739	2,192	2,189	2,189	**2,189**	813	73
47 Escarpment Redgum	28,206	1,742	7,980	8,177	8,204	**8,204**	20,002	29
48 Escarpment Scribbly Gum-Apple	5,488	132	3,616	3,648	3,648	**3,648**	1,840	66
50 Wet Bangalow-Brushbox	10,098	2,139	4,386	4,431	4,442	**4,442**	5,656	44
52 Foothill Grey Gum-Ironbark-Spotted Gum	46,753	3,868	11,543	12,323	12,327	**12,328**	34,425	26

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
53 Gorge Grey Box	11,147	5,454	8,190	8,271	8,276	**8,276**	2,871	74
54 Grey Box-Red Gum-Grey Ironbark	20,438	1,592	3,085	3,305	3,361	**3,361**	17,077	16
55 Foothills Grey Gum-Spotted Gum	8,685	95	1,727	1,933	1,933	**1,933**	6,752	22
56 Granite Mallee	1,887	1,428	1,573	1,593	1,593	**1,593**	294	84
57 Highland Granite Stringybarks	2,483	1,682	2,282	2,282	2,282	**2,282**	201	92
58 Gorge Grey Gum	5,532	2,780	3,741	3,745	3,748	**3,748**	1,784	68
59 Gorge Ironbark-Grey Gum	63,226	5,789	24,220	24,730	24,736	**24,736**	38,490	39
60 Grassy New England Blackbutt-Tallowwood-Blue Gum	40,245	2,649	20,333	20,716	20,716	**20,716**	19,529	51
61 Grey Box-Ironbark	131	21	36	37	37	**37**	94	28
62 Grey Box-Northern Grey Gum	509	6	73	72	72	**72**	437	14
63 Grey Gum-Stringybark	12,810	3,702	7,541	7,759	7,759	**7,759**	5,051	61
65 Heathy Scribbly Gum	7,758	2,254	4,497	4,669	4,669	**4,669**	3,089	60
67 High Elevation Ferny Blackbutt	10,462	49	3,599	3,722	3,722	**3,722**	6,740	36
68 High Elevation Messmate-Brown Barrell	329	90	91	91	91	**91**	238	28
69 High Elevation Moist Open Tallowwood-Blue Gum	3,533	118	1,665	1,677	1,677	**1,677**	1,856	47
70 High Elevation Open Spotted Gum	50,005	950	13,705	15,013	15,034	**15,034**	34,971	30
71 Ironbark	7,713	52	1,176	1,674	1,674	**1,679**	6,034	22
72 Low Relief Coastal Blackbutt	859	37	434	437	437	**437**	422	51
73 Lowland Red Gum	57,016	1,676	9,428	11,441	11,505	**11,546**	45,470	20
74 Lowlands Scribbly Gum	3,496	1,199	2,202	2,292	2,292	**2,292**	1,204	66
75 Lowlands Spotted Gum-Box	19,737	5	3,294	3,604	3,624	**3,625**	16,112	18
76 Coastal Mallee	1,412	1,182	1,212	1,212	1,212	**1,212**	200	86

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
77 Mangrove	734	351	374	382	382	**386**	348	53
78 Mann River Wet New England Blackbutt	5,132	2,343	4,788	4,788	4,788	**4,788**	344	93
79 Manna Gum-Stringybark	90	41	60	60	60	**60**	30	67
80 Manna Gum	1,287	11	306	307	307	**307**	980	24
81 Messmate	6,309	483	1,370	1,381	1,381	**1,381**	4,928	22
83 Mid Elevation Wet Blackbutt	1,180	0	905	904	904	**904**	276	77
84 Mid North Coast Wet Brushbox-Tallowwood-Blue Gum	10,378	26	5,086	5,238	5,238	**5,238**	5,140	50
85 Mixed Moist Hardwood	346	0	141	143	143	**143**	203	41
86 Mixed New England Stringybarks	3,002	9	1,377	1,385	1,385	**1,385**	1,617	46
87 Mixed Tableland Stringybark-Gum Open Forest	4,694	32	758	765	765	**765**	3,929	16
88 Moist Escarpment New England Blackbutt	10,275	4,934	8,630	8,640	8,640	**8,640**	1,635	84
89 Moist Foothills Spotted Gum	35,657	909	15,312	15,590	15,590	**15,590**	20,067	44
90 Moist Messmate-Gum	25,159	627	14,070	14,184	14,184	**14,184**	10,975	56
91 Moist Open Escarpment White Mahogany	1,814	54	1,094	1,119	1,119	**1,119**	695	62
92 Moist Shrubby Stringybark-Gum	4,139	13	1,869	1,867	1,867	**1,867**	2,272	45
93 Montane Stringybark-Gum	28,687	972	5,387	5,371	5,371	**5,371**	23,316	19
95 Northern Moist Blackbutt	9,101	743	5,197	5,860	5,865	**5,865**	3,236	64
97 Needlebark Stringybark-Large Fruited Blackbutt	9,966	450	4,826	5,224	5,224	**5,224**	4,742	52
98 New England Peppermint	3,590	100	2,906	2,844	2,844	**2,844**	746	79
99 New England Stringybark-Blakely's Red Gum	10,786	2,950	5,322	5,323	5,325	**5,325**	5,461	49
100 Northern Grassy Sydney Blue Gum	9,245	1,723	5,169	5,247	5,252	**5,252**	3,993	57
101 Northern Open Grassy Blackbutt	21,590	2,518	5,964	6,357	6,357	**6,359**	15,231	29

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
102 Northern Ranges Dry Tallowwood	57,107	2,894	11,742	12,757	12,883	**12,883**	44,224	23
103 Northern Wet Brushbox	16,379	1,282	6,583	6,791	6,801	**6,801**	9,578	42
104 Northern Wet Tallowwood-Blue Gum	25,764	4,462	13,070	13,339	13,343	**13,343**	12,421	52
105 Nymboida Tallowwood-Turpentine	2,645	0	1,983	2,009	2,009	**2,009**	636	76
106 Open Coastal Brushbox	6,533	460	2,396	2,534	2,534	**2,534**	3,999	39
109 Open Shrubby Brushbox-Tallowwood	17,472	1,938	6,657	6,858	6,864	**6,864**	10,608	39
110 Open Silvertop Stringybark-Blue Gum	3,130	440	2,181	2,185	2,185	**2,185**	945	70
111 Open Silvertop Stringybark-Tallowwood	4,525	5	2,239	2,258	2,258	**2,258**	2,267	50
112 Paperbark	28,577	7,320	10,221	10,718	10,723	**10,746**	17,831	38
113 Peppermint	6,478	1,799	2,903	2,890	2,890	**2,890**	3,588	45
114 Peppermint-Mountain/Manna Gum	12,829	1,041	1,773	1,775	1,775	**1,775**	11,054	14
115 Red Bloodwood	217	30	199	200	200	**200**	17	92
116 Red Gum-Stringybark	27,128	284	667	701	706	**710**	26,418	3
117 Red Mahogany	1,273	1,135	1,202	1,204	1,204	**1,204**	69	95
118 Richmond Range Spotted Gum	22,511	4	3,010	3,039	3,072	**3,072**	19,439	14
119 Richmond Range Spotted Gum-Box	24,814	22	2,835	2,914	2,932	**2,932**	21,882	12
120 River Oak	3,221	117	475	478	487	**489**	2,732	15
122 Rough-barked Apples	1,683	223	1,346	1,372	1,372	**1,372**	311	82
123 Roundleaved Gum	17,975	1,493	7,112	7,132	7,132	**7,132**	10,843	40
124 Roundleaved Gum-Turpentine	30	0	21	23	23	**23**	7	77
126 Sandstone Spotted Gum-Blackbutt	4,808	91	1,061	1,126	1,130	**1,131**	3,677	24
127 Sherwood Needlebark Stringybark	9,098	580	1,378	1,393	1,398	**1,398**	7,700	15

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
128 Silverleaved Ironbark	1,988	1	80	80	80	**80**	1,908	4
129 Smoothbarked Apple	270	255	268	268	268	**268**	2	99
131 Snow Gum	288	192	246	247	247	**247**	41	86
132 Snow Gum -Mountain/Manna Gum	21,305	419	1,542	1,557	1,566	**1,584**	19,721	7
133 Snow Gum-Black Sallee	2	2	2	2	2	**2**	0	100
135 South Coast Tallowwood-Blue Gum	5,338	33	2,021	2,058	2,058	**2,058**	3,280	39
138 Steel Box/Craven Grey Box	427	0	170	174	175	**175**	252	41
139 Stringybark-Apple	34,813	2,354	8,114	8,298	8,401	**8,401**	26,412	24
140 Stringybark-Mallee	2,194	2,039	2,177	2,177	2,177	**2,177**	17	99
142 Swamp Mahogany	578	139	273	296	296	**296**	282	51
143 Swamp Oak	2,883	779	1,004	1,019	1,021	**1,037**	1,846	36
145 Sydney Peppermint-Stringybark	255	21	47	47	47	**47**	208	18
146 Tallowwood	8,430	4,542	6,534	6,557	6,557	**6,557**	1,873	78
147 Turpentine	2,943	145	1,291	1,345	1,357	**1,362**	1,581	46
148 Very Wet New England Blackbutt-Tallowwood	1,498	1,137	1,403	1,411	1,411	**1,411**	87	94
149 Mallee-Peppermint mosaic	1,618	46	449	445	445	**445**	1,173	28
150 Washpool Brushbox-Tallowwood	5,683	3,541	5,338	5,340	5,340	**5,340**	343	94
152 Wet Bloodwood-Tallowwood	33,357	1,221	7,701	8,648	8,696	**8,696**	24,661	26
153 Wet Coastal Tallowwood-Brushbox	6,581	30	776	793	793	**793**	5,788	12
154 Wet Flooded Gum-Tallowwood	9,317	143	1,734	2,070	2,085	**2,085**	7,232	22
155 Wet Foothills Blackbutt-Turpentine	7,437	33	2,955	3,005	3,005	**3,005**	4,432	40
157 Wet Shrubby Brushbox-Tallowwood	4,891	124	2,884	2,897	2,897	**2,897**	1,994	59

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
158 Wet Spotted Gum-Tallowwood	2,538	626	911	935	935	**935**	1,603	37
162 Whitetopped Box	4	0	4	4	4	**4**	0	100
163 Yellow Box-Blakely's Red Gum	7,245	62	418	422	422	**428**	6,817	6
168 Rainforest	159,211	55,723	145,466	145,663	145,669	**145,669**	13,542	91
174 Orange Gum-Tumbledown Gum-Apple	15,435	0	182	184	189	**189**	15,246	1
175 Orange Gum-New England Blackbutt-Tumbledown Gum	19,304	343	1,193	1,218	1,225	**1,225**	18,079	6
176 Orange Gum-Ironbark	34,295	282	946	979	979	**998**	33,297	3
177 Outcrop Orange Gum-New England Blackbutt	7,945	6	999	999	1,002	**1,017**	6,928	13
178 Outcrop Black Cypress-Tumbledown Gum	1,034	0	4	5	5	**5**	1,029	0
179 Yellow Box-Broad-leaved Stringybark	3,859	0	827	835	856	**856**	3,003	22
180 Western New England Blackbutt	12,415	0	3,345	3,348	3,349	**3,349**	9,066	27
181 Stringybark-Gum	30,258	0	18,493	18,498	18,500	**18,500**	11,758	61
182 Apple-Black Cypress	1,994	0	211	211	211	**211**	1,783	11
183 Red Gum-Apple	592	0	1	1	1	**1**	591	0
184 Tumbledown Gum-Ironbark	11,070	0	4,482	4,482	4,482	**4,482**	6,588	40
185 Orange Gum-Black Cypress	3,510	0	1,408	1,411	1,411	**1,411**	2,099	40
186 Open Tumbledown Gum-Black Cypress-Orange Gum	10,593	204	630	638	639	**654**	9,939	6
189 Silverleaved Ironbark-Cypress	23,285	82	197	197	197	**197**	23,088	1
190 Yellow Box-Grey Box-Red Gum	21,273	269	624	657	657	**661**	20,612	3
194 Round-leaved Gum wet heath	5,997	0	2,446	2,455	2,456	**2,456**	3,541	41
195 Apple-Manna Gum woodland	16,214	283	1,208	1,213	1,215	**1,216**	14,998	7
196 Broad-leaved Stringybark-Apple Box	19,948	386	3,688	3,726	3,727	**3,741**	16,207	19

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
197 Broad-leaved Stringybark	1,643	20	89	90	90	**95**	1,548	6
198 Silvertop Stringybark	1,200	0	16	16	16	**16**	1,184	1
200 Broad-leaved Stringybark-Ribbon Gum	650	0	7	7	7	**7**	643	1
Total Forest Ecosystems	2,166,601	221,159	778,386	800,747	802,171	**802,421**	1,364,180	37
Non-Forest Ecosystem								
5 Banksia	2,046	257	609	745	746	**746**	1,300	36
64 Heath	9,805	8,943	9,041	9,041	9,041	**9,041**	764	92
66 Herbfield and Fjaeldmark	68	53	52	52	52	**52**	16	76
96 Natural Grassland	370	43	266	266	266	**266**	104	72
121 Rock	18,162	1,191	16,974	16,943	16,943	**16,943**	1,219	93
125 Saltbush	16	10	11	11	11	**11**	5	69
141 Swamp	24,118	9,192	13,168	13,485	13,561	**14,802**	9,316	61
169 Scrub	5,447	2,895	3,075	3,117	3,117	**3,117**	2,330	57
199 Riparian Shrubland	1,252	0	3	3	3	**8**	1,244	1
Total Non-Forest Ecosystems	61,284	22,584	43,199	43,663	43,740	**44,986**	16,298	73
Total Terrestrial ecosystems	**2,227,885**	**243,743**	**821,585**	**844,410**	**845,911**	**847,407**	**1,380,478**	**38**
As proportion of total Terrestrial ecosystem area (%)	100	11	37	38	38	**38**	62	

Notes:

[1] Area derived by ABARES from spatial data associated with the North East region RFA 2000. Figures for individual ecosystem classes are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the North East RFA (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land. Spatial datasets covering different time-periods have been reprojected to a common projection but some small differences remain between the datasets. Informal reserves on other Crown land identified from the 2004 Forest Management Zone dataset are included in all subsequent time periods.

Totals may not tally due to rounding

Table 1.28 Terrestrial ecosystem areas in the Lower North East RFA region

as identified in the CRA spatial data, by changes in area in the CAR reserve system over time

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
Forest Ecosystem								
2 Alpine Gum	3,971	205	1,540	1,794	1,794	**1,798**	2,173	45
3 Baileys Stringybark	285	214	234	234	234	**234**	51	82
6 Barrington Dry Shrubby New England Blackbutt-Blue Gum	3,227	161	1,678	1,688	1,688	**1,688**	1,539	52
7 Barrington Moist Blue Gum-White Mahogany	32,659	485	6,520	10,870	11,127	**11,494**	21,165	35
8 Barrington Wet New England Blackbutt-Blue Gum	45,911	2,158	10,746	11,728	11,728	**11,728**	34,183	26
10 Black Sallee	2	1	1	1	1	**1**	1	50
11 Blackbutt-Sydney Peppermint-Smoothbarked Apple	1,382	240	435	435	435	**435**	947	31
12 Blue Mountain Ash	1	0	1	1	1	**1**	0	100
13 Blue-leaved Stringybark	25	0	25	25	25	**25**	0	100
14 Brown Barrell	814	48	427	427	427	**427**	387	52
15 Brown Barrell-Gum	8,711	668	2,551	3,497	3,497	**3,554**	5,157	41
16 Bull Oak	5	0	5	5	5	**5**	0	100
17 Candlebark	20	0	2	2	2	**2**	18	10
18 Casuarina Woodland	362	272	299	299	317	**317**	45	88
19 Central Mid Elevation Sydney Blue Gum	40,971	731	8,629	9,213	9,227	**9,245**	31,726	23
20 Clarence Lowland Needlebark Stringybark	81	78	79	79	79	**79**	2	98
21 Lowlands Grey Box	1,219	576	699	724	724	**724**	495	59

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
22 Coast Cypress Pine	34	29	32	32	32	**32**	2	94
23 Coast Range Bloodwood-Mahogany	564	0	528	528	528	**528**	36	94
25 Coast Range Spotted Gum-Blackbutt	25	0	25	25	25	**25**	0	100
26 Coastal Flooded Gum	8,753	136	1,916	1,946	1,968	**1,989**	6,764	23
27 Coastal Sands Blackbutt	17,312	7,561	8,386	8,386	9,400	**9,400**	7,912	54
28 Cool Moist Messmate	6,467	293	1,910	1,903	1,903	**1,903**	4,564	29
29 Corkwood-Crabapple and Mixed Stringybarks	2,293	105	1,517	1,527	1,527	**1,527**	766	67
30 Diehard Stringybark-New England Blackbutt	43,510	8,886	29,416	29,852	29,852	**29,859**	13,651	69
31 Dorrigo White Gum	1,123	23	126	122	122	**122**	1,001	11
32 Dry Foothills Blackbutt-Turpentine	33,592	894	6,875	7,093	7,167	**7,167**	26,425	21
33 Dry Foothills Spotted Gum	17,688	1,039	3,139	3,265	3,291	**3,394**	14,294	19
34 Dry Grassy Blackbutt-Tallowwood	59,390	2,822	7,926	8,097	8,180	**9,092**	50,298	15
35 Dry Grassy Stringybark	97,614	14,475	34,193	36,365	36,365	**36,436**	61,178	37
36 Dry Grassy Tallowwood-Grey Gum	178,516	3,213	44,703	46,140	46,337	**46,339**	132,177	26
37 Dry Heathy Blackbutt-Bloodwood	2,889	1,095	1,495	1,506	1,511	**1,511**	1,378	52
38 Dry Heathy New England Blackbutt	528	79	365	391	391	**391**	137	74
39 Dry Heathy New England Stringybarks	15	7	15	15	15	**15**	0	100
41 Dry Open New England Blackbutt	32,932	2,904	8,744	8,969	8,969	**8,969**	23,963	27
42 Dry Redgum-Bloodwood-Apple	69,509	10,303	20,783	22,120	22,120	**22,120**	47,389	32
43 Dry Silvertop Stringybark-Apple	14,918	4,371	7,494	8,131	8,131	**8,131**	6,787	55
44 Dry open Redgum-Broad Leaved Apple	2,291	920	1,431	1,461	1,461	**1,461**	830	64
46 Eastern Red Gums	38	23	32	36	36	**36**	2	95

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
47 Escarpment Redgum	20,498	594	2,708	3,024	3,135	**3,150**	17,348	15
48 Escarpment Scribbly Gum-Apple	7,574	1,658	2,739	2,954	2,954	**2,954**	4,620	39
49 Escarpment Tallowwood-Bloodwood	49,918	4,451	21,070	21,653	21,677	**21,678**	28,240	43
50 Wet Bangalow-Brushbox	3,614	628	1,620	1,647	1,663	**1,663**	1,951	46
51 Eurabbie	276	9	248	260	260	**260**	16	94
53 Gorge Grey Box	6,034	2,509	3,838	3,999	3,999	**3,999**	2,035	66
54 Grey Box-Red Gum-Grey Ironbark	19,838	7,496	8,347	8,527	8,527	**8,527**	11,311	43
55 Foothills Grey Gum-Spotted Gum	2,438	75	975	977	978	**978**	1,460	40
56 Granite Mallee	4,025	625	1,313	1,326	1,326	**1,340**	2,685	33
57 Highland Granite Stringybarks	924	197	261	261	261	**261**	663	28
58 Gorge Grey Gum	51	21	36	36	36	**36**	15	71
60 Grassy New England Blackbutt-Tallowwood-Blue Gum	33,586	5,450	17,140	17,512	17,512	**17,512**	16,074	52
63/217 Grey Gum-Stringybark	46,977	34,377	37,931	38,488	38,488	**38,488**	8,489	82
65 Heathy Scribbly Gum	23,471	8,182	11,576	11,673	11,679	**11,679**	11,792	50
67 High Elevation Ferny Blackbutt	30,899	3,401	17,192	17,382	17,551	**17,551**	13,348	57
68 High Elevation Messmate-Brown Barrell	15,974	201	3,447	5,590	5,590	**5,618**	10,356	35
69 High Elevation Moist Open Tallowwood-Blue Gum	27,141	4,122	14,131	14,486	14,498	**14,498**	12,643	53
70 High Elevation Open Spotted Gum	12	0	1	1	1	**1**	11	8
71 Ironbark	89,985	24,661	33,722	33,807	40,006	**40,312**	49,673	45
72 Low Relief Coastal Blackbutt	10,894	137	1,660	1,963	1,969	**1,969**	8,925	18
73 Lowland Red Gum	366	45	210	211	211	**211**	155	58

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
74 Lowlands Scribbly Gum	9,724	6,678	6,998	7,011	7,168	**7,168**	2,556	74
76 Coastal Mallee	801	723	729	729	738	**738**	63	92
77 Mangrove	1,001	56	709	702	771	**810**	191	81
79 Manna Gum-Stringybark	632	74	95	103	103	**103**	529	16
80 Manna Gum	3,852	75	1,097	1,110	1,110	**1,110**	2,742	29
81 Messmate	20,291	308	3,980	4,128	4,128	**4,187**	16,104	21
82 Messmate-Mountain Gum Forest	8,537	1,481	2,571	2,573	2,573	**2,867**	5,670	34
83 Mid Elevation Wet Blackbutt	6,981	351	3,928	4,107	4,844	**4,845**	2,136	69
84 Mid North Coast Wet Brushbox-Tallowwood-Blue Gum	31,917	2,679	17,334	17,626	17,691	**17,691**	14,226	55
85 Mixed Moist Hardwood	232	0	48	50	50	**50**	182	22
87 Mixed Tableland Stringybark-Gum Open Forest	7,897	478	2,067	2,137	2,137	**2,341**	5,556	30
88 Moist Escarpment New England Blackbutt	22,579	3,888	18,079	18,276	18,279	**18,279**	4,300	81
89 Moist Foothills Spotted Gum	7,929	117	2,199	2,252	2,277	**2,346**	5,583	30
90 Moist Messmate-Gum	78	0	15	15	15	**15**	63	19
91 Moist Open Escarpment White Mahogany	38,495	6,136	20,323	21,308	21,308	**21,308**	17,187	55
92 Moist Shrubby Stringybark-Gum	423	9	174	176	176	**176**	247	42
93 Montane Stringybark-Gum	2,567	124	513	554	554	**554**	2,013	22
94 Mountain Gum-Brown Barrell	3,196	1,223	3,035	3,041	3,041	**3,041**	155	95
97 Needlebark Stringybark-Large Fruited Blackbutt	502	0	262	262	262	**262**	240	52
98 New England Peppermint	656	591	594	594	594	**594**	62	91
99 New England Stringybark-Blakelys Red Gum	28,245	5,541	8,847	10,298	10,298	**10,298**	17,947	36

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
105 Nymboida Tallowwood-Turpentine	248	0	159	161	161	**161**	87	65
106 Open Coastal Brushbox	64,878	1,184	22,207	22,668	22,970	**22,973**	41,905	35
107 Open Messmate-New England Blackbutt	12,151	1,052	5,618	5,699	5,699	**5,700**	6,451	47
108 Open Ribbon Gum	24,537	1,124	10,754	10,787	10,787	**10,795**	13,742	44
109 Open Shrubby Brushbox-Tallowwood	2,887	298	1,028	1,042	1,046	**1,046**	1,841	36
110 Open Silvertop Stringybark-Blue Gum	53,990	3,928	18,794	19,852	19,852	**19,964**	34,026	37
111 Open Silvertop Stringybark-Tallowwood	1,889	110	1,017	1,019	1,019	**1,019**	870	54
112 Paperbark	12,866	6,760	8,055	8,147	8,220	**8,243**	4,623	64
113 Peppermint	13,115	2,170	4,471	4,521	4,521	**4,521**	8,594	34
114 Peppermint-Mountain/Manna Gum	5,736	674	1,622	1,625	1,625	**1,625**	4,111	28
115 Red Bloodwood	5	5	4	4	4	**4**	1	80
116 Red Gum-Stringybark	12,238	2	90	90	90	**90**	12,148	1
117 Red Mahogany	65	2	2	7	7	**7**	58	11
120 River Oak	922	346	581	606	606	**606**	316	66
122 Rough-barked Apples	2,636	872	984	986	1,016	**1,017**	1,619	39
123 Roundleaved Gum	172	5	21	21	21	**21**	151	12
124/233 Roundleaved Gum-Turpentine	8,624	2,290	3,002	2,994	2,994	**2,994**	5,630	35
129 Smoothbarked Apple	18,751	1,713	4,495	4,689	5,555	**6,315**	12,436	34
130 Smoothbarked Apple-Sydney Peppermint-Stringybark	9,517	26	2,339	2,584	4,392	**4,481**	5,036	47
131 Snow Gum	4,433	2,248	3,258	3,384	3,384	**3,394**	1,039	77
132 Snow Gum -Mountain/Manna Gum	23,120	3,336	6,746	8,390	8,390	**8,444**	14,676	37

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
133 Snow Gum-Black Sallee	16	7	16	16	16	**16**	0	100
134 South Coast Shrubby Grey Gum	151,030	2,486	20,362	21,144	22,811	**23,726**	127,304	16
135 South Coast Tallowwood-Blue Gum	71,217	1,674	17,345	17,587	17,611	**17,621**	53,596	25
137 Southern Wet Sydney Blue Gum	41,695	3,073	12,493	13,773	13,853	**13,934**	27,761	33
138 Steel Box/Craven Grey Box	125	0	90	121	121	**121**	4	97
139 Stringybark-Apple	81,300	16,866	27,734	32,108	32,138	**32,147**	49,153	40
140 Stringybark-Mallee	665	556	634	634	634	**634**	31	95
142 Swamp Mahogany	2,177	330	722	729	762	**770**	1,407	35
143 Swamp Oak	4,868	1,166	1,460	1,468	1,922	**1,922**	2,946	39
145 Sydney Peppermint-Stringybark	13,778	9,468	11,744	11,759	11,759	**11,759**	2,019	85
146 Tallowwood	746	275	411	437	437	**437**	309	59
147 Turpentine	235	3	71	91	91	**91**	144	39
148 Very Wet New England Blackbutt-Tallowwood	2,867	483	2,485	2,498	2,549	**2,551**	316	89
149 Mallee-Peppermint mosaic	3,621	402	1,050	1,100	1,100	**1,103**	2,518	30
153 Wet Coastal Tallowwood-Brushbox	10,245	143	1,225	1,237	1,242	**1,242**	9,003	12
154 Wet Flooded Gum-Tallowwood	6,161	41	1,339	1,389	1,391	**1,391**	4,770	23
155 Wet Foothills Blackbutt-Turpentine	50,264	1,695	17,958	18,865	19,274	**19,274**	30,990	38
156 Wet New England Blackbutt-Silvertop Stringybark	15,604	1,909	7,512	7,606	7,606	**7,609**	7,995	49
157 Wet Shrubby Brushbox-Tallowwood	30,589	2,075	17,244	17,504	18,359	**18,359**	12,230	60
162 Whitetopped Box	967	61	448	576	576	**576**	391	60
163 Yellow Box-Blakely's Red Gum	2,696	4	48	48	48	**48**	2,648	2

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
168 Rainforest	256,326	79,544	217,688	220,422	221,938	**221,950**	34,376	87
174 Orange Gum - Tumbledown Gum - Apple	10,169	75	289	331	331	**331**	9,838	3
175 Orange Gum - New England Blackbutt - Tumbledown Gum	23,572	98	683	699	699	**699**	22,873	3
176 Orange Gum - Ironbark	6,636	1	162	162	162	**162**	6,474	2
177 Outcrop Orange Gum - New England Blackbutt	3,170	2	106	106	106	**106**	3,064	3
178 Outcrop Black Cypress - Tumbledown Gum	659	0	0	0	0	**-**	659	0
179 Yellow Box - Broad-leaved Stringybark	273	1	11	12	12	**12**	261	4
182 Apple - Black Cypress	14,635	75	229	229	229	**229**	14,406	2
183 Red Gum - Apple	4,065	1,797	2,321	2,319	2,319	**2,319**	1,746	57
184 Tumbledown Gum - Ironbark	160	0	0	0	0	**-**	160	0
186 Open Tumbledown Gum - Black Cypress - Orange Gum	7,959	20	185	186	186	**186**	7,773	2
189 Silverleaved Ironbark - Cypress	2,007	0	15	15	15	**15**	1,992	1
190 Yellow Box - Grey Box - Red Gum	7,724	210	393	393	393	**393**	7,331	5
195 Apple - Manna Gum woodland	6,638	33	157	172	172	**172**	6,466	3
196 Broad-leaved Stringybark - Apple Box	10,442	14	268	274	274	**274**	10,168	3
197 Broad-leaved Stringybark	1,346	2	55	55	55	**55**	1,291	4
198 Silvertop Stringybark	1,501	3	100	100	100	**100**	1,401	7
200 Broad-leaved Stringybark - Ribbon Gum	7	0	1	1	1	**1**	6	14
202 Peppermint-Apple-Turpentine	36,556	24,910	29,878	29,885	29,937	**30,225**	6,331	83
203 Grey Gum-Stringybark-Apple	37,492	30,867	32,467	32,487	32,487	**32,487**	5,005	87
204 Grey Gum - Scribbly Gum	18,871	18,032	18,243	18,242	18,242	**18,242**	629	97

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
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		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
205 Peppermint-Silvertop Ash-Stringybark	1,309	1,019	1,033	1,033	1,033	**1,033**	276	79
206 Apple-Grey Gum-Turpentine	28,264	11,592	15,822	15,882	15,970	**16,031**	12,233	57
207 Hunter Spotted Gum-Ironbark	25,740	4	2,300	2,287	3,137	**3,388**	22,352	13
208 Hunter Roughbarked Apple- Red Gum	8,876	644	903	914	919	**925**	7,951	10
209 Yellow Bloodwood-Stringybark	52,329	32,619	37,065	37,090	37,090	**37,090**	15,239	71
210 Yellow Bloodwood-Ironbark	29,520	15,535	19,581	19,585	19,585	**19,585**	9,935	66
211 Apple-Turpentine	21,680	12,009	18,256	18,255	18,255	**18,255**	3,425	84
212 Yellow Bloodwood-Narrowleaved Apple	57,711	37,113	45,900	45,896	45,896	**45,896**	11,815	80
213 Stringybark-Scribbly Gum Woodland	9,196	8,944	9,010	9,006	9,006	**9,006**	190	98
214 Brown Bloodwood-Dwyers Redgum	1,862	1,162	1,163	1,163	1,163	**1,163**	699	62
215 Brown Bloodwood-Ironbark	11,650	11,129	11,157	11,148	11,148	**11,148**	502	96
216 Sandstone Ironbark	12,427	8,820	8,808	8,808	8,808	**8,808**	3,619	71
217 combined into 63/217								
218 Ironbark-Stringybark	15,843	6,246	6,266	6,266	6,266	**6,266**	9,577	40
219 Brown Bloodwood	8,905	4,202	4,226	4,226	4,226	**4,226**	4,679	47
220 Yellow Bloodwood-Stringybark-Narrowleaved Apple	39,881	25,716	33,426	33,431	33,431	**33,431**	6,450	84
221 Apple-Red Bloodwood-Peppermint-Turpentine	23,923	15,340	17,946	18,070	18,085	**18,085**	5,838	76
222 Stringybark-Mallee Woodland	7,084	6,833	6,869	6,867	6,867	**6,867**	217	97
223 Dwarf Apple Forest	20,238	11,420	17,649	17,651	17,651	**17,651**	2,587	87
224 Coastal Apple-Stringybark-Scribbly Gum	1,070	0	46	47	47	**47**	1,023	4
225 Wyong Apple-Scribbly Gum	3,768	0	119	122	146	**146**	3,622	4

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
226 Mahogany-Banksia Heath	9,830	6,065	6,795	6,805	6,805	**6,805**	3,025	69
227 Turpentine-Myrtle	15,745	11,417	12,235	12,279	12,279	**12,279**	3,466	78
228 Turpentine-Oak-Myrtle	13,833	8,329	8,996	8,980	8,980	**8,980**	4,853	65
229 Roughbarked Apple-Forest Oak	33,615	19,286	22,000	22,000	22,000	**22,000**	11,615	65
230 Watagan Blackbutt-Blue Gum	13,664	295	3,563	5,195	5,203	**5,353**	8,311	39
231 Watagan Blue Gum	16,218	194	5,600	6,486	6,589	**6,774**	9,444	42
232 Watagan Spotted Gum-Ironbark-White Mahogany	8,609	90	1,285	2,931	3,002	**3,368**	5,241	39
233 combined into 124/233								
234 Grey Gum - Grey Myrtle	35,600	19,253	23,420	23,374	23,374	**23,374**	12,226	66
235 Wet Roundleaved Gum Forest	2,637	2,176	2,212	2,212	2,212	**2,212**	425	84
236 Bangalay-Blue Gum	14,197	4,374	8,734	8,741	8,741	**8,741**	5,456	62
237 Wollemi Manna Gum	2,260	2,151	2,168	2,168	2,168	**2,168**	92	96
238 Tablelands Grey Gum-Scribbly Gum	210	210	210	210	210	**210**	0	100
239 Wollemi Roughbarked Apple	6,021	1,903	2,799	2,801	2,801	**2,801**	3,220	47
240 Roughbarked Apple-Redgum	316	92	124	125	125	**125**	191	40
241 Ironbark-Redgum	2,550	210	223	223	223	**223**	2,327	9
242 Hunter Grey Box	12,040	5,055	5,525	5,523	5,523	**5,523**	6,517	46
243 Grey Gum-Mugga Ironbark	2,988	2,037	2,048	2,048	2,048	**2,048**	940	69
244 White Box-Grey Gum	1,818	561	998	989	989	**989**	829	54
245 Grey Box	1,024	614	588	588	588	**588**	436	57
246 Scribbly Gum-Redgum Woodland	3,141	1,619	1,723	1,723	1,723	**1,723**	1,418	55

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
247 Coastal Bastard Mahogany Forest	18,002	2,247	4,297	4,447	4,708	**4,861**	13,141	27
248 Apple-Forest Oak	7,508	2,135	2,599	2,602	2,620	**2,620**	4,888	35
249 White Box-Ironbark-Red Gum	26,170	2,830	3,951	3,954	3,954	**3,954**	22,216	15
250 Banksia Heath-Scribbly Gum-Apple	10,795	49	619	614	904	**904**	9,891	8
Total Forest Ecosystems	**3,174,598**	**724,471**	**1,409,830**	**1,452,582**	**1,471,895**	**1,478,051**	**1,696,547**	**47**
Non-Forest Ecosystem								
5 Banksia	4,196	1,323	1,705	1,711	1,896	**1,898**	2,298	45
64 Heath	14,286	10,571	11,616	11,617	11,700	**11,700**	2,586	82
66 Herbfield and Fjaeldmark	2	2	2	2	2	**2**	0	100
96 Natural Grassland	138	111	111	111	111	**111**	27	80
121 Rock	6,576	1,452	6,210	6,333	6,335	**6,372**	204	97
125 Saltbush	200	0	0	0	0	**0**	200	0
141 Swamp	9,130	6,853	8,366	8,392	8,516	**8,618**	512	94
169 Scrub	3,073	2,251	2,729	2,787	2,818	**2,818**	255	92
199 Riparian Shrubland	1,172	1	16	16	16	**16**	1,156	1
Total Non-Forest Ecosystems	**38,773**	**22,564**	**30,755**	**30,969**	**31,394**	**31,535**	**7,238**	**81**
Total Terrestrial ecosystems	**3,213,371**	**747,035**	**1,440,585**	**1,483,551**	**1,503,289**	**1,509,586**	**1,703,785**	**47**
As proportion of total Terrestrial ecosystem area (%)	100	23	45	46	47	**47**	53	

Notes:

[1] Area derived by ABARES from spatial data associated with the North East RFA (2000). Figures for individual ecosystem classes are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the North East RFA (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land. Spatial datasets covering different time-periods have been reprojected to a common projection but some small differences remain between the datasets. Informal reserves on other Crown land identified from the 2004 Forest Management Zone dataset are included in all subsequent time periods.

Totals may not tally due to rounding

Table 1.29 Terrestrial ecosystem areas in the Southern RFA region

as identified in the CRA spatial data, by changes in area in the CAR reserve system over time

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
Forest Ecosystem								
1 Southern Coastal Hinterland Intermediate Altitude Shrub Dry Forest - *E. sieberi*	50,567	18,797	36,429	37,385	37,385	**37,410**	13,157	74
2 Hinterland Heath Shrub Dry Forest - *Corymbia gummifera/Syncarpia glomulifera*	86,242	22,421	42,158	42,971	42,971	**43,024**	43,218	50
3 Northern Hinterland Shrub Dry Forest - *Syncarpia glomulifera/E. scias*	16,215	10,678	14,253	14,246	14,246	**14,249**	1,966	88
4 Northern Gorge Heath Shrub Dry Forest - *E. punctata/E. agglomerata*	17,822	12,719	13,274	13,429	13,429	**13,429**	4,393	75
5 Northern Coastal Lowlands Shrub/Grass Dry Forest - mixed tree species	8,846	291	2,425	3,765	3,765	**3,768**	5,078	43
7 Southern Coastal Hinterland Shrub/Tussock Grass Dry Forest - *E. sieberi*	20,355	1,002	7,005	7,203	7,203	**7,231**	13,124	36
8 Far Southern Coastal Shrub Dry Forest - *E. sieberi*	479	157	203	203	203	**203**	276	42
9 Coastal Lowlands Cycad/Shrub Dry Forest - *Corymbia maculata*	55,532	1,730	10,873	11,454	11,582	**11,651**	43,881	21
10 Southern Coastal Lowlands Shrub/Grass Dry Forest - *E. globoidea/E. longifolia*	17,634	148	4,513	4,567	4,567	**4,577**	13,057	26
11 Coastal Shrub/Grass Dry Forest - *E. botryoides/E. globoidea/Imperata cylindrica*	426	167	254	254	254	**254**	172	60
12 Coastal Hinterland (Buckenboura) Shrub/Cycad Dry Forest - *Corymbia gummifera*	1,005	0	836	821	821	**821**	184	82
13 Southern Escarpment Foothills Rainshadow Dry Grass Forest - *E. agglomerata*	4,192	3,169	3,210	3,210	3,210	**3,210**	982	77
14 Northern Coastal Hinterland Shrub/Grass Dry Forest - *E. fibrosa/Corymbia maculata*	5,756	1,075	1,292	2,183	2,183	**2,183**	3,573	38
15 Central and North East Tableland Dry Shrub Forest - *E. sieberi*	56,597	14,277	19,724	21,855	21,887	**21,887**	34,710	39
16 North East Tableland Dry Shrub/Tussock Grass Forest - *E. agglomerata*	15,506	6,318	9,111	9,131	9,337	**9,337**	6,169	60
17 Northern Sandstone Dry Shrub Forest - *E. punctata*	92	0	0	0	0	**0**	92	0
18 Southern Coastal Hinterland Shrub/Vine/Grass Moist Forest - *E. cypellocarpa/E.*	50,316	13,389	30,493	31,122	31,122	**31,140**	19,176	62

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
muelleriana								
19 Coastal Escarpment and Hinterland Shrub/Fern Dry Forest - *E. muelleriana*	68,666	20,647	41,399	42,145	42,145	**42,167**	26,499	61
20 Coastal Hinterland Gully Rainforest	2,976	80	1,349	1,348	1,348	**1,350**	1,626	45
21 Northern Coastal Hinterland Moist Shrub Forest - *C. maculata/E. pilularis*	69,988	8,892	24,149	24,463	24,482	**24,573**	45,415	35
24 Coastal Tall Wet Heath Swamp Forest - *Casuarina glauca/Melaleuca ericifolia*	6,119	657	1,594	1,580	1,580	**1,581**	4,538	26
25 South Coast Swamp Forest - *Casuarina glauca*	3,792	391	984	986	1,006	**1,008**	2,784	27
27 Ecotonal Coastal Swamp Forest - *Casuarina glauca/E. botryoides*	343	17	29	29	50	**50**	293	15
28 Coastal Sands Shrub/Fern Forest - *E. botryoides/Banksia serrata*	2,525	215	889	979	979	**989**	1,536	39
29 Northern Coastal Sands Shrub/Fern Forest - *E. pilularis/Banksia serrata*	10,838	2,299	4,107	4,401	4,456	**4,456**	6,382	41
32 Coastal Escarpment Rocky Shrub Dry Forest	44	44	46	46	46	**46**	0	105
34 Deua Ecotonal Shrub Forest - *E. smithii/E. cypellocarpa/Astrotricha latifolia/Notelaea venosa*	123	123	117	117	117	**117**	6	95
35 South Coast Acacia Scrubs - *Acacia sylvestris*	3,980	1,876	2,847	2,857	2,857	**2,858**	1,122	72
37 Scabby Range Dry Shrub Woodland - *E. debeuzevillei/Leptospermum namadgiensis*	271	143	250	250	250	**250**	21	92
38 Tableland Dry Heath Shrub/Herb/Grass Woodland - *Calytrix tetragona*(*E.goniocalyx*)	1,456	748	1,179	1,174	1,175	**1,183**	273	81
40 Coastal Hinterland (Deua NP) Dry Shrub Forest (rhyolite) - *E. stenostoma*	2,415	2,336	2,398	2,398	2,398	**2,398**	17	99
41 Rain Shadow (lower Snowy) Shrubland	705	345	394	394	394	**394**	311	56
43 Western Slopes Riparian Moist Sedge Woodland - *E. camaldulensis*	1,589	0	0	0	0	**0**	1,589	0
47 Far Southern Hinterland Herb/Grass Moist Forest - *E. maidenii/E. globoidea*	85	51	72	72	72	**72**	13	85
48 Coastal Lowlands Riparian Herb/Grass Forest - various eucs	3,625	308	953	956	956	**961**	2,664	27
49 Southern Hinterland Shrub/Herb/Grass Riparian Forest - *Angophora floribunda/E.*	14,573	6,810	9,063	9,081	9,081	**9,091**	5,482	62

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
elata/Acacia mearnsii								
50 Southern Escarpment Herb/Grass Dry Forest- *Angophora floribunda/E.tereticornisherb* grass forest	18,926	5,595	7,806	7,932	7,932	**7,933**	10,993	42
51 Araluen Acacia Herb/Grass Dry Forest - *E. melliodora/E. maidenii*	4,882	58	681	1,332	1,332	**1,333**	3,549	27
53 Riparian Acacia Shrub/Grass/Herb Forest - *Casuarina cunninghamiana*	5,242	769	1,662	1,669	1,673	**1,687**	3,555	32
55 Eastern Tableland Fern/Herb/Grass Moist Forest - *E. fastigata*	36,826	4,680	16,737	16,748	16,748	**16,769**	20,057	46
56 Tableland and Escarpment Moist Herb/Fern Grass Forest - *E. radiata/E. viminalis/Viola* spp	30,714	3,114	12,188	13,399	13,399	**13,436**	17,278	44
57 Southern Escarpment Shrub/Fern/Herb Moist Forest - *E. cypellocarpa* incl. *E.fastigata* & *E.obliqua*	37,166	20,695	29,929	31,357	31,357	**31,441**	5,725	85
58 Tableland and Escarpment Wet Layered Shrub Forest - *E. fastigata/Olearia argophylla/Dicksonia antarctica*	19,184	11,650	17,895	17,949	17,949	**17,953**	1,231	94
59 Eastern Tableland and Escarpment Shrub/Fern Dry Forest - *E. radiata/E. sieberi/Leucopogon lanceolatus*	13,656	1,945	5,824	7,575	7,575	**7,595**	6,061	56
61 Southern Escarpment Edge Moist Shrub Forest - *E. fraxinoides*	3,259	2,437	3,006	2,998	2,998	**2,998**	261	92
62 Southern Escarpment Edge Moist Shrub/Fern Forest - *E. fraxinoides/E. cypellocarpa*	7,633	3,530	6,053	6,020	6,020	**6,021**	1,612	79
64 Southern East Tableland Edge Shrub/Grass Dry Forest - *E.dalrympeana/E.radiata*	1,103	0	943	965	965	**965**	138	87
66 Eastern Tablelands Shrub/Grass Moist Forest - *E. dalrympleana/E. radiata/Poa sieberiana*	5,832	1,256	4,185	4,169	4,169	**4,170**	1,662	72
68 North East Tablelands Shrub/Herb/Grass Dry Forest - *E. pauciflora/E. viminalis/Lomandra longifolia*	9,442	471	897	1,303	1,303	**1,303**	8,139	14
70 Western Escarpment Dry Shrubland - *E. dives/Xanthorhoea australis/Platylobium formosum*	1,567	1,180	1,204	1,204	1,204	**1,208**	359	77
71 Western Tableland Dry *Shrubland - E. macrorhyncha/Leptospermum brevipes*	769	457	717	452	452	**717**	52	93

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
72 Tablelands Dry Shrub Forest - *E. dives/E. radiata/Bursaria lasiophylla*	546	0	46	46	46	**46**	500	8
73 Tableland Dry Shrub/Grass Forest - *E. pauciflora/E. viminalis/Acacia dealbata/Themeda australis*	70,124	2,155	7,117	8,369	8,369	**8,411**	61,713	12
74 South Eastern Tablelands Dry Shrub/Grass/Herb Forest - *E. bridgesiana/E. pauciflora/E. rubida/Acaena novae-zealandiae*	50,156	2,482	5,251	6,544	6,544	**6,544**	43,612	13
75 Tablelands Shrub/Tussock Grass Forest - *E. dives/Chionchloa pallida*	32,536	17,329	18,899	18,856	18,856	**18,932**	13,604	58
76 Tablelands Shrub/Grass Dry Forest - *E. rubida/E. pauciflora/Themeda australis*	38,752	8,545	9,010	8,992	8,992	**9,010**	29,742	23
77 Lower Snowy Dry Shrub/Tussock Grass Forest - *E. goniocalyx/Chionochloa pallida*	69,920	35,779	45,738	45,738	45,738	**45,738**	24,182	65
78 Lower Snowy Dry Shrub/Herb Woodland - *E. albens/Callitris glauciphylla/Acacia deanei*	37,242	31,804	34,338	34,338	34,338	**34,338**	2,904	92
79 Montane Dry Shrub/Tussock Grass Forest - *E. nortonii/Cassinia longifolia/Chionochloa pallida*	604	227	249	249	249	**249**	355	41
80 ACT Dry Shrub/Herb Forest - *E. dives/E. bridgesiana/Cassinia longifolia/Hydrocotyle laxiflora*	4	0	0	0	0	**0**	4	0
81 Eastern Dry Shrub/Herb/Grass Forest - *E. bridgesiana/E. dives/Bursaria spinosa/Poa sieberiana*	8,487	0	0	0	0	**0**	8,487	0
82 Western Montane Acacia Fern/Herb Forest - *E. viminalis/E. robertsonii/Cassinia aculeata/Pteridium esculentum*	94,998	65,022	69,301	69,117	69,117	**71,163**	23,835	75
83 Montane Riparian Moist Shrub/Grass/Herb Forest - *E. dalrympleana/E. robertsonii/Acacia melanoxylon/Microlaena stipoides*	945	238	471	471	471	**471**	474	50
85 Montane Riparian Moist Shrub/Sedge/Grass Forest - *E. dalrympleana/E. viminalis/Leptospermum lanigerum/Poa helmsii*	669	652	656	656	656	**656**	13	98
86 Western Montane Moist Shrub Forest - *E.delegatensis/E. pauciflora/Polyscias sambucifolia/Tasmannia lanceolata*	4,061	4,043	4,049	4,049	4,049	**4,049**	12	100

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
87 Western Escarpment Moist Shrub/Herb/Grass Forest - *E. delegatensis/E. dalrympleana/Derwentia derwentiana/Stellaria pungens*	69,713	54,542	54,546	55,511	55,511	**55,597**	14,116	80
88 Western Escarpment Shrub/Grass Forest - *E. chapmaniana/Daviesia latifolia*	587	587	592	592	592	**592**	0	100
89 Widespread Tablelands Acacia/Herb/Grass Forest - *E. dalrympleana/E. viminalis/Acacia melanoxylon/Stellaria pungens*	29,767	837	11,101	13,050	13,050	**13,105**	16,662	44
90 Northern Tablelands Acacia Herb/Grass Dry Forest - *E. bridgesiana/Acacia dealbata/Hydrocotyle laxiflora*	1,347	147	205	205	205	**205**	1,142	15
91 Burrinjuck Acacia Dry Herb/Grass Forest - *E. bridgesiana/E. bicostata/Acacia dealbata/Poa sieberiana*	4,424	455	1,670	1,533	1,533	**2,062**	2,362	47
92 Tablelands Acacia/Grass/Herb Dry Forest - *E. bridgesiana/E. melliodora/Acacia mearnsii/Microlaena stipoides*	6,476	197	269	269	269	**269**	6,207	4
93 Western Tablelands Herb/Grass Dry Forest - *E.robertsonii/Microlaena stipoides*	32,412	6,236	18,580	15,557	15,557	**19,780**	12,632	61
94 South-west Slopes Acacia Dry Herb/Grass Forest - *E. bridgesiana/E. macrorhyncha/Acacia dealbata/Microlaena stipoides*	25,677	0	7,402	6,337	7,393	**9,417**	16,260	37
95 Tableland Acacia Moist Herb Forest - *E. pauciflora/E. dalrympleana/Acacia dealbata/Helichrysum scorpiodes*	36,549	12,188	17,168	16,349	16,349	**17,227**	19,322	47
96 Tableland Tussock Grass/Herb Forest - *E.pauciflora/E.dalrympleana/Poa sieberiana*	318	317	311	311	311	**311**	7	98
97 Montane Acacia/Dry Shrub/Herb/Grass Forest - *E. dalrympleana/E. pauciflora/Acacia dealbata/Stellaria pungens*	67,482	51,529	53,631	52,794	52,794	**53,668**	13,814	80
98 Western Montane Moist Shrub Forest - *E. pauciflora/E. dalrympleana/Daviesia ulicifolia/Lomandra longifolia*	70,756	47,578	49,963	49,887	49,887	**49,963**	20,793	71
99 Montane Dry Shrub/Herb/Grass Forest - *E. pauciflora/Leucopogon hookeri/Stellaria pungens*	10,172	8,690	9,325	9,325	9,325	**9,325**	847	92
100 ACT Montane Dry Shrub/Grass Forest - *E. pauciflora/Acacia dealbata/Poa induta*	5,567	831	815	815	815	**815**	4,752	15

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
101 Western Montane Dry Shrub/Herb/Grass Forest - *E. dalrympleana/E. pauciflora/Daviesia latifolia/Coprosma hirtella/Stellaria pungens*	41,254	16,922	20,295	20,273	20,273	**20,486**	20,768	50
102 Western Montane Dry Fern/Grass Forest - *E. dalrympleana/E. pauciflora/Poa sieberiana/Asperula scoparia*	2,869	1,457	2,760	2,760	2,760	**2,760**	109	96
103 Western Montane Dry Fern/Grass Forest - *E. dives/E. dalrympleana/E. robertsonii/Pteridium esculentum/Poa sieberiana*	49,332	25,230	30,551	29,239	29,239	**30,725**	18,607	62
104 Tableland Acacia/Herb/Grass Forest - *E. robertsonii/E. dalrympleana/Acacia dealbata/Platylobium formosum/Senecio* sp.	41,116	28,726	32,679	31,742	31,742	**33,651**	7,465	82
106 Montane Dry Shrub/Tussock Forest - *E.robertsonii/E. dalrympleana/Platylobium formosum/Tetratheca bauerifolia*	29,551	28,409	28,446	28,446	28,446	**28,446**	1,105	96
107 Tableland Montane Dry Shrub Forest - *E.dalrympleana/E. dives/Hibbertia obtusifolia*	20,330	3,576	5,196	5,198	5,198	**5,198**	15,132	26
108 Western Tablelands Dry Herb/Grass Forest - *E. macrorhyncha/E. dives/Hibbertia obtusifolia/Poa sieberiana*	75,056	25,344	53,611	48,743	51,566	**58,655**	16,401	78
109 Tablelands Dry Shrub/Tussock Grass Forest - *E. dives/E. mannifera/E.* macrorhyncha/*Hibbertia obtusifolia/Chionochloa pallida*	28,497	2,083	4,107	6,019	6,019	**6,071**	22,426	21
110 Tablelands Dry Shrub/Grass Forest - *E. dives/E. mannifera/E. macrorhycha/Poa sieberiana*	18,393	2,528	8,080	8,628	8,628	**8,720**	9,673	47
112 Eastern Tablelands Dry Shrub Forest - *E. sieberi/E. dives/Brachyloma daphnoides/Poa sieberiana*	7,646	0	1,141	1,490	1,490	**1,567**	6,079	20
113 North East Tablelands Dry Shrub/Grass Forest - *E. mannifera/E. dives/Brachyloma daphnoides/Dianella revoluta*	50,342	4,334	6,666	9,525	9,540	**9,540**	40,802	19
114 Tablelands Dry Shrub/Tussock Grass Forest - *E.macroryncha/E.rossii/E.* goniocalyx/*Chionochloa pallida*	25,018	1,613	4,292	4,374	4,374	**4,432**	20,586	18
115 South East Tablelands Dry Shrub/Tussock Grass Forest - *E. rossii/E. mannifera/Pultenaea procumbens/Chionochloa pallida*	59,766	2	6,696	9,576	9,576	**9,576**	50,190	16

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
116 Western Slopes Herb/Grass Woodland - *E. blakelyi/Microlaena stipoides/Hydrocotyle laxiflora*	4,052	0	134	134	134	**678**	3,374	17
117 Western Slopes Dry Grass Woodland - *E.albens/Microlaena stipoides/Bothriochloa macra*	981	0	22	22	22	**22**	959	2
118 Western Slopes Dry Grass Forest - *E. sideroxylon/E. blakelyi/E. goniocalyx/Elymus scaber*	308	0	12	185	185	**185**	123	60
119 Western Tablelands Dry Shrub/Grass Forest - *E. macrorhyncha/E. polyanthemos/Hibbertia obtusifolia/Gonocarpus tetragynus*	36,151	2	9,241	8,382	10,245	**12,251**	23,900	34
120 Western Slopes Shrub/Herb/Grass Dry Forest - *E. macrorhyncha/E. albens/Hydrocotyle laxiflora/Microlaena stipoides*	10,354	0	1,051	1,034	1,121	**1,152**	9,202	11
121 Western Slopes Grass/Herb Dry Forest - *E. macrorhyncha/E. goniocalyx/Gonocarpus tetragynus/Poa sieberiana*	61,833	7,439	24,530	25,103	26,470	**30,080**	31,753	49
124 Western Montane Wet Heath/Herb Grass Woodland - *E. pauciflora/Epacris breviflora*	4,390	247	550	406	406	**1,549**	2,841	35
127 Sub-alpine Dry Shrub/Herb/Grass Woodland - *E. debeuzevillei*	187	178	165	165	165	**165**	22	88
128 Sub-alpine Dry Shrub/Herb Woodland - *E. niphophila*	45,894	40,986	41,089	41,089	41,089	**41,089**	4,805	90
130 Sub-alpine Shrub/Grass Woodland - *E. niphophila*	66,452	65,979	66,252	65,857	65,857	**66,265**	187	100
137 Coastal Escarpment Moist Shrub/Fern Forest - *E. sieberi/E. piperita/Gleichenia dicarpa*	14,476	8,968	12,190	12,227	12,227	**12,229**	2,247	84
138 Northern Plateau and Escarpment Heath Shrub Dry Forest - *E. sieberi/E. consideniana*	30,823	16,434	23,533	23,325	23,325	**23,370**	7,453	76
139 Northern Coastal Hinterland Heath Shrub Dry Forest - *C. gummifera/E. sclerophylla*	48,057	15,237	27,265	27,760	27,760	**27,766**	20,291	58
146 Tableland Dry Herb/Grass Woodland - *E. pauciflora/E. stellulata/Asperula scoparia*	1,164	244	336	339	339	**340**	824	29
153 Tablelands and Slopes Herb/Grassland/ Woodland - *Themeda australis* plus *E.*	156	0	1	3	3	**3**	153	2

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
pauciflora/E. rubida								
154 Tableland Dry Grass Woodland - *E. bridgesiana/Themeda australis*	15	0	0	0	0	**0**	15	0
160 Western Slopes Dry Grass Woodland - *E. blakelyi/E. melliodora/Danthonia racemosa*	3,646	52	74	44	44	**72**	3,574	2
161 Tablelands and Slopes Dry Herb/Grass Woodland - *E. melliodora/Danthonia racemosa*	556	0	0	0	0	**0**	556	0
162 Western Slopes Moist Herb/Sedge/Grass Woodland - *E. blakelyi/Carex appressa*	150	0	0	0	0	**0**	150	0
164 Coastal Escarpment Cool Temperate Rainforest	1,049	717	960	960	960	**960**	89	92
165 Southern Escarpment Cool/Warm Temperate Rainforest	3,716	1,040	2,762	2,860	2,860	**2,860**	856	77
166 Central Coastal Hinterland and Lowland Warm Temperate Rainforest	7,926	4,136	5,960	5,963	5,984	**5,984**	1,942	75
167 Coastal Lowland Sub Tropical/Littoral Rainforest	585	11	236	237	237	**237**	348	41
168 Ecotonal Granite Dry Rainforest - *Backhousia myrtifolia/Acmena smithii/Angophora floribunda/Pittosporum undulatum*/Doodia *aspera*	316	0	201	242	242	**242**	74	77
169 Coastal Hinterland Sub Tropical Warm Temperate Rainforest	7,825	2,215	2,512	2,514	2,514	**2,514**	5,311	32
170 Southern Coastal Hinterland Dry Gully Rainforest - *Backhousia myrtifolia*	7,244	870	3,926	3,944	3,944	**3,946**	3,298	54
171 Coastal Shrub/Grass Forest - *E. tereticornis*	3,512	1,699	1,669	1,669	1,669	**1,669**	1,843	48
172 Kosciuszko Western Escarpment Cool Temperate Rainforest	106	106	107	107	107	**107**	0	100
173 Northern Grass Herb Forest on Basalt	164	0	13	13	13	**13**	151	8
174 Shoalhaven Gorge Forest - *E. tereticornis / E.melliodora*	13,473	5,547	7,465	7,574	8,024	**8,024**	5,449	60
175 Northern Coastal Lowlands Swamp Forest - *E. robusta*	459	22	95	95	95	**95**	364	21
176 Morton Plateau Mallee Swamp Low Forest	40,155	35,619	38,233	38,241	38,241	**38,241**	1,914	95
177 Illawarra Lowland Sub-Tropical Rainforest	1,674	0	0	0	0	**0**	1,674	0

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
178 Robertson Warm Temperate Rainforest	215	1	2	2	2	**2**	213	1
179 Eastern Deua dry shrub Forest - *Angophora costata*	2,713	607	2,177	2,193	2,193	**2,193**	520	81
180 Cooma Dry grass Forest - *E. viminalis-E.dives*	1,134	0	0	0	0	**0**	1,134	0
181 North-eastern Tablelands Gully Fern Forest - *E.elata / Calochlaena dubia*	3,098	0	248	439	439	**439**	2,659	14
185 Mangrove Estuarine Low Forest	1,393	226	332	332	345	**345**	1,048	25
192 South West Slopes Tall Shrubland Low Forest - *E.dwyeri-Acacia doratoxylon*	1,689	0	695	777	777	**777**	912	46
196 South West Slopes Tall Shrubland Low Forest - *E.dealbata*	152	0	0	0	0	**0**	152	0
Total Forest Ecosystems	**2,445,600**	**911,373**	**1,296,860**	**1,312,357**	**1,320,538**	**1,351,081**	**1,094,519**	**55**
Non-Forest Ecosystem								
36 Montane / Sub-Alpine Dry Rocky Shrubland	2,828	2,680	2,725	2,725	2,725	**2,725**	103	96
65 Southern Escarpment Edge Moist Heath - *Oxylobium ellipticum*	31	29	29	29	29	**29**	2	94
69 Eastern Tablelands Damp Heath - *Epacris microphylla/Schoenus apogon*	63	8	45	49	49	**49**	14	78
123 Montane Wet Heath/Bog - *Baeckea utilis*	300	282	291	291	291	**291**	9	97
125 Montane Wet Heath/Herb Grass - *Hypolepsis japonica - Hydrocotyle peduncularis*	50	19	17	17	17	**17**	33	34
126 Montane Wet Sedgeland - *Carex gaudichaudiana*	189	3	96	96	96	**96**	93	51
131 Sub-alpine Herbfield	32,815	32,671	32,761	32,759	32,759	**32,761**	54	100
134 Eastern Tablelands Dry Heath - *Allocasuarina nana*	3,635	1,173	1,394	1,525	1,525	**1,525**	2,110	42
135 Southern Escarpment (Wadbilliga) Moist Heath	155	49	120	120	120	**120**	35	77
140 Northern Coastal Tall Wet Heath	4,324	250	1,310	1,310	1,310	**1,310**	3,014	30

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
141 Northern Coast (and Escarpment) Wet Heath/Sedge	3,448	2,638	2,811	2,813	2,813	**2,815**	633	82
144 Northern Coast and Hinterland Moist Heath	1,042	602	765	766	766	**766**	276	74
147 Tablelands Moist Sedge/Herb/Grassland	130	14	36	26	26	**34**	96	26
148 Tableland Tussock Grassland /Sedgeland/ Woodland - *Poa labillardieri*	3,218	1	44	48	48	**48**	3,170	1
151 Tableland Sedge/Grass Herbland - *Themeda australis/Carex appressa*	0	0	0	0	0	**0**	0	NA
152 Tableland Herb/Grassland - *Themeda australis*	2	0	0	0	0	**0**	2	0
157 ACT/Monaro Dry Grassland - *Bothriochloa macra/Chrysocephalum apiculatum*	285	2	1	1	1	**1**	284	0
158 Monaro Dry Grassland - *Austrostipa* spp/ *Danthonia* ssp	230	0	18	18	18	**18**	212	8
186 Mudflats/Saltmarshes	893	96	427	427	427	**427**	466	48
187 Coastal Headland Heathlands	414	109	16	16	16	**16**	398	4
188 Sand-dune Wetlands	373	80	191	191	191	**191**	182	51
189 Coastal Alluvial Valley Floor Wetlands	143	0	2	3	3	**3**	140	2
190 Rock	2,362	1,617	1,768	1,783	1,804	**1,804**	558	76
22/23 Southern Coastal Hind Dune/Headland Scrub & Southern Coastal Dune Scrub	1,226	572	268	268	268	**268**	958	22
23/26 Coastal Dune Herb/Grassland & Southern Coastal Dune Scrub	2,335	543	526	526	526	**526**	1,809	23
123/126 Montane Wet Heath/Bog - *Baeckea utilis* & Montane Wet Sedgeland - *Carex gaudichaudiana*	2,296	567	1,504	1,512	1,512	**1,513**	783	66
129/133 Alpine Wet Herbfield & Sub-alpine Wet Herb / Grassland / Bog	49,794	47,672	47,852	47,804	47,804	**47,852**	1,942	96
Total Non-Forest Ecosystems	**112,581**	**91,677**	**95,017**	**95,123**	**95,144**	**95,205**	**17,376**	**85**
Total Terrestrial ecosystems	**2,558,181**	**1,003,050**	**1,391,877**	**1,407,480**	**1,415,682**	**1,446,286**	**1,111,895**	**57**

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
		Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
	Terrestrial ecosystem total[1]	Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016**[3]		
As proportion of total Terrestrial ecosystem area (%)	100	39	54	55	55	57	43	

Notes:

[1] Area derived by ABARES from spatial data associated with the Southern RFA (2001). Figures for individual ecosystem classes are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the Southern RFA (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land. Spatial datasets covering different time-periods have been reprojected to a common projection but some small differences remain between the datasets. Informal reserves on other Crown land identified from the 2004 Forest Management Zone dataset are included in all subsequent time periods.

Totals may not tally due to rounding

Table 1.30 Terrestrial ecosystem areas in the Eden RFA region

as identified in the CRA spatial data, by changes in area in the CAR reserve system over time

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
Forest Ecosystem								
1 Dry Rainforest	42	9	38	38	38	**38**	4	90
2 Myanba Rainforest	333	322	334	334	334	**334**	0	100
3 Rocky Top Dry Shrub Forest	1,188	918	1,045	1,045	1,045	**1,047**	141	88
4 *Acacia sylvestris* / Brogo Shrub Rainforest	6,288	3,533	3,883	3,883	3,883	**3,883**	2,405	62
5 Bunga Head Rainforest	7	7	7	7	7	**7**	0	100
6 Coastal Warm Temperate Rainforest	6,390	2,047	4,246	4,251	4,251	**4,750**	1,640	74
7 Hinterland Warm Temperate Rainforest	3,026	1,275	2,229	2,230	2,230	**2,231**	795	74
8 Cool Temperate Rainforest	1,053	326	989	989	989	**990**	63	94
9 Mountain Wet Layered Forest (*E. nitens*)	1,813	180	1,732	1,732	1,732	**1,732**	81	96
10 Mountain Wet Layered Forest (*E. fastigata*)	17,940	4,624	10,226	10,225	10,225	**10,252**	7,688	57
11 Tantawangalo Wet Shrub Forest	790	212	772	772	772	**772**	18	98
12 Mountain Wet Fern Forest	2,259	438	1,794	1,794	1,794	**1,794**	465	79
13 Hinterland Wet Fern Forest	44,032	17,975	28,056	28,057	28,057	**28,759**	15,273	65
14 Hinterland Wet Shrub Forest	25,875	5,889	11,539	11,589	11,589	**12,319**	13,556	48
15 Mountain Wet Herb Forest	30,875	6,617	18,321	18,317	18,317	**18,345**	12,530	59
16 Basalt Wet Herb Forest	12,208	790	3,809	3,894	3,894	**3,911**	8,297	32
17 Flats Wet Herb Forest	2,931	429	1,198	1,201	1,201	**1,203**	1,728	41
18 Brogo Wet Vine Forest	4,306	777	1,386	1,386	1,386	**1,386**	2,920	32

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
19 Bega Wet Shrub Forest	16,891	1,305	4,047	4,049	4,049	**4,056**	12,835	24
20 Bega Dry Grass Forest	3,808	159	3,238	3,238	3,238	**3,239**	569	85
21 Candelo Dry Grass Forest	1,463	60	1,254	1,254	1,254	**1,254**	209	86
24 Subalpine Dry Shrub Forest	26,584	2,127	4,633	4,713	4,713	**4,747**	21,837	18
25 Sandstone Dry Shrub Forest	822	697	745	745	745	**745**	77	91
26 Tableland Dry Shrub Forest	16,114	2,218	6,868	6,866	6,866	**6,886**	9,228	43
27 Waalimma Dry Grass Forest	1,324	0	364	364	364	**365**	959	28
28 Wog Wog Dry Grass Forest	922	435	899	899	899	**899**	23	98
29 Nalbaugh Dry Grass Forest	1,936	58	835	835	835	**835**	1,101	43
30 Wallagaraugh Dry Grass Forest	914	199	496	496	496	**497**	417	54
31 Hinterland Dry Grass Forest	27,586	4,098	17,689	17,689	17,689	**17,699**	9,887	64
32 Coastal Dry Shrub Forest (*E. longifolia*)	23,400	4,760	10,022	10,025	10,025	**14,382**	9,018	61
33 Coastal Dry Shrub Forest (*E. muelleriana*)	16,136	4,734	9,947	10,068	10,068	**10,088**	6,048	63
34 Brogo Dry Shrub Forest	14,144	3,588	6,262	6,262	6,262	**8,309**	5,835	59
35 Escarpment Dry Grass Forest	22,004	4,225	9,821	9,835	9,835	**9,836**	12,168	45
36 Dune Dry Shrub Forest	603	239	505	505	505	**505**	98	84
37 Coastal Dry Shrub Forest (An. floribunda)	15,147	4,719	7,250	7,244	7,244	**7,417**	7,730	49
40 Riverine Forest	65	0	44	44	44	**44**	21	68
41 Mountain Dry Shrub Forest (*E. fraxinoides*)	1,864	1,105	1,620	1,620	1,620	**1,621**	243	87
42 Coastal Dry Shrub Forest (*E. obliqua*)	21,552	2,719	7,258	7,259	7,259	**7,314**	14,238	34
43 Mountain Dry Shrub Forest (*E. cypellocarpa*)	2,479	2,123	2,284	2,284	2,284	**2,284**	195	92

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
44 Foothills Dry Shrub Forest	3,142	1,082	2,490	2,490	2,490	**2,490**	652	79
45 Mountain Dry Shrub Forest (*E. sieberi*)	1,915	691	1,134	1,134	1,134	**1,135**	780	59
46 Lowland Dry Shrub Forest	15,120	6,274	8,117	8,115	8,115	**8,730**	6,390	58
47 Eden Dry Shrub Forest	17,141	9,407	12,970	12,969	12,969	**13,321**	3,820	78
48 Bega Dry Shrub Forest	4,455	2,630	3,461	3,461	3,461	**4,174**	281	94
49 Coastal Dry Shrub Forest (*E. agglomerata*)	31,835	5,306	10,568	10,566	10,566	**10,900**	20,935	34
50 Genoa Dry Shrub Forest	3,026	1,996	2,262	2,262	2,262	**2,262**	764	75
58 Swamp Forest	953	224	855	855	855	**860**	93	90
71 Monaro Basalt Grass Woodland	3,387	89	3,080	3,080	3,080	**3,080**	307	91
72 Numeralla Dry Shrub Woodland	8,240	467	533	567	567	**567**	7,673	7
73 Monaro Dry Grass Forest	3,615	18	1,248	2,105	2,105	**2,105**	1,510	58
79 Timbillica Dry Shrub Forest	22,792	1,124	7,295	7,296	7,296	**7,416**	15,376	33
81 Wadbilliga Dry Shrub Forest	27,337	26,551	27,031	27,031	27,031	**27,031**	306	99
82 Wadbilliga Range Ash Forest	1,007	1,007	1,014	1,014	1,014	**1,014**	0	100
84 Wadbilliga Range Wet Forest	3,207	2,521	2,590	2,590	2,590	**2,592**	615	81
85 Wadbilliga Gorge Dry Forest	7,234	5,442	6,324	6,324	6,324	**6,324**	910	87
86 Wadbilliga River Valley Forest	1,894	1,447	1,721	1,721	1,721	**1,721**	173	91
Total Forest Ecosystems	**533,412**	**152,212**	**280,378**	**281,618**	**281,618**	**292,497**	**240,915**	**55**
Non-Forest Ecosystem								
23 Monaro Grassland	331	0	0	0	0	**0**	331	0

Terrestrial ecosystem type	Area (hectares)							Proportion in protected areas as at 30 June 2016 (%)
	Terrestrial ecosystem total[1]	Terrestrial ecosystem in protected areas on public land, by time period					Terrestrial ecosystem not in protected areas as at 30 June 2016	
		Pre-RFA[2]	At 30 June 2001[3]	At 30 June 2006[3]	At 30 June 2011[3]	**At 30 June 2016[3]**		
38 Southern Riparian Scrub	516	106	412	413	413	**415**	101	80
39 Northern Riparian Scrub	485	34	260	261	261	**261**	224	54
51 Rock Shrub (*K. ambigua*)	51	20	44	44	44	**44**	7	87
52 Mountain Rock Scrub	202	153	169	169	169	**169**	33	84
53 Montane Heath	1,350	382	576	746	746	**746**	604	55
54 Mountain Nadgee Heath	371	306	363	363	363	**363**	8	98
55 Coastal Lowland Heath	1,630	1,490	1,602	1,602	1,602	**1,602**	28	98
56 Swamp Heath	385	10	135	135	135	**135**	250	35
57 Lowland Swamp	1,892	896	1,586	1,586	1,586	**1,587**	305	84
59 Sub-alpine Bog	1,869	181	567	567	567	**569**	1,300	30
60 Floodplain Wetlands	3,281	285	474	471	471	**478**	2,803	15
61 Coastal Scrub	1,504	1,128	1,197	1,197	1,197	**1,197**	307	80
63 Estuarine Wetland (*M. ericifolia*)	930	91	133	131	131	**134**	796	14
64 Saltmarsh	295	48	81	81	81	**81**	214	27
66 Estuarine Wetland (*Av. marina*)	38	0	15	15	15	**20**	18	52
83 Wadbilliga Mallee Heath	3,085	3,060	3,061	3,061	3,061	**3,061**	24	99
Total Non-Forest Ecosystems	**18,215**	**8,189**	**10,675**	**10,842**	**10,842**	**10,873**	**7,342**	**60**
Total Terrestrial ecosystem	**551,627**	**160,401**	**291,053**	**292,460**	**292,460**	**303,370**	**248,257**	**55**
As proportion of total Terrestrial ecosystem area (%)	100	29	53	53	53	**55**	45	

Notes:

[1] Area derived by ABARES from spatial data associated with the Eden RFA (1999). Figures for individual ecosystem classes are of variable accuracy and should not be assumed to be more accurate than the nearest 100 hectares. Increasing levels of reservation over time are applied to this area.

[2] Directly from the pre-RFA Formal Reserve extent reported in the Eden RFA (formal reserve spatial data provided by the NPWS to the Commonwealth Government at signing of the RFA Scoping Agreement 25 January 1996). Reserves on public land only.

[3] Reserves on public land only. This includes the NPWS estate (formal reserves); informal reserves identified from Forest Management Zone datasets at RFA signing (2000), 2004 and 2016; and additional Regional Prescriptions from the Integrated Forestry Operations Approval where available. Together these components constitute the CAR reserve system on public land. Spatial datasets covering different time-periods have been reprojected to a common projection but some small differences remain between the datasets. Informal reserves on other Crown land identified from the 2004 Forest Management Zone dataset are included in all subsequent time periods.

Totals may not tally due to rounding

Extent of World Heritage Areas in NSW RFA regions

The total land area of the four NSW RFA regions is 15.0 million hectares, of which 749 thousand hectares (5 per cent) is in a UNESCO World Heritage Area (WHA) as at 30 June 2016. The sum of the extent of Forest Ecosystems identified during the CRA process was determined as 8.32 million hectares[31], of which 730 thousand hectares (9 per cent) is in a World Heritage Area as at 30 June 2016.

When the RFA Scoping Document was signed in early 1996, and before all three NSW RFAs came into effect, the only World Heritage area within the NSW RFA regions was the Gondwana Rainforests WHA[32], which was inscribed on the World Heritage List in 1986 and extended in 1994. A total of 309 thousand hectares of land (including 299 thousand hectares in Forest Ecosystems) of the Gondwana Rainforests WHA is in NSW RFA regions, with 213 thousand hectares of land (208 thousand hectares in Forest Ecosystems) in the Lower North East Region and 97 thousand hectares of land (91 thousand hectares in Forest Ecosystems) in the Upper North East region.

As a consequence of the RFA processes[33] the Greater Blue Mountains[34] was inscribed on the World Heritage List in 2000, representing the evolution of Australia's unique eucalypt vegetation. This included 439 thousand hectares of land (431 thousand hectares in Forest Ecosystems) in the Lower North East RFA region.

In 2010, the Australian Convict Sites[35] WHA was inscribed to the World Heritage List and included 350 hectares of land (all within Forest Ecosystems) in the Lower North East RFA region. No further inscriptions to the World Heritage List have been made that occur within NSW RFA regions.

Table 1.31 below summarises the extent of World Heritage Areas in each RFA region at various time points before and after the respective NSW RFAs were signed, including the most recent area as at 30 June 2016. No World Heritage Areas occur within the Southern or Eden RFA regions.

Table 1.32 summarises the extent of Forest Ecosystems in World Heritage Areas in each RFA region at various time points before and after the RFAs were signed. The areas of Forest Ecosystems identified during the CRA process have not been updated since that time. The data presented here therefore do not take into account any change to the total area of

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[31] This area of 8.32 million hectares could be taken as the total area of forest in NSW RFA regions at the date of signing the RFAs, but is never presented as such in the RFA documentation or tables

[32] www.environment.gov.au/heritage/places/world/gondwana

[33] Commonwealth of Australia (1999) CRA World Heritage Sub-theme: Eucalypt-dominated vegetation. Report of the Canberra Expert Workshop 8 and 9 March, 1999, Commonwealth of Australia, Environment Forest Taskforce, Canberra. Available from www.agriculture.gov.au/SiteCollectionDocuments/forestry/publications/nat_cra_whs.pdf

[34] www.environment.gov.au/heritage/places/world/blue-mountains

[35] www.environment.gov.au/heritage/places/world/convict-sites

forest, that is, any additional area of Forest Ecosystems subsequently identified, or any areas that no longer form Forest Ecosystems.

Table 1.31 World Heritage Areas (WHA) in NSW RFA regions over time periods before and after RFA signing

RFA region	Land area ('000 hectares)							Proportion of RFA region area in WHA as at 30 June 2016 (%)
		WHA in RFA region, by time period[2]					RFA region not in WHA as at 30 June 2016	
	RFA region total[1]	Pre-RFA[3]	At 30 June 2001[4]	At 30 June 2006[4]	At 30 June 2011[4]	**At 30 June 2016[4]**		
Upper North East								
Total area	3,910	97	97	97	97	**97**	3,814	2.5
As proportion of total (%)	100	2.5	2.5	2.5	2.5	**2.5**	98	
Lower North East								
Total area	5,789	213	652	652	652	**652**	5,137	11
As proportion of total (%)	100	3.7	11	11	11	**11**	89	
Southern								
Total area	4,516	0	0	0	0	**0**	4,516	0
As proportion of total (%)	100	0	0	0	0	**0**	100	
Eden								
Total area	814	0	0	0	0	**0**	814	0
As proportion of total (%)	100	0	0	0	0	**0**	100	
All RFA regions								
Total area	**15,029**	**309**	**748**	**748**	**749**	**749**	**14,281**	**5.0**
As proportion of total (%)	**100**	**2.1**	**5.0**	**5.0**	**5.0**	**5.0**	**95**	

Notes:

[1] Area derived by ABARES from spatial data associated with the CRA reports published in 1998-2000. Area and proportion of RFA region in WHA over time is applied to this area.

[2] Area derived by ABARES from spatial data for WHA current to 2016.

[3] Figures exclude WHA records that were inscribed on the World Heritage List after the signing of the RFA Scoping Agreement (25 January 1996).

[4] Figures include WHA records inscribed on the World Heritage List up to this date.

Totals may not tally due to rounding

Table 1.32 Forest Ecosystem areas in World Heritage Areas (WHA) in NSW RFA regions over time periods before and after RFA signing

RFA region	Area ('000 hectares)							Proportion of Forest Ecosystem area in WHAs as at 30 June 2016 (%)
	RFA region total of Forest Ecosystems[1]	RFA Forest Ecosystem area in WHAs, by time period[2]					Forest Ecosystems not in WHA as at 30 June 2016	
		Pre-RFA[3]	At 30 June 2001[4]	At 30 June 2006[4]	At 30 June 2011[4]	**At 30 June 2016[4]**		
Upper North East								
Total Forest Ecosystems	2,167	91	91	91	91	**91**	2,076	4
As proportion of total Forest Ecosystems (%)	100	4.2	4.2	4.2	4.2	**4.2**	96	
Lower North East								
Total Forest Ecosystems	3,175	208	639	639	639	**639**	2,535	20
As proportion of total Forest Ecosystems (%)	100	6.5	20	20	20	**20**	80	
Southern								
Total Forest Ecosystems	2,446	0	0	0	0	**0**	2,446	0
As proportion of total Forest Ecosystems (%)	100	0	0	0	0	**0**	100	
Eden								
Total Forest Ecosystems	533	0	0	0	0	**0**	533	0
As proportion of total Forest Ecosystems (%)	100	0	0	0	0	**0**	100	
All RFA regions								
Total Forest Ecosystems	**8,320**	**299**	**730**	**730**	**730**	**730**	**7,590**	**8.8**
As proportion of total Forest Ecosystems (%)	**55**	**3.6**	**8.8**	**8.8**	**8.8**	**8.8**	**91**	

Notes:[1] Area derived by ABARES from spatial data associated with the Forest Ecosystem CRA reports published in 1998-2000. Area and proportion of Forest Ecosystems in WHA over time is applied to this area.

[2] Area derived by ABARES from spatial data for Forest Ecosystems CRA reports, and WHA current to 2016.

[3] Figures exclude WHA records that were inscribed on the World Heritage List after the signing of the RFA Scoping Agreement (25 January 1996).

[4] Figures include WHA records inscribed on the World Heritage List up to this date.

Totals may not tally due to rounding

Indicator 1.2a Forest dwelling species for which ecological information is available

This indicator reports the level of information available to manage forest dwelling species and tracks changes in this knowledge over time. The amount of habitat, disturbance and life history information available to make management decisions indicates the capacity to assess risk to species and to implement conservation strategies.

The national State of the Forests report provides information on forest dwelling and forest dependent species on a five yearly basis.

Over the period from-1998 to 2011, the number of forest dwelling vertebrate species identified in NSW increased by 64 per cent from 504 to 827. Over the same period, the corresponding national figure increased from 1227 to 2212 species, an increase of 80 per cent.

Species sighting data is available at a regional level from the NSW BioNet Atlas, although by its nature, this is not exhaustive and does not include forest dwelling and dependence information. Case studies such as the WildCount project are able to provide species observational data at an RFA regional level.

Table 1.33 Number of forest-dwelling vertebrate species, by jurisdiction (2011) [1]

Taxonomic group [2]	NSW	Australia [3]
Fish	73	220
Amphibians	77	200
Reptiles	213	789
Birds	344	666
Mammals	120	336
Total	827	2,212

Table 1.34 Number of forest-dwelling vertebrate species, by year

Year	NSW	Australia
1998	504	1,227 [4]
2001	780	1,817
2006	760	—
2011	827	2,212

— = not available

[1] Forest-dwelling species are species that may use forest habitat for all or part of their lifecycles.

[2] Subspecies are included where they are managed by jurisdictions or nationally. Non-native species are not included.

[3] Numbers for Australia also include data from offshore forested islands—such as Torres Strait, Christmas, Lord Howe and Norfolk islands.

[4] SOFR 1998 reported a national minimum estimate of forest-dwelling native vertebrate fauna, based on an incomplete compilation of data from New South Wales, the Northern Territory, Tasmania and parts of Queensland.

Source: SOFR 2013.

Table 1.35 Number of forest-dependent vertebrate species, by jurisdiction, 2011 [1]

Taxonomic group [2]	NSW	Australia [3]
Fish	36	109
Amphibians	31	91
Reptiles	92	350
Birds	199	371
Mammals	68	180
Total	426	1,101

Source: SOFR 2013

Notes:

[1] Forest-dependent species are species that must inhabit a forest habitat for all or part of their lifecycles.

[2] Subspecies are included where they are managed by jurisdictions or nationally. Non-native species are not included.

[3] Numbers for Australia also include data from offshore forested islands—such as Torres Strait, Christmas, Lord Howe and Norfolk islands.

Table 1.36 Number of forest-dwelling vascular plant species, by jurisdiction

Reporting date	NSW	Australia
1998	—	13,622
2001	7,448	16,532
2006	7,461	n.r.
2011	7,472	16,836

Source: SOFR 2013

Notes:

— = not available.

n.r. = not reported

BioNet Atlas

NSW maintains a centralised, publicly accessible, spatial database which includes species sightings – The BioNet Atlas[36]. The atlas contains biodiversity observation data for NSW and is a component of the BioNet repository which contains a number of biodiversity data products.

The atlas has been expanded since 1980 from exclusively listing species sightings data to now include four data collections:

- **Species Sightings** – records of species including flora, mammals, birds, reptiles, amphibians, some fungi, invertebrates and fish
- **Systematic Surveys** – detailed systematic flora or fauna survey information for sites where systematic surveys have been undertaken
- **Threatened Biodiversity** –detailed ecological data for each species, populations, communities and key threatening processes listed under the BC Act, in addition to management actions
- **Species Names** – species taxonomic details.

WildCount case study 2014[37]

WildCount is a long term, fauna monitoring project undertaken by NSW OEH and NPWS which uses remotely located motion-sensitive digital cameras to record fauna within 146 parks and reserves straddling the Great Eastern Ranges. The study area covers more than 250,000 km^2 in eastern NSW. Since the WildCount program started in 2012, a small team of researchers and volunteers have collected, processed and reviewed approximately 280,000 wildlife images each year.

In 2014, remote motion sensitive cameras were deployed at a total of 204 sites across eastern NSW, 200 of which were on national parks estate. The WildCount 2014 field season recorded 87 species: 43 mammals, 41 birds, and 3 reptiles across the NSW RFA regions. Findings from across the four RFA regions in 2014 are detailed in **Table 1.37**.

[36] http://www.environment.nsw.gov.au/wildlifeatlas/about.htm
[37] WildCount case study provided by NPWS Biodiversity and Wildlife team

Table 1.38 Summary of 2014 WildCount findings by RFA regions in 2014

Region	Number of sites	Number of parks	Number of species detected	Number of threatened species
Eden	10	5	29	1
Southern	49	32	49	3
LNE	57	41	67	7
UNE	37	31	58	6

Indicator 1.2c Representative species from a range of habitats monitored at scales relevant to regional forest management

This indicator provides broad habitat, population and range information for representative forest dwelling flora and fauna. Evidence of changing ranges or densities of forest dwelling species can be used to guide forest management activities so that they are consistent with maintenance of forest biodiversity.

Scientific Studies

Detailed information has accumulated over the past 20-30 years on the response of representative species to wood harvesting in NSW. An overview of species responses to pre-RFA harvesting in northern NSW found that 40 species appeared to be significantly disadvantaged by harvesting, another 40 species appeared to be significantly favoured by harvesting, while the remainder (147 species) appeared to be relatively unaffected (Kavanagh and Stanton 2005). The sensitivity of some species to harvesting reinforces the necessity for sustainable forest management practices, especially via prescriptions designed to mitigate impacts on specific species. A recent review of these practices during the RFA period concluded that there is a considerable body of knowledge supporting their effectiveness at the local level (Slade and Law 2016).

A range of species-specific responses to wood harvesting as assessed by scientific studies are presented in **Table 1.38**. For many threatened species, such as the Giant Barred Frog and the Golden-tipped Bat, mitigation measures protect core habitat along riparian zones and maintain populations (Lemckert and Brassil 2000; Law and Chidel 2004). Other threatened species, such as hollow-dependent Eastern Pygmy Possum and insectivorous bats, show resilience to wood harvesting because of sufficient landscape protection (Law et al. 2002; Law et al. 2013). Some species, such as the Hastings River Mouse, appear to require some level of disturbance to their habitat and have been found to occur in higher numbers after harvesting compared to areas where harvesting was excluded (Law et al. 2016). Conversely, Greater Gliders are highly sensitive to intensive wood harvesting, though populations can be maintained by excluding harvesting from riparian zones and retaining > 40 % of the basal area in harvested areas (Kavanagh 2000). Koalas are the subject of current research and high detection rates have been recorded after harvesting, across a range of intensities and different times since harvest, at an equivalent rate to old growth forest (Law unpubl. data).[38].

[38] See appendix 3 and 4 for further information on national and NSW threatened species

Table 1.39 Scientific studies assessing the impact of timber harvesting on biodiversity in NSW

Species/Resource	Harvesting Impact	Key Mitigation Measure	Source
Eastern Forest bat	n.d.	Landscape protection	Law and Anderson 2000
Eastern Pygmy Possum	n.d.	Landscape protection	Law et al. 2013
Eucalypt nectar	-	Landscape protection + large tree protection	Law et al. 2000; Law and Chidel 2008
Forest bat community	±	Landscape protection + hollow tree retention	Law and Chidel 2002; Lloyd et al. 2006; Adams et al. 2009
Forest diurnal bird community	±	Landscape protection	Kavanagh and Stanton 2003
Forest frog community	±	Riparian buffer and Landscape protection	Lemckert 1999
Giant Barred Frog	n.d.	Riparian buffer	Lemckert and Brassil 2000
Giant Burrowing Frog	?	Landscape Protection	Penman et al. 2005
Golden-tipped Bat	n.d.	Riparian/Rainforest buffer	Law and Chidel 2004
Greater Glider	-	Hollow tree retention	Kavanagh 2000
Hastings River Mouse	+	Disturbance+Landscape protection	Law et al. 2016
Koala	n.d.	Landscape and browse tree protection	Law unpubl. data
Large Forest owls	n.d.	Landscape protection	Kavanagh 2002
Large-footed Myotis	n.d.	Riparian buffers	Law unpubl. data
Yellow-bellied Glider	n.d.	Landscape protection	Kambouris et al. 2014

Notes: n.d. indicates no impact detected;
? indicates potential impact;
+ indicates positive impact
- indicates negative impact
± indicates positive or negative impacts for different species within the community monitored

Long-term trends

While short-term studies provide an assessment of the response of different species to wood harvesting and mitigation measures, long-term trends are also essential to gauge the time taken for populations to recover after disturbance. A number of long-term studies have focused on documenting trends over time. One example is the Eden Burning Study area in the Eden RFA region, which has been tracking changes in fuel loads, plants, diurnal birds and bats over more than two decades in relation to wood harvesting and frequent burning. Wood harvesting resulted in a short term increase in understorey plant species diversity, which was no longer apparent 15 years after harvesting (**Figure 1.21**). Frequent fire resulted in small, but predictable changes in vegetation, with short-lived herbaceous species increasing in frequently burnt sites and longer-lived shrubs decreasing in these sites (Penman *et al*. 2008). Another long-term example is from the Karuah Hydrology area in Chichester State Forest in the LNE region where forest bats have been banded annually for 20 years. The effect of harvesting history (old growth forest compared to regrowth forest 16-30 years after harvesting) on survival was minor and species-specific, with no detectable effect on survival for two species, a small positive effect for one species, and a small negative effect for another species (Law *et al*. 2018). There was also no effect of harvesting history on the abundance or body condition of any of these species.

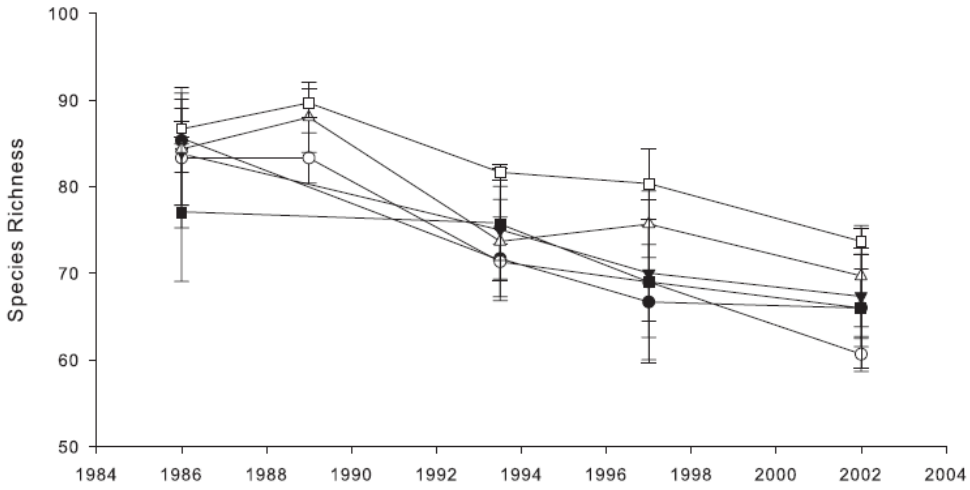

Figure 1.21 Total species richness of ground flora and shrubs at the coupe level (Penman et al. 2008).

One of the longest ecological studies in Australia is now nearing 40 years, investigating the recovery of diurnal birds from intensive harvesting in the Eden RFA region (Kavanagh et al 1985; Kavanagh and Stanton 2003). One of the original aims of this study was to investigate the importance of small unlogged patches as refugia and sources of recovery for bird populations. The study began in the 1970s when no old trees were retained in logged areas and no stream-side reserves were retained. However, intensive harvesting took place as a patchwork of small (~15 hectare) alternate coupes, with unharvested coupes retained adjacent to harvested coupes to maintain landscape heterogeneity. The study found that recovery on harvested coupes had occurred for many species after 13 years and that, after 22

years, the bird assemblages on harvested and unharvested coupes had largely converged (**Figure 1.22**). The presence of nearby unharvested forest patches aided recovery time on the harvested coupes. Notably, some hollow-nesting species (e.g. White-throated Tree-creepers *Cormobates leucophaea*) had not fully recovered on harvested coupes, emphasising the importance of retaining old or 'habitat trees' in the harvested areas themselves.

Forest owls and arboreal mammals have been subject to long-term, periodic monitoring in the south-east forests of the Eden RFA region (Kavanagh and Stanton unpubl. data). About 14 years after intensive wood harvesting and major wildfire disturbance, significant increases were recorded in the distribution and detection rates of the Powerful Owl (*Ninox strenua*) and the Sooty Owl (*Tyto tenebricosa*) (**Figure 1.23**). Detection rates of these two owls continued to increase until approximately 20 years after disturbance by 1997/2000. Thereafter, site-occupancy for the Powerful Owl decreased substantially, following a marked decrease in abundance of their principal prey species, the Common Ringtail Possum (*Pseudocheirus peregrinus*). These results highlight the dynamic nature of regenerating forests and the predator- prey interactions within the system.

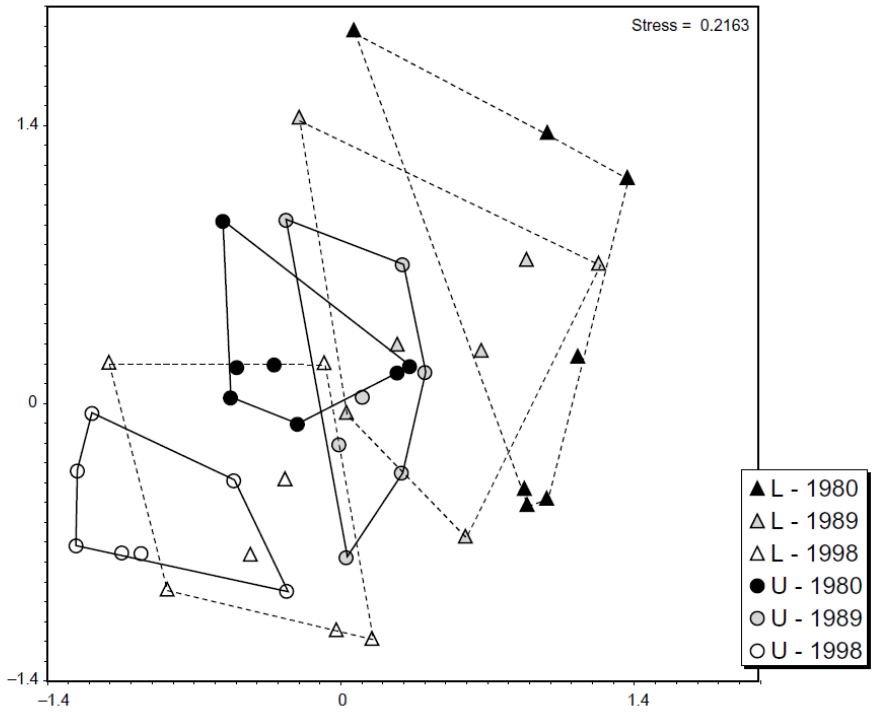

Figure 1.22 Similarity in bird assemblages on logged and unlogged coupes in 1980, 1980 and 1998 (after Kavanagh and Stanton 2003). Polygon groupings are made by treatments within each year. U=unlogged, L=logged. Logged coupes grouped by broken lines, unlogged coupes grouped by solid lines. Axes represent multidimensional values so that greater distances along the plot represent greater differences in bird communities.

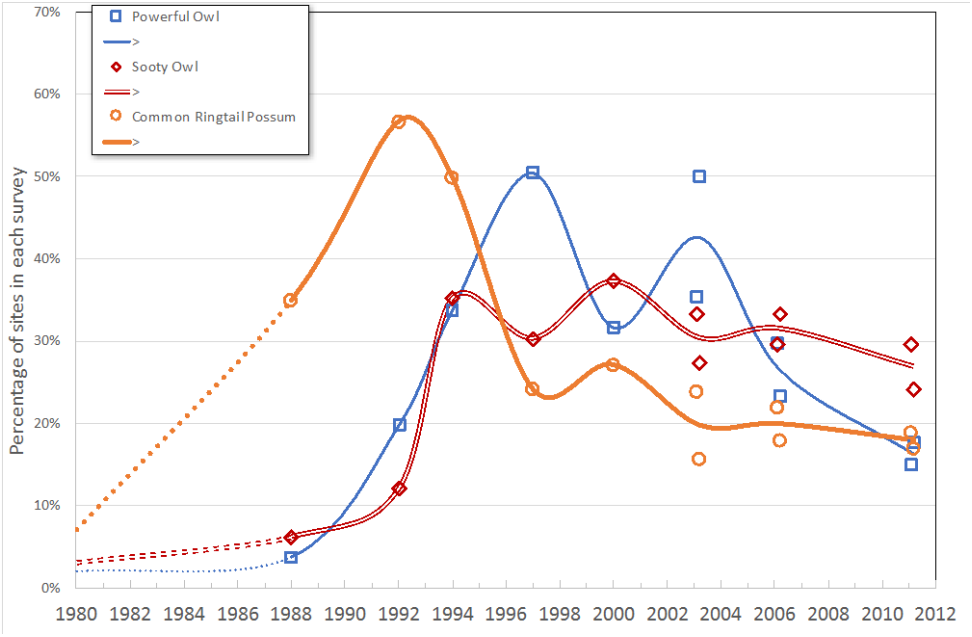

Figure 1.23 Detection rates for two species of large forest owl and a primary prey species in the far south-east forests of NSW. Connecting lines pass through the average measure for years with two samples and are to aid interpretation of the data points (Kavanagh and Stanton unpubl. data).

In addition to monitoring in native forests, changes to biodiversity since establishment of eucalypt plantations on cleared farmland in the North East RFA region have been monitored for 17 years. Among diurnal birds, 47 per cent of species increased (mostly forest species) over 11 years of plantation growth and 31 per cent of species (mostly open country species) declined (Law *et al.* 2014). Eleven threatened mammals and nocturnal birds were recorded in these plantations, but common species such as the Brushtail Possum were the main increasers over time (Law *et al.* 2017).

WildCount (see Indicator 1.2a) is looking at trends in occurrence of animals at the sites, to understand if animals are in decline, increasing or stable.

Other current biodiversity monitoring programs undertaken by FCNSW or Department of Primary Industries (DPI) - Forestry in native forests are listed in **Table 1.39**.

Table 1.40 Monitoring of forest dwelling species by FCNSW and/or DPI

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
Southern brown bandicoot (*Isoodon obesulus*)	Ben Boyd National Park and Nadgee Nature Reserve in the far south-eastern corner of NSW	Ground-living mammals	Infrared cameras used to monitor trends in southern brown populations at 40 sites. In addition to the target species, the cameras record information about the status of other threatened fauna, including the long-nosed potoroo (*Potorous tridactylus*) and eastern pygmy possum (*Cercatetus nanus*), as well as other species of interest for environmental management, such as the long-nosed bandicoot (*Perameles nasuta*).	Commenced in 2013	Camera monitoring to-date has indicated that the southern brown bandicoot occurs in discrete patches of habitat within each reserve, and has persisted in those patches irrespective of surrounding management activities. This is also the case for the long-nosed bandicoot, which is common and widespread, and the long-nosed potoroo, also relatively widespread. However, monitoring has not been in place for long enough to infer meaningful trends in patterns of occurrence of these species.
Brush-tailed Rock Wallaby *(Petrogale penicillata*)	Cessnock / Watagans, Watagans and Pokolbin SFs LNE	Ground-living mammals	Pellet counts assessing ongoing presence of BRTPs as a result of fox control programs - part of Fox threat abatement plan.	Commenced in approximately 2000. Pellet counts at standard points across 3 sites. 3 times per year	Rock wallabies persist at the sites, need for revision of methodology and safety concerns. Data is only allowing for determination of persistence at sites. Sampling has temporarily ceased due to safety concerns on cliff edges.
Large-footed Myotis *(Myotis macropus)*	Kippara and Mount Boss State forest, UNE	Flying mammal	Banding of bats inhabiting several bridges in Kippara State Forest and surrounding area. Occurring for more than 10 years.	Commenced in approximately 1996	Bat age, health, sex, previously banded. Data allowing for population estimates and changes over time in harvested forest

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
					landscape. Long term data.
Southern Brown Bandicoot (*Isoodon obesulus*)	Yambulla, Nadgee, Timbillica and East Boyd State forest – Far south east NSW Eden	Ground-living mammals	Twice annual remote camera sample surveys. Monitoring persistence in the landscape over time and habitat management strategy within the Eden threatened species licence	2007	Presence of individuals over sampling period enabling determination of occupancy rates and changes in occupancy over time. Data indicates on going presence in the forests, additional data captured on Long-nosed Bandicoots and Long-nosed Potoroos showing similar presence in the forests.
Smoky Mouse (*Pseudomys fumeus*)	Nullica State Forest Eden	Ground-living mammals	Twice annual remote camera sample surveys. Monitoring persistence in the landscape over time and habitat management strategy within the Eden threatened species licence including vegetation plots.	2007	Presence of individuals over sampling period enabling determination of occupancy rates and changes in occupancy over time. Species persists in low numbers.
Giant Burrowing Frog (*Helioporus australicus*)	Nullica and Yambulla State forest Eden	Frogs	Breeding site monitoring, through identification of tadpoles, stream and weather monitoring, song meter call identification	2007	Breeding sites located are continuing to be used, calling parameters and weather conditions including stream flow characteristics.
Yellow-bellied Glider (*Petaurus australis*)	Bago and Maragle State forest Tumut	Arboreal Mammals	Surveys and monitoring of population to assess ongoing persistence of population and provide data on endangered population.	2010	Population appears not to be isolated but is linked through the broader area of Kosciusko National Park, powerline easements do not appear to be the barrier they were considered. Population persists in the forests.

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
Bell-minor associated Dieback (forest health)	Northern NSW forests UNE, LNE	Forest Health	Investigations underway into satellite image modelling for retrospective assessment of change in canopy health, helicopter flights undertaken to repeat 2004 forest health assessing	2016	Results will be collated and used to improve understanding of rate of spread, causal factors and value of fire as a tool
Koala (*Phascolarctos cinereus*)	Northern NSW forests and Eden forests (UNE, LNE, Eden)	Arboreal mammals	Song meters deployed to record the male bellowing calls in spring / early summer	2015	Preliminary use of song meters proving to be very successful, recogniser developed, enabling repeat sampling to be undertaken which will enable long term habitat occupancy trends.
Acacia ruppii	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Niemeyera whitei	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Boronia umbellata	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Melaleuca groveana	Northern Forests UNE, LNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
Tasmannia purpurascens	Northern Forests LNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Hibbertia marginata	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Grevillea quadricauda	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Eucalyptus glaucina	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Angophora robur	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Parsonsia dorrigoensis	Northern Forests UNE, LNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.
Macrozamia johnsonii	Northern Forests UNE	Flora	Response to disturbance, review results with EPA, determine appropriate protective measures	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
Biodiversity in eucalypt plantations	Northern Forests UNE	Ground-living mammals, arboreal mammals, diurnal and nocturnal birds	DPI Research and monitoring	1997	Results peer reviewed and published, used to assess biodiversity status
Significant bat roosts	Southern Forests RFA	Bats	Annual population counts	1999	Results used to assess biodiversity status
Burning study	Eden RFA	Various	Monitoring flora and fauna response to burning	1986	Results peer reviewed and published, used to assess response to disturbance
Forest bats	Northern Forests LNE	Bats	Annual banding	1999	Results peer reviewed and published, used to assess response to disturbance
Golden-tipped bat (*Kerivoula papuensis*)	Southern RFA	Arboreal mammals	Periodic Radio tracking	2001	Results peer reviewed and published, used to assess response to disturbance
Hastings River mouse (*Pseudomys oralis*)	Northern Forests UNE	Ground-living mammals	1,150 traps in 23 locations	April 2015	Results used to assist in determining appropriate conditions for species for IFOA revision.

Monitoring	Location	Category	Details	Commenced, schedule and frequency)	Summary of results
Aquatic macro-invertebrates	Northern Forests UNE	Invertebrate	Ongoing monitoring at 6 sites	May 2015	Results used to assist in determining appropriate conditions for species for IFOA revision.
Northern corroboree frog (*Pseudophryne pengilleyi*)	Tumut area	Amphibians	Monitored via call response	2005	Results used to assist in determining appropriate conditions for species for IFOA revision.

Source: FCNSW and DPI staff.

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Lloyd A., Law B. and Goldingay R. 2006. Bat activity on riparian zones and upper slopes in Australian timber production forests and the effectiveness of riparian buffers. *Biological Conservation* **129**: 207-20.

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Penman, T. D., Binns, D. L., Shiels, R. J., Allen, R. M. &Kavanagh, R. P. (2008). Changes in understorey plant species richness following logging and prescribed burning in shrubby dry sclerophyll forests of south-eastern Australia. Austral Ecology 33(2): 197-210.

Slade, C. and Law, B. (2016) The other half of the coastal State Forest estate in New South Wales; the value of informal forest reserves for conservation. Australian Zoologist

Indicator 1.3a Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species

This indicator assesses the risks to loss of forest genetic variation and describes the formal measures designed to mitigate this risk. A loss of genetic diversity in species can result in a decreased ability to adapt to future environmental change, and thus a higher risk of extinction.

Australia's Biodiversity Conservation Strategy 2010—2030 is a guiding policy framework for conserving Australia's biodiversity, which includes genetic diversity. Formal measures are in place across NSW to address the risk of loss of genetic variation in threatened species. These measures include recovery plans, conservation advices, habitat restoration, wildlife corridors, engineered animal movement mechanisms, seed-collecting programs, and management of habitat and populations under forest management systems. Nominations for listing as 'threatened' include species with populations that are low in numbers, small in geographic extent or fragmented, and that have low genetic variability, hybridisation and fecundity issues.

The NSW *Saving our Species* program also considers where it is prudent to 'insure' against future extinction by storing a representative sample of the genetic variation of the species in a way that allows for reintroduction if extinction in the wild occurs. Genetic storage can be either storage of preserved genetic material (i.e. seeds) or maintaining the species in live, captive populations[39]. For example, although outside the NSW RFA regions, the *Saving our Species* program is continuing to work in partnership with surrounding landholders to increase the population and improve the genetic diversity of rock-wallabies at Jenolan Caves[40].

In the NSW RFA regions, there are several examples of projects aimed at conserving and increasing threatened species populations.

In the Ourimbah State Forest in the LNE region, the NSW Government implemented a habitat protection program for one of Australia's largest colonies of the eastern horseshoe bat (*Rhinolophus megaphyllus*), which was first discovered in the mid-1990s. The program involved modifications to harvesting plans to protect the habitat of the bat. Long-term

[39] OEH 2013, *Introducing Saving our Species Program*, accessed 4 September 2017 www.environment.nsw.gov.au/research-and-publications/publications-search/introducing-saving-ourspecies

[40] OEH 2016, *Savings our Species 2016-2021: More plants and animals to be saved from extinction*, accessed 4 September 2017 www.environment.nsw.gov.au/research-and-publications/publicationssearch/saving-our-species-2016-2021

monitoring since 1996 shows that the species is thriving, with a population at the site fluctuating at around 10,000 individuals[41].

Case study: Release of long-nosed potoroos and southern brown bandicoots in Booderee National Park

Long-nosed potoroos (a vulnerable species) and southern brown bandicoots (an endangered species) have long been extinct in Booderee, likely as the result of predation by foxes[42]. An intensive feral predator control program has been carried out in Booderee since the early 2000s, and fox and cat numbers are now low.

Populations of long-nosed potoroos (*Potorous tridactylus*) and southern brown bandicoots (*Isoodon obesulus*) are being translocated from State forests near Eden to the Booderee National Park near Jervis Bay. The release of these species into Booderee National Park has been made possible by the park's intensive fox control program.

Seasonal monitoring using remote sensing digital cameras showed southern brown bandicoots were thriving in the State forests near Eden with the aid of a permanent pest animal baiting program. Due to the increased numbers in the southern brown bandicoot population, individuals have been translocated to the Booderee National Park to re-establish a resident population[43].

The project plans to introduce at least 36 long-nosed potoroos and 30 southern brown bandicoots. This project is a partnership between Parks Australia (Department of the Environment and Energy), FCNSW, the NSW NPWS, the Australian National University (ACT) and the Southern Ark team from Department of Environment, Land, Water and Planning (Victoria), with veterinary assistance from Taronga Zoo.

Progress of the project to date includes:

- The first group of 23 long-nosed potoroos was released in Booderee in October 2014, with a further 12 animals released in October 2015.
- Thirteen southern brown bandicoots were reintroduced in May 2016, after being absent from the park for almost 100 years.
- Researchers from the Australian Government National Environmental Science Programme's Threatened Species Recovery Hub have been involved in the reintroductions and are coordinating tracking and monitoring of the released animals.
- Southern brown bandicoots tracked for a month following translocation all appeared to show normal behaviour, including nest building, and they rapidly selected heath as their preferred habitat.

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[41] FCNSW n.d., *Ecology*, accessed 15 November 2016 www.forestrycorporation.com.au/about/contact-us

[42] Department of the Environment and Energy 2017, *Booderee potoroos and bandicoots*, accessed 1 September 2017 www.environment.gov.au/biodiveristy/threatened/publications/factsheet-booderee-potoroos-andbandicoots

[43] FCNSW 2014, *Southern brown bandicoot continues to thrive in Eden State forests*, accessed June 2017 www.forestrycorporation.com.au/about/releases/southern-brown-bandicoot

- Ongoing monitoring continues to detect both long-nosed potoroos and southern brown bandicoots, including some with pouch young, persisting at the release sites.

Wetland values

Australia has international obligations under the Ramsar Convention to protect the ecological character of declared Ramsar wetlands. The four Ramsar Wetlands of International Importance in the NSW RFA regions cover approximately 48,176 hectares. While the original NSW RFAs do not include clauses specifically on wetland values, they include the commitments from the NSW Government to implement measures to improve catchment and water management. These measures have largely been met as reported in the five-yearly reviews and in the Independent Reviews.

All Ramsar listed wetlands, including those in RFA regions, are protected by Part 3 of the EPBC Act. This means any action (including forestry operations) that has, will have, or is likely to have, a significant impact on the ecological character of a Ramsar wetland must be referred to the Minister and undergo an environmental assessment and approval process.

The primary responsibility for managing wetlands and their associated flora and fauna is vested in the respective landholder/land manager. Individual state and territory governments have the primary legislative and policy responsibility for natural resource management[44]. The NSW OEH is responsible for implementing the Ramsar Convention in NSW.

Australia's obligations under the Convention on Wetlands of International Importance (Ramsar Convention)

The Ramsar Convention is an international agreement promoting the conservation and wise use of wetlands. It aims to halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain.

As a signatory of this Convention, Australia has an obligation to manage and protect wetlands of international importance (Ramsar wetlands). The EPBC Act establishes a process for identifying Ramsar wetlands and encourages best practice management through nationally consistent management principles. The EPBC Act provides automatic protection for Ramsar wetlands by ensuring an assessment process is undertaken for proposed actions (including forestry operations) that will, or are likely to, have a significant impact on the ecological character of a declared Ramsar wetland. This process allows the Commonwealth Minister for the Environment to grant or refuse approval to take an action, and to impose conditions on the taking of an action.

The exemption from other Commonwealth assessment and approval requirements under section 38 of the EPBC Act for forestry operations in RFA areas does not apply to operations within Ramsar wetland sites.

Protecting NSW Ramsar sites

Wetland sites are listed under the Ramsar Convention if they meet at least one of the nine Ramsar criteria. A wetland should be considered internationally important if it:

[44] DoEE, Managing Wetlands, www.environment.gov.au/water/wetlands/managing (accessed 1 May 2018)

1. Contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.
2. Supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
3. Supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.
4. Supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
5. Regularly supports 20,000 or more waterbirds.
6. Regularly supports one per cent of the individuals in a population of one species or subspecies of waterbird.
7. Supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.
8. Is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.
9. Regularly supports one per cent of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species. Under the Ramsar Convention, the NSW government is required to protect the ecological character of its Ramsar sites.

The NSW Government's Wetlands Policy promotes the sustainable conservation, management and wise use of wetlands in NSW and the need for all stakeholders to work together to protect wetland ecosystems and their catchments. The policy recognises that there are several Acts which can help to protect wetland values such as the BC Act and the EPBC Act.

The NSW Government is responsible for managing all Ramsar wetlands in the NSW RFA regions and works collaboratively with a diverse range of stakeholders, including Ramsar Convention Secretariat, Commonwealth Government, local governments, landowners and community groups, to promote the conservation and wise use of wetlands and to implement the Ramsar Convention[45]. OEH is responsible for:

- Coordinating which wetlands in NSW are to be nominated for listing as Ramsar sites
- Advising on how existing Ramsar wetlands are managed
- Managing Ramsar wetlands in national parks and reserves
- Promoting the values of the Ramsar Convention
- Reporting to the Australian Government on how the convention is being implemented in NSW.

Ramsar sites in NSW RFA regions

[45] OEH, *Internationally significant wetlands*, www.environment.nsw.gov.au/topics/water/wetlands/internationally-significant-wetlands (accessed 27 April 2018)

As of May 2018, 66 Australian wetlands – including 12 in NSW- have been designated to the Ramsar list. Of the 12 Ramsar sites in NSW, four are located in the NSW RFA regions and cover approximately 48,176 hectares (see **Table 1.40**).

Table 1.41 Ramsar Wetlands of International Importance in NSW RFA regions

Wetland	RFA	Date of listing	Area (hectares)
1. Blue Lake	S	17 March 1996	338
2. Little Llangothlin Nature Reserve	NE	17 March 1996	258
3. Hunter Estuary Wetlands	NE	21 February 1984	2,968
4. Myall Lakes	NE	14 June 1999	44,612

Notes:
RFA region: S – Southern, NE – North East, E – Eden
Source: Environmental Resources Information Network Species of National Environmental Significance Database.

Blue Lake[46]

Blue Lake and Hedley Tarn within Kosciuszko National Park are a rare example of a near-natural alpine wetland within the South-East Coast Drainage Division. Blue Lake is one of only four cirque lakes found on the Australian mainland, and Blue Lake is the deepest of these alpine lakes which contain the freshest water in Australia. It is listed under Ramsar criteria 1, 2 and 3.

A number of rare or threatened plants are found within the Ramsar site, including the branched caraway (*Oreomyrrhis brevipes*), wedge oschatzia (*Oschatzia cuneifolia*) and the snow-wort (*Abrotanella nivihena*) and it supports the endangered ecological community of montane peatlands and swamps.

Threatened animal species found around Blue Lake include the mountain pygmy possum (*Burramys parvus*) and the broad tooth rat (*Mastacomys fuscus*).

The Ramsar site contains the only high altitude alpine wetlands in Australia. In addition to supporting nationally threatened species, the site supports other populations of plant and animal species important for maintaining the biological diversity of this particular biogeographic region. This has been acknowledged through the inclusion of Kosciuszko National Park as a biosphere reserve in the UNESCO man and the biosphere program.

Site Management

Management of this Ramsar site is guided by scientific information available from Australian Wetland Database, and a range of management plans. This includes the site's Ramsar

[46] DoEE 2016, *Australian Wetlands Database: Blue Lake*, www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=48 (accessed 27 April 2018)

information sheet, its ecological character description, and the plan of management for Kosciuszko National Park.

Little Llangothlin Nature Reserve[47]

The Little Llangothlin Nature Reserve Ramsar site is located between Armidale and Glen Innes on the New England Tablelands in north-eastern NSW. The Ramsar site comprises all of the 257.6 hectare Nature Reserve which is managed by the NSW NPWS. It is listed under Ramsar criteria 1, 2 and 4.

The site supports terrestrial habitat including about 44 hectares of eucalypt woodland with grass understorey, including patches of the nationally threatened ecological community 'New England peppermint (*Eucalyptus nova-anglica*) grassy woodlands' and cleared areas that are predominantly grasslands containing kangaroo grass (*Themeda australis*) and exotic pasture species (Benson and Ashby 2000). The grasslands support the nationally endangered Austral toadflax (*Thesium australe*), a small plant which parasitises the roots of kangaroo grass.

The site regularly supports large numbers of waterbirds and waders, and is an important drought refuge for waterbirds. The nationally endangered Australasian bittern *(Botaurus poiciloptilus*) has been recorded twice at the site in recent years and is suspected to breed there.

Little Llangothlin Nature Reserve was traditionally used by Indigenous peoples and numerous artefacts have been found at the site. Currently the Ramsar site is used for scientific research, teaching, and nature-based recreation.

Site Management

Management of this Ramsar site is guided by scientific information available from Australian Wetland Database, and a range of management plans. This includes the site's Ramsar information sheet, its ecological character description, and a plan of management for Little Llangothlin Nature Reserve.

Hunter Estuary Wetlands[48]

The Hunter Estuary Wetland Ramsar site is currently in two parts - *Kooragang Nature Reserve* (now part of Hunter Wetlands National Park) that was listed under the Ramsar convention in 1984, and *Hunter Wetlands Centre* that was added in 2002. The site is listed under criteria 2, 4 and 6.
The Kooragang component of the Hunter Estuary Wetlands Ramsar site is located in the estuary of the Hunter River, approximately 7 km north of Newcastle on the coast of NSW. Hunter Wetlands Centre Australia is 2.5 km from Kooragang. Although the sites are not

[47] DoEE 2016, *Australian Wetlands Database: Little Llangothlin Nature Reserve*, www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=45 (accessed 27 April 2018)
[48] DoEE 2016, *Australian Wetlands Database: Hunter Estuary Wetlands*, www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=24 (accessed 27 April 2018)

contiguous they have significant linkages, both hydrologically and by a wildlife corridor consisting of Ironbark Creek, the Hunter River and Ash Island.

Hunter Wetlands Centre Australia is a small but unique complex of wetland types surrounded by urban development along three boundaries. Previously degraded, this urban wetland has been restored. Habitat types at the Hunter Wetlands Centre Australia include restored semi-permanent/seasonal freshwater ponds and marshes, natural semi-permanent/seasonal brackish ponds and marshes, freshwater swamp forests and a coastal estuarine creek.

The Hunter Estuary Wetlands Ramsar site supports three species that are nationally and internationally listed. The estuary stingray (*Dasyatis fluviorum*) listed as vulnerable on the IUCN Red List (Version 2009.1) and the green and golden bell frog (*Litoria aurea*) listed as vulnerable under the EPBC Act have been found within the Kooragang component of the Ramsar site. The Australasian bittern (*Botaurus poiciloptilus*), listed as endangered on both the EPBC Act and the IUCN Red List (Version 2009.1), has been found at both components of the Ramsar site.

The Hunter Estuary Wetland Ramsar site supports 112 species of waterbirds and 45 species of migratory birds listed under international agreements, including the great egret (*Ardea alba*), cattle egret (*Ardea ibis*), terns (*Sterna* spp.), glossy ibis (*Plegadis falcinellus*) and white-breasted sea-eagle (*Haliaeetus leucogaster*). It also provides refuge for waterbirds such as ducks and herons during periods of inland drought and regularly supports one per cent of the population of the eastern curlew (*Numenius madagascariensis*) and the red-necked avocet (*Recurvirostra novaehollandiae*).

Site Management

Management of this Ramsar site is guided by scientific information available from Australian Wetland Database, and a range of management plans. This includes the site's Ramsar information sheet, its ecological character description, a plan of management for Hunter Wetlands Centre, which is on private land, and a plan of management for Kooragang Nature Reserve. A plan of management is being prepared for Hunter Wetlands National Park, which now incorporates Kooragang Nature Reserve.

Myall Lakes[49]

The Myall Lakes Ramsar wetland is located within the Myall Lakes National Park, approximately 75 kilometres north of Newcastle on the NSW mid-north coast. Myall Lakes National Park comprises four main lakes (the Bombah Broadwater, Boolambayte, Two Mile and Myall Lakes), together with the lesser areas of Nerong Creek, sections of the Upper and Lower Myall River, Boolambayte Creek, Fame Cove Inlet and Broughton Island. The Ramsar site incorporates a number of distinct wetlands associated with the waterways and dune systems. It is listed under Ramsar criteria 1, 2 and 3.

[49] DoEE 2016, *Australian Wetlands Database: Myall Lakes*, www.environment.gov.au/cgi-bin/wetlands/ramsardetails.pl?refcode=52# (accessed 27 April 2018)

The site supports a high diversity of animal species, with 298 birds, 58 mammals, 44 fish species, 37 reptiles and 29 amphibians recorded from the Ramsar site (NSW Wildlife Atlas). Many of the site's fauna are found in a wide range of wetland types, including estuarine waters; intertidal forested wetlands; coastal freshwater lagoons; permanent rivers, streams or creeks; freshwater tree dominated wetlands; and shrub dominated wetlands.

The Myall Lakes Ramsar site supports five wetland dependent species which are listed as nationally threatened under the EPBC Act, or listed as internationally threatened in the IUCN Red List, including the Australasian bittern, Freycinet's frog, green and gold bell frog, green thighed frog and stuttering frog.

The site is important for providing habitat for migratory birds, with 22 species listed in agreements between Australia and Japan, China and the Republic of South Korea recorded from the site. Migratory species listed under international agreements which breed in the Ramsar site include little tern (*Sterna albifrons*), sooty shearwater (*Puffinus griseus*), short-tailed shearwater (*Puffinus tenuirostris*) and wedge-tailed shearwater (*Puffinus pacificus*).

The site's vegetation is particularly diverse, with 946 species of terrestrial flora, two mangrove species (*Avicennia marina* and *Aegiceras corniculatum*), 10 species of submerged aquatic flora recorded including *Vallisneria gigantea, Ruppia megacarpa, Myriophyllum salsugineum* and *Najas marina*, and saltmarsh species such as *Sarcocornia quinqueflora, Suaeda australis, Baumea juncea* and *Juncus kraussii*. The terrestrial species occur in a wide range of vegetation communities, from rainforest and wet sclerophyll vegetation to heathland and sand dune vegetation.

Site Management

Management of this Ramsar site is guided by scientific information available from Australian Wetland Database, and a range of management plans. This includes the site's Ramsar information sheet, its ecological character description, a plan of management for Myall Lakes National Park, Little Broughton Island Nature Reserve and Stormpetrel Nature Reserves, and a zoning plan for those parts of the Ramsar site within the Port Stephens–Great Lakes Marine Park.

Nationally Important wetlands

There are 198 Nationally Important Wetlands in NSW, of which almost half (48.5 per cent) are within NSW RFA regions (Appendix 2). A wetland may be considered nationally important if it meets at least one of six criteria covering factors such as their ecological role, their social and cultural values and the flora and fauna that rely on them[50].

Non-Ramsar wetland areas in RFA regions and the extent in terrestrial ecosystems, and in the CAR Reserve system

[50] OEH, Other protected wetlands, www.environment.nsw.gov.au/topics/water/wetlands/protecting-wetlands/other-protected-wetlands (accessed 2 May 2018)

Spatial data for NSW wetlands shows there are 172 thousand hectares of non-Ramsar wetlands in the four NSW RFA regions. Wetlands include coastal lagoons and lakes, estuarine wetlands, floodplain wetlands, freshwater lakes, and reservoirs.

By NSW RFA regions, there are 82 thousand hectares in the Lower North East RFA region, 50 thousand hectares in the Southern RFA region, 35 thousand hectares in the Upper North East RFA region, and 5.2 thousand hectares in the Eden RFA region.

Of the non-Ramsar wetland area of 172 thousand hectares, 24 thousand hectares (14 per cent) are in the CAR reserve system and 148 thousand hectares (86 per cent) are outside the CAR reserve system.

Of the total non-Ramsar wetland area of 172 thousand hectares, 23 thousand hectares are contained in Forest Ecosystems, of which 7.9 thousand hectares (34 per cent) are also in the CAR reserve system. Additionally, there are 9.5 thousand hectares of non-Ramsar wetlands that are contained in Non-Forest Ecosystems, of which 6.0 thousand hectares (63 per cent) are also in the CAR reserve system. The total area of non-Ramsar wetlands within the RFA terrestrial ecosystems is 33 thousand hectares, of which 14 thousand hectares (42 per cent) are in the CAR reserve system.

However, the majority of non-Ramsar wetlands areas in RFA regions (139 thousand hectares) are located not within RFA terrestrial ecosystems. Examples include coastal lagoons such as Lake Macquarie and Tuggerah Lake on the NSW Central Coast in the Lower North East RFA region, and reservoirs such the network of reservoirs that form the Snowy Hydro Scheme in the Southern RFA region. Of this area of non-Ramsar wetlands in RFA regions that are not within RFA terrestrial ecosystem, 10 thousand hectares (7 per cent) are in CAR reserves and 129 thousand hectares (93 per cent) are outside CAR reserves.

A full summary of the extent of wetlands in each RFA region, by land type, including terrestrial ecosystems, and the extent in the CAR Reserve system is in **Table 1.41**.

Table 1.42 Extent of non-Ramsar wetlands, by land type and extent in CAR reserves

RFA region and land type[1]	Total area ('000 hectares)[2]	Wetland area ('000 hectares)[3]		
		In CAR reserve system on public land[4]	Not in CAR reserve system on public land	Total
Upper North East				
Forest Ecosystems	2,167	2.9	3.5	6.4
Non-Forest Ecosystems	61	2.4	1.8	4.2
Total terrestrial ecosystems	2,228	5.3	5.3	10.6
Not in terrestrial ecosystem	1,682	1.7	22.7	24.4
All land types	**3,910**	**6.9**	**28.0**	**35.0**
Lower North East				
Forest Ecosystems	3,175	2.5	6.0	8.5

RFA region and land type[1]	Total area ('000 hectares)[2]	Wetland area ('000 hectares)[3]		
		In CAR reserve system on public land[4]	Not in CAR reserve system on public land	Total
Non-Forest Ecosystems	39	2.1	0.8	2.9
Total terrestrial ecosystems	3,213	4.6	6.8	11.4
Not in terrestrial ecosystem	2,576	5.2	65.3	70.5
All land types	**5,789**	**9.8**	**72.1**	**81.9**
Southern				
Forest Ecosystems	2,446	2.5	5.8	8.2
Non-Forest Ecosystems	113	1.1	0.5	1.5
Total terrestrial ecosystems	2,558	3.5	6.2	9.8
Not in terrestrial ecosystem	1,958	3.2	36.9	40.1
All land types	**4,516**	**6.7**	**43.2**	**49.9**
Eden				
Forest Ecosystems	533	0.1	0.1	0.2
Non-Forest Ecosystems	18	0.5	0.4	0.8
Total terrestrial ecosystems	552	0.5	0.5	1.1
Not in terrestrial ecosystem	262	0.3	3.8	4.1
All land types	**814**	**0.8**	**4.4**	**5.2**
All RFA regions				
Forest Ecosystems	8,320	7.9	15.4	23.3
Non-Forest Ecosystems	231	6.0	3.5	9.5
Total terrestrial ecosystems	8,551	13.9	18.9	32.8
Not in terrestrial ecosystem	6,478	10.3	128.8	139.0
All land types	**15,029**	**24.2**	**147.7**	**171.9**

Notes:

[1] The areas of 'Forest Ecosystems' and 'Non-Forest Ecosystems' together form the total 'Terrestrial ecosystems' area for an RFA region (both classes are reported in both the CRA reports and the RFA data tables). The remaining land area (being agricultural, horticultural and urban land) described as 'Not in terrestrial ecosystem' is not reported in the CRA reports of the RFA data tables.

[2] Area derived by ABARES from spatial data associated with the Forest Ecosystem CRA reports published in 1998-2000.

[3] Area derived by ABARES from wetlands area dataset provided by OEH NSW, also available at https://sdi.nsw.gov.au/nswsdi/catalog/search/resource/details.page?uuid=%7BD4FDC636-DE36-443E-8B09-4AB275A71EE7%7D

[4] CAR reserve system on public land only. This includes the NPWS estate (formal reserves); informal reserves; and values protected by prescription identified from Forest Management Zone datasets at 2016, together with additional Regional Prescriptions from Integrated Forestry Operations Approvals where available.

Totals may not tally due to rounding

Non Ramsar wetland data collection methodology

The NSW wetland information in **Table 1.41** has been sourced OEH and records of spatial extent and attributes for natural wetlands and reservoirs.

The NSW wetland areas dataset was captured by OEH using existing wetland datasets, digitised wetland maps and outputs from remote sensing methods to detect presence of water from satellite imagery. Coding of wetland types was completed by visual assessment of wetland areas overlaid over satellite imagery.

For this analysis, wetland records covering the Ramsar list of wetlands of international importance are excluded. Ramsar wetlands are also recorded in the NSW wetland areas dataset, and four of these which were identified as occurring within an RFA region were subsequently excluded (see above for information on Ramsar wetlands).

The non-Ramsar wetland spatial coverage was overlaid with original CRA spatial data on terrestrial (Forest and Non-Forest) ecosystems as well as land not included in the terrestrial ecosystem datasets, including agricultural and urban land. These datasets were also overlaid on the spatial coverage of the CAR reserve system as at June 2016.[51]

The areas of individual terrestrial ecosystems identified during the CRA process (1995-2000) have not been updated since that time. The data presented therefore do not take into account of any additional area of terrestrial ecosystems subsequently identified, or any areas that no longer form a terrestrial ecosystem, or any areas that have previously been misclassified into the wrong terrestrial ecosystem.

Indicator 4.1a Area of forest land managed primarily for protective functions

The area of forest land where priority is given to protecting soil and hydrological functions provides an indication of the emphasis being placed by society on the conservation of these values. This indicator includes areas managed to protect soil and water by excluding incompatible activities.

Throughout the NSW RFA regions, soil and water resources are protected through the allocation of land for conservation and maintenance purposes. The area of forest land where priority is given to protecting soil and hydrological functions provides an indication of the emphasis being placed by society on the conservation of these values. This indicator includes areas managed to protect soil and water by excluding incompatible activities.

In NSW, the area managed for protective functions comprises all public nature conservation reserves; catchments managed specifically for water supply; and those parts of multiple-use public forests in which wood harvesting and road construction are not permitted.

[51] This approach has not been undertaken before, and has not been peer-reviewed or made public, and its assumptions have not been checked.

Forested catchments are highly valued as sources of drinking water because forest vegetation, soil and litter serve as natural filters, and the quality of water flowing from such catchments is therefore usually very high. In NSW, as of 2014 approximately 180,000 hectares of forest are managed specifically for water supply in closed catchments from which human disturbance activities are excluded. Another 83,000 hectares of forest in closed water catchments are available for wood harvesting, subject to scientifically based mitigation measures to protect soil and water values.

An IFOA can be made to cover forestry operation on State forests or other Crown-timber lands covered by a NSW Forest Agreement. IFOAs include an Environment Protection Licence (EPL) issued by the NSW EPA.

The EPL requires FCNSW to assess NSW State forests soil erosion and water pollution hazards prior to the commencement of wood harvesting. The principle of environmental care requires that soil, water catchment, cultural and landscape values are protected by careful planning, location, construction and maintenance of roads and tracks, and regulation of their use.

The NSW Government also implements a PNF Code that sets minimum operating standards for harvesting on private lands[52].

The total area of land protected or excluded from wood harvesting for the purpose of soil and water protection across all categories of land in 2014 was 263,424 hectares, as shown in **Table 1.42**.

Table 1.43 Soil and water management – area of land protected, 2005–2014[53]

Year ended 30 June	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fully protected (hectares)	231,334	196,049	182,619	183,752	183,752	177,635	178,366	178,356	180,200	180,200
Partly protected (hectares)	95,162	53,587	62,839	60,295	76,709	75,191	79,846	83,256	83,224	83,224
Total protected (hectares)	326,496	249,636	245,458	244,047	260,461	252,826	258,212	261,612	263,424	263,424

Source: Forests NSW, FCNSW

Indicator 4.1b Management of the risk of soil erosion in forests

[52] 2013 figures sourced from NSW EPA

[53] Note: For this indicator, data is only available at the State level to 2014.

This indicator assesses the extent to which the risk of soil erosion has been explicitly identified and addressed in forest management. Water quantity is important for ecosystem health and water supply for human use.

The avoidance of soil erosion reflects the extent to which associated values, including soil fertility and water quality, are protected.

FCNSW has a comprehensive soil assessment program for forestry operations, consisting of four modules: inherent soil erosion and water pollution assessment, mass movement assessment, dispersibility assessment, and seasonality. Where an EPL is active FCNSW is required to apply all four assessment modules during a pre-operational planning phase, which precedes commencement of any forestry activities.

Legally binding instruments are in place in NSW that establish a regulatory framework for the maintenance of soil values. In NSW, the significantly lower risk of erosion assessed for nature conservation reserves means that prescriptions in that tenure are not as stringent as in multiple-use public forests.

The *Protection of the Environment Operations Act 1997* (NSW) (POEO Act) prohibits the pollution of waters in NSW. The IFOAs contain EPLs which have best management practices to prevent the pollution of waters. FCNSW has the ability to turn the EPLs on or off. Where FCNSW chooses to turn on the EPL, forestry operations must meet the best management practice requirements contained in the EPL. The EPL requires FCNSW to undertake comprehensive soil assessments which identify the hazard category (risk of soil erosion and water pollution) and determine the level of protection required at each site to conserve soil and water values (**Table 1.43**).

Table 1.44 Area of multiple-use public forest where disturbance activities were planned, proportion assessed for risk of soil erosion, and assessed category, 2010–11

Disturbance activity	Metric	NSW
Native forest harvesting and silviculture	Area (hectares)	27,484
	Proportion assessed for risk of soil erosion (%)	100
	Assessed category [1]	Category 1 (That the soil erosion risk assessment system comprehensively takes account of rainfall intensity, slope, soil erodibility and management practices that could contribute to soil disturbance.)
Plantation operations	Area (hectares)	14,068
	Proportion assessed for risk of soil erosion (%)	100
	Assessed category [1]	Category 1
Road construction and maintenance	Area (hectares)	n.r.
	Proportion assessed for risk of soil erosion (%)	n.a.
	Assessed category [1]	n.a.
Fire management	Area (hectares)	36,936
	Proportion assessed for risk of soil erosion (%)	100
	Assessed category [1]	Category 1

Source: Various NSW agencies, SOFR 2013. Note: For this indicator, data is only available at the State level.

Table notes: n.a. = not applicable; n.r. = not reported

(1) Assessed category rating refers to a four-tier category system in SOFR 2013, Table 4.5, ranging from Category 1 to Category 4, which assesses the level of planning processes.

Summary and future management of environmental values

Old Growth Values

Old growth values were one of the criteria used to establish the CAR reserve system under the NSW RFAs. Of the 2.54 million hectares of old-growth forest identified as part of the CRA process in the three NSW RFA regions, a total of 1.1 million hectares (45 per cent) was already protected under formal reservation (the NPWS (NPWS) estate) before the NSW RFAs were signed.

By mid-2001, after all three NSW RFAs came into effect, a total of 1.9 million hectares (78 per cent) of the old-growth forest identified in the CRA process was protected under the CAR reserve system (which includes Formal Reserves, Informal Reserves, and Regional Prescriptions for forest management on public land). By mid-2016 a total of 2.0 million hectares (80 per cent) of the identified old-growth forest is protected under the CAR Reserve system.

The renewed NSW RFAs will continue to protect old growth values in both the CAR reserve system and through ecologically sustainable forest management in State forests through the NSW Forest Management Framework. The draft NSW IFOA explicitly states that forestry operations are prohibited from all old growth forests in RFA regions.

Wilderness Values

Over 92 per cent of the Delineated Wilderness identified according to JANIS criteria as part of the CRAs, is protected by formal reserves in all three NSW RFAs, totalling 1.6 million hectares. In the Eden RFA region over 99 per cent of Delineated Wilderness is protected in formal reserves. The JANIS reservation targets were for 90 per cent or more of wilderness to be protected in formal reserves.

The 20 year rolling extensions to the NSW RFAs will provide for the continued protection of wilderness values through ecological sustainable forest management across the NSW RFA regions predominantly through the CAR reserve system and NSW Forest Management Framework, specifically the requirements under the *Wilderness Act 1987* (NSW). Declared Wilderness must be managed in a way that maintains its wilderness values as set out in Section 9 of the *Wilderness Act 1987* (NSW). Nearly all Delineated Wilderness is within the national parks system and is managed by OEH. The aim is to protect these large natural areas, the functioning of their ecosystems, and their processes of evolution with a minimum of human interference.

Pest animal control, weed control and bushfire management all occur as part of wilderness management. Where possible, management strategies that minimise the impacts and unintended effects of these activities on wilderness values are employed.

Endangered Species Values

The NSW RFAs address the conservation of endangered species through a system of conservation reserves and the management of habitat in areas outside the reserve system, including through a series of management prescriptions in harvest areas. Endangered

species are further protected under the BC Act (following repeal of the TSC Act in 2017), *Fisheries Management Act 1994* (NSW) (FM Act) and provisions in the IFOAs.

There are currently 412 threatened species and 8 non-threatened migratory birds listed under the EPBC Act that are known or likely to occur within the NSW RFA regions. Almost all listed species (99.5%) have a conservation advice and/or recovery plan to assist recovery. There are also 28 EPBC Act listed threatened ecological communities in the NSW RFA regions. All have conservation advices, recovery plans or both in place to assist in management and recovery. Since the signing of the first NSW RFA (Eden - 26 August 1999), 81 additional species in NSW have been listed as threatened under national legislation. Table 1.8 shows figures by NSW RFA region.

The renewed NSW RFAs will continue to provide for the protection of endangered species through the CAR reserve system and the NSW Forest Management Framework incorporating adaptive management and continual improvement. Research on endangered species will continue to be an important part of the adaptive management of forests in NSW RFA regions. Proposed research priorities to be listed in the renewed NSW RFAs include Matters of National Environmental Significance (which includes endangered species), forest ecology and the effectiveness of management prescriptions. Results of this research will be incorporated into management responses for a range of environmental values and will likely benefit the management of threatened species into the future.

The NSW IFOAs for public lands and PNF Codes for private lands contain measures designed to mitigate the impact of forestry operations on threatened species and threatened ecological communities. Threatened ecological communities, as listed by the NSW Threatened Species Scientific Committee, are not available for timber harvesting as the NPW Act prohibits the picking or harming of all threatened ecological communities[54]. The current IFOAs do not authorise any forestry operations in threatened ecological communities.

The renewed RFAs will require that Matters of National Environmental Significance are reported on in each five yearly review. The proposed rolling extension mechanism in the renewed NSW RFAs creates an incentive for the continual improvement and adaptive management of endangered species values in NSW RFA regions.

National Estate Values

The amended RFA will continue to provide for the protection of national estate values through a combination of the National and Commonwealth Heritage Lists, the NSW Heritage Register and the Heritage Codes of local planning schemes. The expiration and repeal of parts of the EPBC Act and the *Australian Heritage Council Act 2003* (Cth) relating to the Register of National Estate did not diminish protection of Commonwealth heritage places. These parts were superseded by stronger ongoing heritage protection provisions under national environment law.

[54] S118A of the NPW Act was revoked in August 2017. The relevant provision is now Clause 2.2 of the BC Act.

For the past 20 years, the NSW forest management systems have provided for the protection of National Heritage Values of National Heritage Places in accordance with National Heritage Management Principles. This will continue under the renewed NSW RFAs, and will incorporate new information and adapt to changing circumstances.

There are 6 places on the National Heritage List and 21 places on the Commonwealth Heritage List within the NSW RFA regions.

The NSW RFAs will continue to ensure the forest management framework in NSW and CAR reserve system provide for the protection of National and Commonwealth heritage values. The modernised and renewed NSW RFAs have been drafted to reflect current heritage concepts and definitions consistent with the EPBC Act.

World Heritage Values

There are three World Heritage properties located within, or partly within, the NSW RFA regions – all within the North East RFA region. These are now managed cooperatively by the NSW and Australian governments in accordance with the 2009 Australian World Heritage Intergovernmental Agreement.

Both the Greater Blue Mountains Area and Australian Convict Sites (Old Great North Road) World Heritage properties were listed after the signing of the North East RFA on 31 March 2000. The Gondwana Rainforests of Australia was listed before the signing of the North East RFA in December 1994. These are being maintained and managed for multiple values under the NPW Act. There are no World Heritage properties currently within the Southern or Eden RFA regions.

Under the EPBC Act, World Heritage properties are Matters of National Environmental Significance. The EPBC Act therefore provides protection for World Heritage properties by ensuring that an assessment process is undertaken for proposed actions (including forestry operations). The exemption of forestry operations in RFAs from other Commonwealth assessment and approval requirements under section 38 of the EPBC Act does not apply to operations within World Heritage properties. World Heritage values will continue to be managed and protected through assessment processes for proposed actions under the renewed NSW RFAs.

Biodiversity Values

Biodiversity values were fundamental in establishing CAR reserve system under NSW RFAs and were a focus of the CRAs. The formal reserves in the CAR reserve system form part of the National Reserve System, which aims to secure long-term protection for samples of Australia's diverse ecosystems and the plants and animals they support.

The response of representative species to wood harvesting in NSW has been the subject of study over the past 20 to 30 years. An overview of species responses to pre-RFA harvesting in northern NSW found that 40 species appeared to be significantly disadvantaged by harvesting, another 40 species appeared to be significantly favoured by harvesting, while the remainder (147 species) appeared to be relatively unaffected (Kavanagh and Stanton 2005). The sensitivity of some species to harvesting reinforces the necessity for sustainable forest management practices, especially via prescriptions designed to mitigate impacts on specific species. A recent review of these practices during the RFA period concluded that there is a

considerable body of knowledge supporting their effectiveness at the local level (Slade and Law 2016). This demonstrates that through the life of the RFAs there has been continuous improvement of forest management through the application of new information about biodiversity values. This adaptive management will continue in the renewed NSW RFAs.

Australia's Biodiversity Conservation Strategy 2010—2030 is a guiding policy framework for conserving Australia's biodiversity, which includes genetic diversity.

NSW *Saving our Species* program also considers where it is prudent to 'insure' against future extinction by storing a representative sample of the genetic variation of the species in a way that allows for reintroduction if extinction in the wild occurs.

Prior to the signing of the RFAs, a total of 2.57 millionhectares(17 per cent) of the total land area in the RFA regions was protected under formal reservation (the NPWS estate). These data include all land categories, namely Forest Ecosystems, Non-forest Ecosystems. These data exclude areas within the NSW RFA regions that were land not classified as a terrestrial ecosystem such as agricultural land and built up areas.

By mid-2001, after all three RFAs came into effect a total of 4.04 million hectares (27 per cent) of total land in RFA regions was protected under the CAR reserve system (which includes Formal Reserves, Informal Reserves, and Regional Prescriptions for forest management on public land). This represents an increase of 1.47 million hectares of land in protected areas after all three RFAs came into effect.

By mid-2016, a total of 4.22 million hectares (28 per cent) of the total land in RFA regions was protected under the CAR reserve system. This represents an increase of 182,000 hectares of land in CAR Reserves across the four RFA regions since all three RFAs came into effect.

Future RFA five-yearly reviews will be focussed on outcomes and the objectives of the NSW RFAs. Monitoring and reporting arrangements will be strengthened and streamlined, and where possible indicate the impact of management prescriptions. This demonstrates that the renewed NSW RFAs, including the proposed 5 year rolling extension mechanism, will maintain and enhance protections for biodiversity values.

Wetland values

The four Ramsar Wetlands of International Importance in the NSW RFA regions cover approximately 48,176 hectares. These sites are Blue Lagoon (338 hectares) in the Southern RFA, and in the North East RFA are Little Llangothlin Nature Reserve (258 hectares), Hunter Estuary Wetlands (2,968 hectares) and Myall Lakes (44,612 hectares). All four were Ramsar listed before the NSW RFAs were signed. All Ramsar listed wetlands, including those in NSW RFA regions, are protected by Part 3 of the EPBC Act.

The renewed NSW RFAs will continue to provide for the protection of the ecological character of Ramsar listed wetlands through the NSW Forest Management Framework, in accordance with Australia's obligations under the Ramsar Convention. The variations to the NSW RFAs as drafted include specific clauses to this effect.

For the non-Ramsar listed wetlands in the NSW RFA regions, there are 82,000 hectares in the Lower North East RFA region, 50,000 hectares in the Southern RFA region, 35,000 hectares in the Upper North East RFA region, and 5,200 hectares in the Eden RFA region. Of the non-

Ramsar wetland area of 172,000 hectares, 24,000 hectares (14 per cent) are in the CAR reserve system and 148,000 hectares (86 per cent) are outside the CAR reserve system.

While the current NSW RFAs do not include clauses specifically on wetland values, they include the commitments from the NSW Government to implement measures to improve catchment and water management. These measures have largely been met as reported in the independent five-yearly reviews.

The renewed NSW RFAs as drafted include new clauses regarding landscape management where, in line with the NFPS, NSW has agreed to implement forest management practices that seek to ensure the availability of reliable, high quality water supplies from forested land, and to minimise soil compaction and disturbance to minimise downstream impacts. Managing forests in such a way will ensure that forestry operations minimise their impact to wetland values over the life of the RFAs.

Future RFA five-yearly reviews will be focussed on outcomes reporting and specifically the objectives of the NSW RFAs. Monitoring and reporting arrangements will also be strengthened and streamlined, and where possible indicate the impact of management prescriptions. This demonstrates that the renewed NSW RFAs, including the proposed 5 year rolling extension mechanism will maintain and enhance protections for environmental values.

2.Indigenous Heritage Values

Indigenous heritage values[55] are considered to be the values of a place which are of significance as part of Indigenous practices, observances, customs, traditions, beliefs or history. The extent to which Indigenous people participate in forest management reflects their connection with the land, and the integration of Indigenous values into forest management practice, policy and decision-making.

For clarity, while the RFA Act and the Montréal Process Criteria and Indicators use the term 'Indigenous', the New South Wales Government and community use the term 'Aboriginal' to describe the First Peoples of NSW. This report uses both terms depending on the context.

This section includes the following Montréal Process indicators:

- Indicator 6.4 a – Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes
- Indicator 6.4.c – The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management
- Indicator 6.5.d – Resilience of forest dependent Indigenous communities to changing social and economic conditions

Access, management and ownership are key parts of the relationship of Indigenous people with land. The Indigenous estate can be broadly divided into land tenure and management categories based on the degree of Indigenous ownership, management and other rights over the land. Effective Indigenous participation can occur through a variety of direct or consultative mechanisms.

The primary piece of legislation which protects Aboriginal cultural heritage in NSW is the NPW Act. Under the NPW Act it is an offence to harm (destroy, deface, or damage) or desecrate an Aboriginal object or Aboriginal place, or in relation to an object, move the object from the land on which is has been situated.

An Aboriginal Place declaration recognises that places are (or were) of special significance to Aboriginal culture. It gives the land a higher level of protection, to safeguard its significance to Aboriginal people.

Table 2.1 shows the area of forest land in NSW for which Indigenous people have use and rights that protect their special values as recognised through formal management regimes.

[55] The Term *Indigenous* is used in the national context and in relation to the relevant international Montréal Indicators. In a specifically NSW context the term *Aboriginal* is generally preferred and used, although both terms have been used in this document.

Table 2.1 Area of forest land in NSW to which Indigenous people have use and rights that protect their special values as recognised through formal management regimes, as of June 2016.

Tenure Category	Area of forest formally managed to protect Indigenous people's values (ha)	Proportion of total area of that forest tenure category that is formally managed to protect Indigenous people's values (%)
Special Management Zone - Area managed for Aboriginal cultural heritage – Multiple use State forest	1,140	0.05
Land with recognised Native title (Githabul, Bandjalang and Yaegal) – Multiple use State forest	57,422	2.63
SUBTOTAL Multiple Use state Forest	58,562	2.68
Indigenous Land Use Agreements (ILUA) – Nature Conservation Reserves	461,432	6.2
Memoranda of understanding for joint management– Nature Conservation Reserves	1,903,092	26
Lease-back agreements – Nature Conservation Reserves	99,437	1.4
SUB TOTAL Nature Conservation Reserves[1]	2,463,961	33
TOTAL Multiple Use Forest & Nature Conservation Reserve	**2,522,523**	**34**

Notes:

(1) Data provided for Nature Conservation Reserves includes all NPWS estate – not filtered for forest coverage from GIS layer AboriginalCoManagementReserves_P.lyr. This layer was current at February 2014, additions have been made to the attribute table associated with this indicator submission.

(2) Total area nature conservation reserves is 7.2 million hectares

Indicator 6.4a Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes

This indicator monitors the degree to which land is placed under appropriate tenure classifications or management regimes to protect Indigenous peoples' values in forests. An acceptable level of accountability for the protection of Indigenous peoples' cultural, religious, social and spiritual needs and values is an essential part of forest management.

For the purposes of this indicator 'Formally managed' includes management required by legislation, or protection of places through management zones, prescriptions and/or codes of practice where these lead to relevant sites being actively managed or protected on the ground. The four broad categories used to identify Indigenous land are shown in **Table 2.2**

Table 2.2 Categories of Indigenous land

Indigenous land category	Description
Indigenous owned and managed	Freehold lands that are both owned and managed by Indigenous communities
Indigenous managed	Lands that are managed but not owned by Indigenous communities (e.g. Crown reserves and leases); and lands that are owned by Indigenous people, but have formal shared management agreements with Australian and state and territory government agencies (e.g. leased-back nature conservation reserves)
Indigenous co-managed	Lands that are owned and managed by other parties, but have formal, legally binding agreements in place to include input from Indigenous people in the process of developing and implementing a management plan (e.g. nature conservation reserve memoranda of understanding)
Other special rights	Lands subject to native title determinations and active Indigenous land use agreements. These are independent of tenure and, in most cases, do not grant ownership or management rights of land to Indigenous communities. They can provide for the right to access areas of cultural significance, or a legal requirement for consultation with the local Indigenous community before any major development activities take place

Source: *Australia's State of the Forests Report 2013*

Comprehensive Regional Assessment

The NSW RFAs noted that identification and assessment of National Estate Values for the CRAs were complete with the exception of Indigenous heritage values. The identification and assessment of Indigenous heritage values was intended to be a continuing effort through the period of implementation of the NSW RFAs.

Register of the National Estate (archive)

Records of Indigenous sites were maintained by the Australian Government in the Register of the National Estate (RNE) between 1975 until it was closed in 2007[56]. The RNE was recognised at the time the RFAs came into effect. **Table 2.3** shows the area of Indigenous sites in the RNE as of in each of the four NSW RFA regions, by total land and Forest Ecosystems. A total of 23 thousand hectares of Forest Ecosystems were present on Indigenous sites in the RNE when it was closed.

Table 2.3 Area of Indigenous sites on the Register of the National Estate (2006)

	RFA region[1] ('000 hectares)				
Land cover type	Upper North East	Lower North East	Southern	Eden	**Total**
All	3	6	10	7	25
Forest Ecosystems	2	5	9	7	23

Notes: [1] Areas derived by ABARES from the Register of the National Estate as at 2006

Totals may not tally due to rounding

Australia's State of the Forests Report 2013

Since the RFAs were signed, the area of land, and forest, to which Indigenous communities have legislated rights has increased, as has the availability and accessibility of associated information and spatial data. For Indicators 6.4a and 6.4c of SOFR 2013, the NFI reported Indigenous land interest in four categories (**Table 2.2**) that were developed by ABARES, and populated using information and datasets from national, state and territory governments agencies, and non-government organisations[57,58].

The detailed description of land and forest in each category is given in Indicators 6.4a and 6.4c of SOFR 2013 and Dillon et al (2013). The spatial Indigenous forest extent dataset prepared for SOFR 2013 was published by ABARES as *Australia's Indigenous forest estate (2013) v2.0*[59].

[56] www.environment.gov.au/heritage/places/register-national-estate

[57] Montréal Process Implementation Group for Australia and National Forest Inventory Steering Committee, 2013, *Australia's State of the Forests Report 2013*, ABARES, Canberra, December. CC BY 3.0

[58] Dillon R, Jeyasingham J, Eades S, Read S 2015, *Development of the* Australia's Indigenous forest estate (2013) *dataset*. ABARES Research report 15.6, Canberra, August. CC BY 3.0.

[59] agriculture.gov.au/abares/forestsaustralia/publications

NFI Indigenous forest estate as prepared for SOFR 2013

The NFI Indigenous land and forest extent as prepared for SOFR 2013 includes 1.71 million hectares of land and 1.34 million hectares of forest across the four NSW RFA regions (**Table 2.4**).

Table 2.4 Areas of land and forest under Indigenous ownership, Indigenous management, Indigenous co-management and Other special rights ('000 hectares)

NFI Indigenous category	Land cover type	RFA region				
		Upper North East	Lower North East	Southern	Eden	**Total**
Indigenous owned	All	19	11	7	1	**39**
	Forest	16	10	7	1	**34**
Indigenous managed	All	0	5	4	15	**23**
	Forest	0	2	4	15	**21**
Indigenous co-managed	All	84	593	305	0	**982**
	Forest	84	580	267	0	**930**
Other special rights	All	36	9	618	3	**667**
	Forest	35	7	314	3	**359**
Total	**All**	**139**	**618**	**933**	**20**	**1,711**
	Forest	**135**	**598**	**591**	**19**	**1,343**

[1] Area derived by ABARES by intersecting *Australia's Indigenous forests estate (2013) v2.0* with RFA regions

Note: Totals may not tally due to rounding

Of the Indigenous forest estate, 0.93 million hectares (69 per cent) are in the Indigenous co-managed category and 0.36 million hectares (27 per cent) are in the Other special rights category. The Indigenous co-managed extent is largely due to the formal co-management arrangements in place for some NSW national parks, for example, Kosciuszko National Park in the Southern RFA region and Wollemi National Park in the Lower North East RFA region. The extent of forest within the Other special rights category is largely due to the Tumut Brungle Indigenous Land Use Agreement that is in place in part of the Southern RFA region.

Indicator 6.4c The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management

This indicator measures the extent to which Indigenous people participate in forest management. Active participation in forest management reflects the relationship between people and the land, and the integration of Indigenous peoples values with forest management practise, policy and decision making.

Guidelines

All Aboriginal objects and places on all land tenures are protected under the NPW Act. The NSW OEH manages Aboriginal heritage under a range of policies and procedures, including the Aboriginal Regional Assessment Policy, the Management of Aboriginal Cultural Material Policy and Guideline, and the Aboriginal cultural heritage provisions of the NPW Act.

The NSW OEH is legislatively responsible for the proper care and preservation of Aboriginal objects, including Aboriginal remains in NSW. OEH manages Aboriginal heritage in accordance with the following:

- National Parks and Wildlife Regulation 2009 (NSW)
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010) Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010)
- Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010)
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)
- Management of Aboriginal Cultural Material Policy (OEH 2012).

These preservation outcomes are primarily delivered through legal requirements for all land managers to comply with the NPW Act. FCNSW has developed Operational Guidelines for Aboriginal Cultural Heritage Management to ensure it complies with the requirements of the NPW Act when conducting forestry operations on State forests and other Crown-timber land. . These guidelines were updated in 2010 in response to changes to the NPW Act. The guidelines represent a due diligence code of practice approach to the identification and protection of Aboriginal heritage. Application of these guidelines is one component of a broader consultation approach with local communities to encourage involvement in the management and use of State forests. Information regarding Aboriginal community consultative processes is reported in FCNSW's annual reports.

Aboriginal involvement in the management of the national parks estate

Aboriginal joint management is one of the main ways that the NSW Government, through OEH, facilitates Aboriginal involvement in managing the national parks estate. This involves a partnership between OEH and Aboriginal communities for the management of a park or reserve. Joint management in NSW has a long history, with the first formal agreement being the

leaseback of Mutawintji National Park, in the far west region north-east of Broken Hill, as an Aboriginal owned park in 1998. Since 1998, OEH has negotiated 31 joint management agreements with Aboriginal communities, covering 2.2 million hectares, or about 25% of the NPWS estate. This is likely to increase in the future. The NPWS estate provides critically important places for Aboriginal communities to connect with their country and practice their culture. Aboriginal joint management has significant benefits, including Aboriginal employment, support for Aboriginal organisations and businesses, opportunities to practise and pass on Aboriginal culture, improved management and interpretation of Aboriginal cultural heritage, enhanced visitor experiences in parks, and improved knowledge and expertise by park managers.

There are three types of Aboriginal joint management arrangements in NSW:

- Aboriginal ownership and lease back arrangements. Under Part 4A of the NPW Act, the legal title to a dedicated reserve is returned to Aboriginal ownership (LALCs) to hold on behalf of the Aboriginal Owners) then leased back to the NSW Government under mutually agreed conditions. Lease payments are spent on the care, control and management of the park.
- Indigenous land use agreements (ILUAs), developed in response to Native Title claims made under *Fisheries Management Act 1994 (NSW) Native Title Act 1993* (Cth). These are voluntary agreements between the native title group and other key stakeholders in the management of lands and waters pursuant to the *Native Title Act 1993* (Cth).
- Memoranda of understanding (MOUs). The most common form of joint management in NSW parks is a non-binding MOU with an Aboriginal community. MOUs recognise the local Aboriginal peoples' cultural association with an area and ensure greater involvement in its management. An advisory committee, which provides advice to the NSW Government on the management of the park, can be established.

Examples of joint Aboriginal management agreements within the NSW RFA regions include:

- Eden – Biamanga (Part 4A)
- North East – Arakwal (three ILUAs), Worimi Conservation Lands (Part 4A), Gaagal Wanggaan (Part 4A), Githabul (ILUA), Saltwater (MOU) and Yarriabini (MOU), Western Bundjalung (ILUA)
- Southern – Gulaga (Part 4A), Tumut and Brungle Gundagai Aboriginal Community (MOU), Southern Snowy Mountains Aboriginal Community (MOU)

There are more than 200 Aboriginal members of boards and committees making decisions about the joint management of parks or reserves of the NPWS estate. In 2016–17, data from 20 of the 31 joint management boards/committees details:

- Over 170 committee/board meetings held
- Over 60 Aboriginal people were employed in joint management in various capacities including rangers, joint management coordinators, field officers, Aboriginal liaison officers, administrative support officers and casual discovery guides.
- More than 20 Aboriginal people were employed through other Aboriginal organisations to work on projects for the joint management committee, boards of management and negotiations.

- Approximately 100 committee / board / Aboriginal community members attended training sessions, which included Indigenous land management, governance, job application, resume writing and job interview skills training and basic firefighting training. Many achieved accreditations such as Certificate 3 in Aboriginal Land Management, Senior First Aid, Level 1 Crosscut Chainsaw Operator Certificate, *Chemcert* chemical accreditation, or Office of the Registrar of Indigenous Corporations governance certificate.
- Committees, boards and Aboriginal community members carried out a range of cultural heritage assessments, including, Archaeological survey Clarkes Beach and Tyagarah middens. Committee members delivered training including cultural awareness.
- Committees, boards and Aboriginal community members participated in many film productions including a short news piece for French TV on world's most beautiful beaches and a film *The Mountains Call Us Home* a film about the Biamanga and Gulaga Board that has been shown at community events and staff training and induction days, and posted on ABC Open website.
- At least 8 Aboriginal businesses contracted for work in excess of $75,000. The contracted work included Aboriginal sites Survey Assessment work, cultural fire assessment survey, weed control and meeting facilitation.

OEH administers the Aboriginal Park Partnerships Funding Program, a contestable annual funding program for Aboriginal/OEH partnerships across all parks and reserves including those which are co-managed or jointly managed. The program has run from 2008/09 and funded 200 projects during this time. In 2016/17, the projects involved, either directly or indirectly, over 350 Aboriginal community members supporting a diverse range of activities including culture camps, cultural burning workshops, Aboriginal business support, and cultural heritage identification and mapping within parks.

Aboriginal involvement in the management of State forests

The FCNSW's Aboriginal Partnerships Team works with Aboriginal communities throughout NSW protecting, nurturing and managing Aboriginal cultural heritage and significant sites whilst creating sustainable partnerships with the Aboriginal community. These partnerships, built on trust and transparency, aim to return the community to the bush and the bush to the community. The team's vision is, in partnership with Aboriginal people and organisations, to build Aboriginal enterprises that manage significant areas of the forest with a focus on sustainability, profitability and strong partnerships.

The team works to conserve the qualities and attributes of places that have spiritual, historic, scientific or social value for past, present and future generations. This includes finding, protecting and managing Aboriginal Cultural sites prior to FCNSW operations including road works, harvesting and regeneration works. The team liaises with Aboriginal Land Councils, Elders and community members to gain an understanding of their spiritual connection with the land and to ascertain evidence of past Aboriginal activities in the forest.

FCNSW engenders partnerships with Aboriginal community groups, Land Councils, Native Title Claimants and Aboriginal organisations on a regular basis. Partnerships include permits for activities, land permits for joint management, MOU's, joint management of Aboriginal Places,

joint management initiatives with native title holders and permits for community enterprise developments.

The types of partnerships FCNSW include:

- Access and joint management to areas of significance
- Access to traditional resources and materials including bark for canoe making and firewood
- Land for teaching and camping including purpose built culture camps
- Development of visitor experiences and access to areas for tourism enterprises
- Cultural burning
- Support for caring for country activities
- Aboriginal cultural heritage survey and assessment
- Sponsorship of events such as the Koori Knockout and NAIDOC week events

FCNSW is in the process of formalising many partnerships by issuing land based permits to Aboriginal groups to manage specific areas of land. However, we remain flexible on permit type arrangements to suit the needs of community groups including minimising costs for different organisations (e.g. rates and insurance costs).

FCNSW recognises Aboriginal values on all hardwood State forests and plantations. FCNSW welcomes the opportunity to provide equivalent native title rights (the right to camp, teach, utilise bush resources, conduct cultural activities etc.) on extinguished lands and to recognise and support native title in conjunction with the all of government approach on all lands where native title is granted.

FCNSW currently has contracts with 28 Aboriginal organisations for Aboriginal Cultural Heritage survey and assessment. These contracts are mostly with Land Councils and they ensure the management of Aboriginal cultural heritage is carried out locally with the Aboriginal community supporting the Aboriginal Partnerships Team. FCNSW encourages and supports the caring for country projects undertaken by green teams within Aboriginal Organisations and Land Councils including applications for grants for their activities.

Providing access and joint management to areas of significance for Aboriginal people is an important role played by FCNSW. For example, a partnership has been maintained with the Darkinjung LALC since the early 1990s for joint management of the Warre Warren Aboriginal Place in McPherson State Forest on the central coast of NSW. In recent years, FCNSW provided a large shelter, water tanks and toilet facilities within Warre Warren, providing the basic facilities for cultural teaching and camps focused on training children and young people in their Aboriginal heritage. Also in McPherson State Forest, Bara Barang Aboriginal Corporation has a permit for cultural camping, teaching and tourism as well as seed collection for the Bara Barang traditional plant nursery.

Bulahdelah Mountain Aboriginal Place is jointly managed by FCNSW and Karuah LALC. The place has walking tracks and two lookouts which attract around 5000 visitors per year. In recent years, a plan has been implemented to improve the visitor facilities focusing on sharing cultural values through interpretation including contemporary carved trees. A series of sculpture workshops sponsored by FCNSW resulted in the tree carving on the mountain. Karuah LALC has joint management of the area under a permit for culture camps, teaching and tourism. Future

aspirations for Karuah LALC include cultural tours supported by the visitor facilities that have been upgraded, development of a carving small business and cultural burning with FCNSW.

Access to traditional resources and materials is an important part of our approach of returning the bush to the community. Free firewood permits are provided state wide for Aboriginal people and are managed by the Aboriginal Partnerships Team Leader. Another arrangement exists with Purfleet-Taree LALC where FCNSW delivers and donates several truckloads of salvage timber prior to each winter. Young members of the community cut and split firewood and deliver it to elders for use as home heating. Biripi Aged Care has a permit over nine State forests to collect wood for making traditional wooden tools with youth and in Western region permits have been provided for the collection of miscellaneous wood off the forest floor. Bark for canoe making, from harvesting operations, is provided on request free of charge to community groups, the Saltwater Freshwater Arts Alliance Aboriginal Corporation, NSW Department of Education and Sydney Maritime Museum. Each year a new canoe is made for Corroboree and featured at the Australian Museum.

FCNSW has another partnership with the Anaiwan Aboriginal Traditional Owners for over 10 years at Riamukka State Forest near Walcha. The Anaiwan Traditional Owners use a former forestry depot for cultural teaching and camping. This arrangement has been very successful, with the Anaiwan managing the site and FCNSW providing new water tanks, a teaching shelter, new toilets and a ride-on mower.

In 2014, a permit was issued to Keepa Keepa Inc for cultural heritage teaching and camps on Heaton State Forest on the Sugarloaf Range near Newcastle. Keepa Keepa Inc is affiliated with Awabakal LALC. FCNSW assists with improved security at the site, removal of dangerous trees and provision of a teaching shelter, new toilet and water tanks.

In Githabul traditional country FCNSW has an ILUA in place and has been working in partnership which included the setting up of a dedicated camping and teaching shelter. FCNSW has been supporting the Githabul rangers working on country which has included weed management, cultural burning and road maintenance projects in Toonumbar State Forest. The Western Bundjalung ILUA has recently been finalised with ILUA's between the Bandjalang and Yaegl Peoples being negotiated. FCNSW aims for these ILUA's to develop into strong partnerships.

At Coffs Harbour FCNSW has developed strong partnerships with the local Aboriginal community. Gumgali track is a Gumbaynggirr interpretive walk to Korora lookout which was developed in partnership with the community and includes sculpture, street art and a sound bar which tells the story of Gumgali, the black goanna, in Gumbaynggirr and English. The walk attracts around 10 000 visitors per year and has led to the running of cultural tours by Bularri Muurlay Nyanggan Aboriginal Corporation (BMNAC) as a tourism venture. BMNAC has also set-up a café under permit at Sealy Lookout. Sealy Lookout attracts around 200 000 visitors per year and the café has become a successful enterprise which financially supports the language revitalisation work by BMNAC. FCNSW also works closely with Coffs Harbour LALC supporting the Darrunda Wajaarr green team through multiple bushland regeneration projects and cultural burning. In 2017/2018 around 1500 hectares of country was burnt together including two very special community led burning celebration days.

FCNSW has a close relationship with Eden LALC and is working on a group of projects together. Eden LALC has a permit for part of East Boyd State Forest for cultural, teaching and tourism. This includes a culture camp where FCNSW has installed toilets and undertaken significant road works including a concrete causeway and bitumen road to allow access by 2WD cars. The

Bundian Way is a cross-agency project where Eden LALC aims to develop a walking and camping experience connecting the coast at Eden to the high country around Mount Kosciuszko. FCNSW has been working closely with Eden LALC on this project supporting their tourism and economic aspirations including the identification and potential development of camp sites and facilities on State forest. Cultural burning is another important element of this partnership and in 2017 eight Eden LALC Land and Sea Rangers attended FCNSW fire camp for one week and were trained as forest firefighters to national standards. The first joint cultural burn was carried out in 2018 at East Boyd State Forest in the Eden LALC permit area. This is area is one site in an adaptive management and monitoring project being led by FCNSW investigating the benefits of cultural burning to forest health and chronic Eucalypt decline which is occurring across the east coast of Australia. The Land and Sea Rangers are assisting with the monitoring of this project. More joint burning is planned in the future including FCNSW assisting in the burning of Eden LALC lands.

FCNSW has a number of Aboriginal partnerships in the Grafton area. In partnership with Acmena Juvenile Justice Centre (JJC), FCNSW is supporting the rehabilitation of Aboriginal young people through the provision of timber for wood working and projects in State forests that demonstrate potential career opportunities. FCNSW is also currently working with Grafton-Ngerrie LALC and other Aboriginal groups to protect a significant massacre site discovered during highway pre- construction surveys. Finally, in a lovely project, FCNSW has developed a cultural camp, including a timber teaching shelter, toilets and landscaping in Ramornie State Forest for the Djinders women's group. Djinders aim to use the area for healing and support of Aboriginal women affected by violence. Young people from Acmena JJC helped with the construction of the timber shelter and have built outdoor tables for the place demonstrating the links that can be made through strong partnerships.

Indicator 6.5d Resilience of forest dependent Indigenous communities to changing social and economic conditions

This indicator provides a measure of the extent to which forest dependent Indigenous communities are able to respond and adapt to change successfully. Resilient forest dependent Indigenous communities will adapt to changing social and economic conditions, ensuring they prosper into the future**.**

Forest dependence

All Aboriginal communities, including those in the areas now covered by the three NSW RFAs, were forest dependent prior to, and for many years after, European settlement. Aboriginal people are the most disadvantaged group in NSW, including in the RFA regions, experiencing shorter lives and higher rates of unemployment, illness, violence, and incarceration than other people in NSW. Aboriginal communities have demonstrated resilience by continuing to live in forested regions and other places that have been subject to enormous changes in social and economic conditions, including land dispossession and forced relocations. Contemporary Aboriginal communities continue to rely on forested landscapes for food, materials, recreation, employment, and economic, spiritual and social wellbeing.

It is recognised that access to native forests enables Aboriginal people to practise and maintain cultural values, leading to an improved sense of well-being, and personal and community resilience. However, it is also understood that the dependence of Aboriginal communities on native forests has social, cultural and economic aspects that vary in intensity depending on the local context, and the connections and values of each Aboriginal community (SOFR 2013).

The information presented in this section – largely drawn from the series of Australia's State of the Forest Reports – informs an understanding of resilience based on forest access, community adaptive capacity and economic dependence on forests. It should be noted that the data presented here does not capture aspects of resilience that relate to the Aboriginal cultural context, such as traditional skills and knowledge, kinship networks and other aspects of Aboriginal culture.

Economic dependence

Aboriginal economic dependence on forest-based activities is difficult to quantify because of a lack of data on Aboriginal involvement in the forest sector (SOFR 2013). The information in this section should therefore be considered in this context.

Analysis in the 2003, 2008 and 2013 SOFRs covering the 1996-2011 reporting period indicates that Aboriginal people have taken up mainstream employment in forestry industries at about the same rate as the non-Aboriginal population (see; SOFR 2003). This employment spans a variety of industries including timber processing, plantation management, agroforestry, heritage surveys of crown timber production forests, and ecotourism, collection and sale of fuelwood, contract road building, the manufacture of furniture, charcoal burning and nursery management (SOFR 2008).

Table 2.5 Mainstream employment of Indigenous and non-Indigenous people in NSW forestry-related industries

Total indigenous population of employment age (15-64 years)		Number of Indigenous and non-Indigenous people employed in forestry industries			
1996	2001	1996		2001	
		Indigenous	Non-Indigenous	Indigenous	Non-Indigenous
59300	70703	63	2155	60	2723

Source ABS (1996, 2001), cited in SOFR 2003

The most recent available SOFR data (2013), provides information on Aboriginal communities and the Aboriginal workforce employed in the forest and wood products industries in selected NSW regions. The number of people directly employed in the forest and wood products industries is used here as an indicator of the economic dependence of Aboriginal communities on these industries. It should be noted that this data refers only to employment in the forest industry, the data does not provide information on Aboriginal people employed in management of parks or caring for country.

Table 2.6 shows that only a small proportion (<1.40%) of the total Aboriginal Workforce across the NSW RFA regions were employed in the forest and wood products industries in 2011. The table also shows that the number of the Aboriginal workforce employed in these industries had decreased across the NSW RFA regions during the 2006-2011 reporting period, however, this is comparable with overall workforce participation in the forestry industry.

Table 2.6 Characteristics of Aboriginal communities and workers in NSW regions with more than 0.4% of the Aboriginal workforce employed in forest and wood products industries 2011

	Community characteristics – employment dependence				Characteristics of indigenous workers in forest & wood products industries				Land tenure	
Indigenous Region[1]	Number of indigenous people employed in forest and wood products industries	Proportion of indigenous workforce employed in forest and wood products industries (%)	Change in number employed, 2006-11[2] (%)	Indigenous people in population (%)	Median age (years)	Secondary school qualification[3] (%)	Non-school qualification (%)	Unskilled workers (labourer) (%)	Indigenous-owned or managed land ('000 hectares)[4]	Forest in indigenous-owned or managed land ('000 hectares)[4]
South Eastern NSW	37	1.38	-0.48	3.5	41	11.1	44.7	34.2	28	27
North Eastern NSW	42	1.13	-0.34	8.8	27	26.7	17.1	43.9	21	14
NSW Central and North Coast	128	0.96	-0.24	3.8	35	31.7	25.6	41.6	28	22

Source: SOFR 2013 (ABARES)

Notes:

(1) Aboriginal Regions are geographical units used by the ABS. These do not directly align to NSW RFA regions.

(2) Difference in per centage employed from 2006 to 2011.

(3) Secondary school qualification is defined as Year 12 or equivalent as highest year of school completed.

(4) Includes Aboriginal-owned land and Aboriginal-managed land as described in Indicators 6.4a and 6.4c. Aboriginal co-managed land and land with other special rights have not been included because they are less suitable for the forest and wood products industry, due to restrictions on resource extraction based on tenure type or land ownership.

Cultural dependency and resilience

Beyond their immediate economic value, most Aboriginal people, even those living significant distances away, are likely to have some cultural dependence on forests, particularly where the forest is part of the traditional country for which a particular group has customary responsibility. Native forests are places where new generations of Aboriginal people can learn about cultural practices and laws. Access to the forests is critical for the continuation and maintenance of cultural values; conversely, loss of access to or use of forests and their products may lead to a diminution of culture and therefore of resilience.

It is recognised that resilience is a complex indicator to quantify, and no single measure of resilience is possible. It is believed, however, that successful Indigenous forest-sector projects

can deliver both social and economic benefits, strengthening the resilience of Indigenous communities in the face of social and economic change.

Summary and future management of Indigenous heritage values

During the early years of the NSW RFAs, data collection and monitoring of Indigenous heritage values was not well coordinated or centralised, although many programs existed at both the state and National level to protect these assets.

While acknowledging the difficulties in collection and coordination, since 2013 the Australian State of the Forests report has attempted to improve capture of Indigenous heritage information which will allow more meaningful analysis in the future and better management of Indigenous heritage values in NSW forests.

Future RFA five-yearly reviews will be focussed on outcomes and the objectives of the NSW RFAs. Monitoring and reporting arrangements will also be strengthened and streamlined, and where possible indicate the impact of management prescriptions. This demonstrates that the five year rolling extension mechanism to be incorporated in renewed NSW RFAs will maintain and enhance protections for Indigenous heritage values.

In the proposed variations to the NSW RFAs the Australian and NSW governments support an ongoing Aboriginal involvement in forest management, including the protection of significant sites and places of Aboriginal cultural heritage. The governments also recognise in the draft variations the *United Nations Declaration on the Rights of Indigenous Peoples*, including the right for the Aboriginal people of NSW to practise and revitalise their cultural traditions and customs.

As discussed in this chapter, access, management and ownership are key parts of the relationship of Aboriginal people with land and culture. The draft variations to the NSW RFAs includes acknowledgement of Aboriginal land rights beyond the native title rights acknowledged in the current NSW RFAs. The draft NSW RFAs also include recognition that there may be potential land claims of Crown lands by LALCs under the *Aboriginal Land Rights Act 1983* (NSW) to compensate for historical dispossession, and to support social and economic development. The governments agree in the draft NSW RFA variations that the provisions in the RFAs do not restrict the rights of LALCs to make these land claims.

The renewed NSW RFAs will continue to provide for the protection of Indigenous Heritage values, through the CAR reserve system and Forest Management Framework. The Forest Management Framework provides a framework for the protection of Aboriginal heritage values that aligns with the NSW legislative framework for Aboriginal cultural heritage management. This includes consultation and ongoing involvement with Aboriginal people and managing the impacts of forestry operations on Aboriginal cultural heritage values. As the NSW Forest Management Framework under the NSW RFAs is adaptive and responsive to new information and changing circumstances it will provide for the protection of Indigenous heritage values during the life of the RFAs.

3.Economic Values

A key goal of sustainable forest management is to maintain the productive capacity of native and plantation forests. This allows for the provision of the forest goods and services required by society without compromising the ability of future generations to meet their own needs. Maintaining the output of both wood and non-wood forest products through harvesting therefore requires, among other things, forest regeneration or establishment, and the maintenance of ecosystem health.

Productive capacity needs to be matched with actual production, consumption, and investment to produce efficient markets and contribute optimally to the broader economy.

To fully consider the economic values relating to forests, both quantitative resource metrics and value metrics are required. Together, these illuminate the complex interactions affecting environmentally and economically sustainable forest management. The indicators in this section support these concepts.

Criterions 2 and 6 of the Montréal Process Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests are concerned with economic values. Specifically these criteria are listed as 'Maintenance of productive capacity of forest ecosystems' and 'Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies'.

Criterion 2 measures the ongoing productive capacity of forests by monitoring the area of native forests and plantations available for producing timber and other forest products. Areas covered include native forest area available for wood production, area harvested, growing stock of merchantable and non-merchantable tree species, age class of plantations, annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations, annual removal of non-wood forest products compared to the level determined to be sustainable, area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation clear-felled and the proportion of that effectively re-established.

Criterion 6 monitors and reports across five sub-criteria relevant to how the forest sector provides multiple socio-economic benefits to society. Areas covered relevant to this chapter include the production and consumption of forest products, investment in the forest sector and forest-related employment and community needs.

This section includes the following Montréal Process indicators:

- Indicator 2.1a – Native forest available for wood production, area harvested, and growing stock of merchantable and non-merchantable tree species
- Indicator 2.1b – Age class and growing stock of plantations
- Indicator 2.1c – Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations
- Indicator 2.1d – Annual removal of non-wood forest products compared to the level determined to be sustainable
- Indicator 2.1e – The area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation harvested and the proportion of that effectively re-established
- Indicator 6.1a – Value and volume of wood and wood products

- Indicator 6.1b – Values, quantities and use of non-wood forest products
- Indicator 6.1c – Value of forest based services
- Indicator 6.1d – Production and consumption and import/export of wood, wood products and non-wood products
- Indicator 6.1e – Degree of recycling of forest products
- Indicator 6.2a – Investment and expenditure in forest management
- Indicator 6.2b – Investment in research, development, extension and use of new and improved technologies.

Indicator 2.1a Native forest available for wood production, area harvested, and growing stock of merchantable and non-merchantable tree species

This indicator reports the capacity of forests to sustainably produce wood to meet society's needs into the future. The area of native forest available for wood production, the nature of the growing stock, and the area harvested over time provide means to demonstrate the sustainability of forest management.

The public production forest estate within the NSW RFA regions is managed by FCNSW and comprises the State forest and other Crown-timber land estate. All State forest areas are assigned a Forest Management Zone (FMZ), including native forest, and hardwood and softwood plantations. The FMZ is a land classification system which sets out in map format the way FCNSW intends to manage forest areas across the entire State forest estate. The FMZ system is based on nationally agreed reserve criteria and clearly differentiates between those areas of State forests which are specifically set aside for conservation and those areas that are available for other activities including harvesting for wood production. The FMZ system provides the basis for allocating the area available for wood production on public forests in NSW.

The Forest Resource and Management Evaluation System (FRAMES) was developed by FCNSW in 1997 as a strategic planning tool. The key purpose of FRAMES is to provide ongoing capacity to model and review growth and yield in the production native forests at a strategic level.

Native forest area available for wood production within the NSW RFA regions

As of 2016-17, within the NSW RFA regions, there was a total native State forest area of 1,368,871 hectares as shown in **Table 3.1**. Of this, 786,826 hectares (or 57 per cent of the total native State forest area) was available for wood production after deductions for harvesting exclusions (**Table 3.2**)

Table 3.1 Total native State forest area within NSW RFA regions

NSW RFA region	Total native State forest area – 2016/17
North East	903,162
Southern	311,499
Eden	154,210
Total	**1,368,871**

Source: FCNSW data 2016–17

Table 3.2 Native forest area within NSW RFA regions available for wood production

NSW RFA region	2004/05[1]	2006/07[1]	2011/12[2]	2016/17[2]
North East	544 779	555 678	528 359	477 719
Southern	245 741	224 950	243 794	193 325
Eden	145 701	146 486	146 898	115 782
Totals	**936 221**	**927 114**	**919 051**	**786 826**

Sources: NSW RFAs Implementation Report 2004–14, Tables 62 to 65; FCNSW data for 2011–12 and 2016–17. Figures for 2004–5 and 2006–7 are gross harvestable area. Figures for 2011–12 and 2016–17 are net harvestable area, that is, after allowing for estimated exclusions for operational and code of forest practices requirements for stream-side reserves, slope restrictions, wildlife habitat protection and other factors. Net harvestable area figures are not available for prior to 2011–12.

Notes:

1 Gross harvestable area

2. Net harvestable area

The area of private native forest available for wood production within the NSW RFA regions has not been comprehensively mapped, therefore is not able to be reported. DPI commissioned a two and half year research project on private native forests on the North Coast of NSW. This research was completed in 2017 and found that 60 per cent of the 9.7 million hectares of land in the North Coast region was forested. Of this area, about 2.9 million hectares of the North Coast region's forests are in private ownership. The research found that a large portion of the properties surveyed could be actively managed for sustainable wood production.

Native forest area harvested in NSW public forests – including NSW RFA regions

In 2016-17, the total native forest harvestable area in NSW State forests was 996,973 hectares and the area harvested was 17,482 hectares or less than two per cent. **Table 3.3** provides an overview of the area of native forest available for harvesting and area harvested from 2005 to 2017 which is captured on a state-wide basis and not for each RFA region. There has been a consistent downward trend in the area harvested on native forests within NSW public managed forests. From 2004-05, the area of native forest harvested was 42,923 hectares and this area did increase slightly in the next two years and reached a peak in reporting period of 45,945 hectares in 2006-07. The area harvested began a gradual decline post 2006/07 and has remained fairly constant under 20,000 hectares since 2013-14.

Of note is the area available for harvesting within NSW in 1995-96, which was 2,352,000 hectares prior to the signing of the NSW RFAs. This reduced dramatically following the signing of the three RFAs between 1999 and 2001, to 1,516,000 hectares in 2000-01.

Table 3.3 Native forest area harvested and area available for harvest in NSW public forests

Year	Harvestable area (ha)[1]	Area harvested (ha)[2]
1995/96	2,352,000[4]	NA[4]
2000/01	1,516,000[4]	50,351[4]
2004/05	1,155,496	42,923[3]
2005/06	965,571	43,709[3]
2006/07	1,008,150	45,945[3]
2007/08	1,100,948	39,953
2008/09	993,225	29,452
2009/10	1,380,132	31,134
2010/11	1,278,585	23,652
2011/12	1,228,391	16,610[5]
2012/13	1,230,224	21,511[5]
2013/14	1,233,439	17,123[5]

Year	Harvestable area (ha)[1]	Area harvested (ha)[2]
2014/15	1,023,530	19,825[5]
2015/16	1,019,609	13,278[5]
2016/17	996,973	17,482[5]

Notes:

(1) Comprised of forest management zones – 3b (Special prescriptions – available for harvest), 4 (General) and 8 (Land for further assessment)

(2) Comprised of alternate coupe (modified shelterwood system); commercial regrowth thinning; group selection; single tree selection and in some instances, non-commercial thinning

(3) Includes cypress pine and river red gum harvesting in western region (not within NSW RFA regions).

(4) Figures derived from the 2013 SOFR: figures were rounded to the nearest thousand.

(5) Includes river red gum harvesting in western region (not within NSW RFA regions)

The downward trend in area harvested at a NSW state-wide basis is consistent with the area harvested in the NSW RFA regions, for the period 2002-2016. The total area harvested in the NSW RFA regions was 21,669 hectares in 2002 and has reduced to 16,350 hectares in 2016 as per **Table 3.4**. There have however been fluctuations in the area harvested, for instance in 2013 the North East RFA region recorded the lowest total area harvested of 8,270 hectares, however, in 2016 the total area harvested rose to 12,640 hectares in 2016.

Table 3.4 Native State Forest areas (hectares) harvested by NSW RFA region, 2002-2016

Year ending June	North East	Southern	Eden	Totals
2002	14,723	4,188	2,758	21,669
2003	16,294	4,248	3,646	24,188
2004	13,780	5,438	3,062	22,280
2005	17,472	3,876	2,418	23,766
2006	16,623	1,823	2,016	20,462
2007	14,454	4,110	2,289	20,853
2008	15,514	3,576	1,829	20,919

Year ending June	North East	Southern	Eden	Totals
2009	8,984	3,451	651	13,086
2010	12,757	1,961	768	15,486
2011	9,542	1,956	922	12,420
2012	18,821	2,685	681	22,187
2013	8,270	2,616	994	11,881
2014	11,717	2,567	1,387	15,671
2015	9,376	1,823	1,111	12,310
2016	12,640	2,512	1,199	16,350

Source: FCNSW corporate database; discrepancies with annual report data arise when data for a particular year are completed or corrected after annual report data are published.

This reduction is commensurate with an increase in the area of nature conservation reserves as a result of tenure changes agreed in the NSW RFAs which impacted on available wood yields. Consequently, areas required to supply wood yields have reduced in response to lower wood supply commitments.

Growing stock of merchantable and non-merchantable tree species

Information on the growing stock is not available for all tenures and therefore cannot be reported on for this Assessment Report.

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Indicator 2.1b Age class and growing stock of plantations

This indicator uses the area, age class and growing stock of native and exotic species plantations to assess the volume of timber that Australia's plantation forests can supply now and into the future.

This indicator provides a state-wide summary of the progress of plantation establishment of native and exotic species over time. An increase in the size and quality of the plantation estate is a significant element in longer-term sustainability, wood supply security, and the growth of the forest industry in New South Wales.

In March 1995, the NSW Government established a forestry policy which set targets for plantation establishment of 10,000 hectares of eucalypt plantations per annum from 1997-98 with the aim of doubling the size of softwood plantations (approximately 200,000 hectares at the time). The NSW Government also passed the *Timber Plantations (Harvest Guarantee) Act 1995* (NSW) to remove impediments to the harvesting of plantation timber and to encourage investment in plantation development.

The CRAs for NSW RFA regions, completed as part of the RFA process, encourage the increased production of plantation-grown timber to supplement the wood supply from native forests.

The New South Wales RFAs list a number of plantation expansion actions under clause 70(b)(i) of the Eden RFA, 75(b)(i) of the North East RFA and clauses 74(b)(i) and 86 of the Southern NSW RFA. The expected contribution of plantations to sustainable sawlog and pulpwood supply is addressed independently in twenty year Wood Supply Agreements developed by NSW.

At the time of the NSW CRAs, there was 234,600 hectares of softwood plantation (primarily radiata pine), and 25,540 hectares of hardwood plantation (primarily Eucalypt species) growing in the NSW RFA regions.

The plantation area in NSW in 2016-17 was 394,000 hectares, of which 307,000 hectares were softwoods and 87,000 hectares were hardwoods (Downham and Gavran 2017).

Between July 2004 and June 2014, just under 50,000 hectares of softwood plantation and 63,000 hectares of hardwood plantation were established. Plantation development for hardwoods has largely ceased since the collapse of managed investment schemes and for the public softwood estate, has tapered to minimal additions.

Between 1994 and 2005, there was significant investment by the NSW Government through FCNSW in hardwood plantation establishment on the North Coast (North East RFA region) on both purchased land as State forest and in joint ventures with private land-owners.

The post-1994 plantation estate managed by FCNSW in the North East RFA region was 28,452 hectares as at June 2014. The predominant species were blackbutt (*Eucalyptus pilularis*), Dunn's white gum (*E. dunnii*) and spotted gum (*Corymbia maculata*). The establishment program peaked in the 1997–2001 period. The large proportion of area established to Dunn's white gum and spotted gum was a result of cheaper land prices in areas suited to these species. Whilst two-thirds of the area established was on previously cleared agricultural land acquired and dedicated as State forest or on second rotation establishment in existing State forest plantations, the balance was planted on private land

under either an annuity or crop share (joint venture) arrangement. Government funding for new plantation establishment ceased in 2004 and the FCNSW program slowed to primarily second rotation establishment.

Under the *Plantations and Reafforestation Act 1999* (NSW) (PR Act), all new plantations (except for plantations of less than 30 hectares which do not otherwise require development approval) must be authorised prior to their establishment. In addition, any existing unauthorised plantations are required to be authorised prior to commencement of forestry operations in excess of 30 hectares.

Table 3.5 provides information from 2003-04 on new plantation authorisations for both hardwood and softwood by each NSW RFA region. Information prior to 2003-04 isn't readily available but the figures indicate that most new plantations were established prior to 2009-10 and there have been minimal new plantings since that period. In terms of the NSW RFA regions, most softwood has been planted in the Tumut sub-region, Southern RFA region with a modest program in the Eden RFA region while hardwoods have been predominantly in the North East RFA region.

In 2012–13, there was a small area of plantation authorisations that were cancelled in the Eden and Southern RFA regions, totalling 266 hectares of softwood and 123 hectares of hardwood. When a plantation authorisation is cancelled, plantation operations (including establishment, management and harvesting) must cease.

In 2014-15, there was a significant area of plantation authorisations cancelled in the North East RFA region as a result of the managed investment schemes (MIS) collapse, totalling 2,600 hectares of softwood and 27,100 hectares of hardwood plantation.

Significant areas of eucalypt plantation were established in NSW RFA regions under MIS. Since the collapse of MIS around 2009, plantation development on new land has largely ceased. Further information on the forestry MIS can be found in the report from the Senate inquiry released in March 2016, Agribusiness managed investment schemes: Bitter Harvest (Commonwealth of Australia 2016).

The majority of these plantations where the authorisation was cancelled were cleared and the timber was burnt on site (poorly growing *E. dunnii*). The properties were subsequently converted to agriculture (e.g. grazing). There were a few plantations harvested before cancellation, with wood chip or small logs being produced. Some of the cancelled authorisations were attached to land that had never been planted.

Table 3.5 provides an overview of the plantation areas by NSW RFA region in 2001, 2005 and 2011 as provided by the National Plantation Inventory's five year periods for spatial data. The decline in area from 2001 to 2005 is partly due to the 2001 data including areas that were not planted and the 2005 plantation layer missing some plantations that may have been within the plantation estate but were fallow land.

Table 3.5 NSW plantations by RFA region (2001, 2005, 2011, 2015)

RFA region	Plantation type (hectares)			Total (hectares)
	Hardwood	Softwood	Unknown	
2001 plantations by RFA region (hectares)				
Eden	1,181	36,703	635	38,519
Lower North East	20,187	11,077	772	32,036
Upper North East	22,701	12,939	737	36,377
Southern	4	126,089	3,149	129,241
Total	**44,072**	**186,807**	**5,293**	**236,173**
2005 plantations by RFA region (hectares)				
Eden	206	35,538	1	35,745
Lower North East	7,768	10,077	5	17,849
Upper North East	29,116	14,350	981	44,447
Southern	8	117,664	1	117,673
Total	**37,098**	**177629**	**988**	**215,715**
2011 plantations by RFA region (hectares)				
Eden	1,832	37,780	40	39,652
Lower North East	27,114	11,416	1,064	39,595
Upper North East	57,429	15,191	1,509	74,129[#]
Southern	16	133,107	36	133,159
Total	**86,392**	**197,494**	**2,650**	**286,535**

RFA region	Plantation type (hectares)			Total (hectares)
2015 plantations by RFA region				
Eden	5,301	40,713	-	46,014
Lower North East	26,797	11,522	41	38,360
Upper North East	56,905	16,058	42	73,005
Southern	47	142,474	-	142,521
Total	**89,050**	**210,767**	**83**	**299,900**

Source: National Plantation Inventory Database, ABARES 2016

Note: Totals may not tally due to rounding. The decline in area from 2001 to 2005 is partly due to the 2001 data including areas that were not planted and the 2005 plantation layer missing some plantations that may have been within the plantation estate but were fallow land.

the large apparent increase in FCNSW plantation area from 2005 to 2011 is probably because the north coast pre-1990 plantations were not included in the 2005 figures.

Table 3.6 Area of new plantations authorised in NSW RFA regions

RFA region	Eden		Southern		North East		Total	
Year	Softwood (ha)	Hardwood (ha)	Softwood (ha)	Hardwood (ha)	Softwood (ha)	Hardwood (ha)	Softwood (ha)	Hardwood (ha)
2003-04	576	78	2,882	36	788	1,989	4,246	2,103
2004-05	536	205	10,445	208	29	8,361	11,010	8,774
2005-06	333	527	13,626	11	548	10,092	14,507	10,630
2006-07	1,649	-	7,229	251	-	11,798	8,878	12,049
2007-08	148	116	7,272	230	-	16,299	7,420	16,645
2008-09	601	-	50	21	2,009	11,242	2,660	11,263
2009-10	-	-	110	21	429	200	529	221

RFA region	Eden		Southern		North East		Total	
2010-11	-	-	140	-	170	196	310	196
2011-12	-	-	-	-	-	705	-	705
2012-13	20	-	-	-	28	137	48	137
2013-14	-	2	319	-	-	128	319	130
2014-15	-	-	276	-	-	83	276	83
2015-16	-	-	39	-	-	300	39	300
2016-17	22	-	67	-	-	52	89	52
Total	**3,885**	**928**	**42,445**	**778**	**4,001**	**61,582**	**50,341**	**63,288**

Source: National Plantation Inventory Database, ABARES 2016

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Indicator 2.1c Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations

This indicator measures the harvest levels of wood products in relation to sustainable and predicted yields. The capacity to implement strategies to deal with changing demand for forest products based on predicted yields from both native and plantation forests is an integral part of sustainable forest management

Sustainable yield from native forests

Calculated sustainable yield is the estimated volume of wood that can be removed each year while ensuring maintenance of functions within native forest systems as a whole. Sustainable yield volumes vary over time according to changing management strategies and utilisation standards, improved resource data, and changes in the net area of native forest available for wood harvesting.

The total area of State forest, including plantations, in the North East, Southern and Eden RFA regions is approximately 1.66 million hectares. FCNSW's native forest component covers approximately 1.37 million hectares of which some 786,000 hectares (or 57%) are estimated to be available for harvest.

Harvest volumes in public native forests are set according to forecast sustainable yields and are influenced by market conditions. Hardwood log production from native forests in NSW in 2013–14 totalled 877,000 m^3 (ABARES 2016), which includes sawlogs and pulplogs. This harvested volume is the lowest since NSW RFAs commenced and is a consequence of a variety of factors including lower demand for some products in some regions; revised estimates of forest area, inventory and growth and yield due to improved information; and the impacts of occasional, intense broad-scale wildfires.

Wood volumes permitted to be harvested by FCNSW are designated in the NSW Forest Agreements (FAs) and RFAs (**Table 3.7**). An annual variation from the designated volume is permissible to accommodate changes in environmental and economic circumstances. This provision, as identified in the IFOAs, allows for harvest volumes in any one year to vary from the committed volume by 25%, but not exceed 5% over a five-year period. Committed volumes designated in the agreements and approvals are made up of high quality large sawlogs and large veneer logs.

Wood volumes harvested from FCNSW native forest and hardwood plantations have not exceeded the annual volumes permitted under the terms of the NSW FA and IFOA for each NSW RFA region.

Large veneer logs and high-quality large sawlogs are referred to as 'quota sawlogs' which comprise committed volumes harvested under the terms of the NSW FAs and IFOAs. Other log types do not make up committed volumes under the agreements and approvals, and are referred to as 'non-quota sawlogs'. Pulp-grade logs do not form part of committed quota volumes except in the Eden RFA region. Quota pulp-grade logs are hardwood only, obtained from either native forest or plantation. State forests in the Eden RFA region do not have any harvestable hardwood plantation areas, so all hardwood is obtained from native forests.

Table 3.7 Wood Volumes in NSW RFAs

Log type	Eden RFA volume	North East – UNE volume	North East – LNE volume	Southern – South Coast volume	Southern – Tumut volume
Quota logs/high-quality large sawlogs (HQL) – may include large veneer logs	Minimum 25,000 cubic metres quota logs for the first five years, then 24,000 cubic metres (Eden to get 1000 cubic metres quota sawlogs from Ingebirah SF in Tumut)	HQL harvest 109,000 cubic metres (plus 20,000 cubic metres to come from LNE region)	HQL harvest 160,000 cubic metres (but 20,000 cubic metres goes to UNE region)	HQL 48,500 cubic metres	HQL 48,000 cubic metres (an additional 1000 cubic metres from Ingebirah SF in Tumut to go to Eden RFA region)
High-quality small sawlogs (HQS)	-	Will be supplied at 1999 levels or greater	-	4850 cubic metres	3085 cubic metres
Low-quality sawlogs (LQS); other forest products (OFP)	Non-quota sawlogs 23,000 cubic metres (from pulp)	OFP – Existing supply arrangements and future supply		OFP – in accordance with current and future demands	
Pulpwood/ pulp-grade logs	345,000 tonnes	30,000 tonnes	152,000 tonnes	97,000 tonnes	-

North East RFA region

While the North East RFA provides for an annual harvest of 269,000 m^3, the North East RFA region Wood Supply Agreement (WSA) commits FCNSW to provide considerably lower volumes.

This variance between sustained yield volume and contracted volume is primarily due to key timber availability assumptions in 'buffer-on-buffer' areas that were to be independently tested after the agreements were signed, and also ongoing improvements to sustainable yield calculations since that time.

A Timber Availability Study was commissioned in 2002 by the then Resource and Conservation Division[60] focusing on the buffer-on-buffer effect on wood availability on the North Coast (North East RFA region).

[60] The Resource and Conservation Division ceased operation in 2007

In 2004, FCNSW undertook a review of wood resources on the North Coast i.e. within that incorporated the North East RFA region results of the Timber Availability study. This review provided a revised sustained yield of high quality large sawlog volume of 232,000 m^3 p.a. for the first five years (2003-2007) and then 220,000 m^3 p.a. from Year 6 to Year 20.

In 2012, two actions resulted in further reductions to wood supply commitments under the WSAs in the North East RFA region. In the first, a customer sold back its Walcha–Styx River allocation in the lower north east (LNE) RFA region, thereby reducing the committed WSA volume by 23,723 m^3. In the second, a NSW Government review of wood supply under the WSAs and subsequent customer negotiations reduced annual allocations of HQL sawlogs from 220,000 m^3 p.a. to about 178,600 m^3 p.a. (around two-thirds of the North East RFA's annual commitment of 269,000 m^3).

Actual harvest levels in the North East RFA region have been consistently about the same or slightly below WSA commitments for each year i.e. well below the calculated sustained yield.

FCNSW harvested wood from the following sources to meet its commitments: native forests within State forests supply approximately 85% of high quality wood in the North East RFA region, hardwood plantations within State forests supply 14%, and private native forests provide the remaining 1%.

Southern RFA region

The Southern RFA region includes two sub-regions: South Coast and Tumut.

The Southern RFA commits the NSW Government to supply a minimum of 48,500 m^3 p.a. of HQL logs from the South Coast sub-region and 48, 000m^3 p.a. from the Tumut subregion for 20 years from 1 January 2001.

South Coast

In 2005, the NSW government identified minor additions to nature conservation reserves. While undertaking this transfer to nature conservation reserves, negotiations on IFOA provisions were completed to ensure wood availability was not compromised despite the additional nature conservation reserve areas. This work confirmed that wood availability gains balanced the volumes transferred to permanent nature conservation reserve.

For each year in the 2004–05 to 2013–14 period, wood was supplied at the levels specified in the WSAs or at a lower volume by agreement with WSA customers.

On 1 July 2013, the largest south coast WSA customer closed one of its three sawmills and renegotiated a reduction in its HQL WSA allocation. FCNSW subsequently sought spot sales of this unallocated HQL volume to other customers in 2013 and 2014.

For the entire 2004–05 to 2013–14 period, the supply of HQS met or exceeded the commitment level in the WSA.

Tumut

The Southern RFA commits the NSW Government to supply a minimum of 48,000 m^3 p.a. of HQL logs from the Tumut sub-region for 20 years from 1 January 2001.

From 2005 to 2009, WSAs were largely met at WSA allocation levels, which are significantly lower than the Southern RFA commitment levels. Those allocations were only for alpine ash

(*Eucalyptus delegatensis)*, as there was little market interest for mixed mountain hardwood and little capacity to process it.

In 2010, an endangered population of yellow-bellied gliders (*Petaurus australis*) on the Bago Plateau was nominated to the NSW Scientific Committee for protection. The nomination area took in most of the alpine ash supply area in the Tumut sub-region. As a result of the nomination, supplies of alpine ash were disrupted. Wood harvesting largely ceased in State forests on the Bago Plateau for three years while the committee considered submissions and negotiations were conducted.

During the same period, closure of the largest WSA customer's sawmill for alpine ash HQL meant there was no HQL market.

In 2011, wood availability forecasts were updated, reducing total high quality large sawlog availability down to around 30,000 m^3 p.a. (first 20 years).

In 2013, a Population Management Plan for the yellow-bellied glider was implemented which allowed ongoing access for wood harvesting on the Bago Plateau. Since then sales have steadily increased, totalling around 21,000 m^3 p.a. in 2017.

Eden RFA region

The Eden RFA commits the NSW Government to provide an annual allocation of 25,000 m^3 of HQL for the first five years, and 24,000 m^3 for the remaining years. The annual allocation was made available in each year.

A change in yield simulation systems and updated scheduling tools in 2002-03 determined that the WSA for the Eden region could be maintained.

The Eden WSA has a single HQL customer who conducts stumpage operations as part of integrated harvesting for sawlogs and pulpwood. The WSA and Eden RFA commitments are the same. Under the terms of the WSA, the customer is not required to harvest the entire allocation and, in some years, not all of the allocation was harvested due to inadequate contractor capacity and lower market demand for HQL and residue (pulpwood). The customer has exercised the right provided in the WSA to carry forward accumulated undercuts to be harvested when markets pick up for both products.

The WSA customer's allocation is augmented by 1,000 m^3 p.a. of HQL alpine ash (*E. delegatensis*) from Ingebirah State Forest in the Tumut sub-region of the Southern region. An average of around 600 m^3 p.a. was made available under this allocation.

Private land

The NSW Government is committed to supporting the sustainable development of plantation forestry throughout the state. Over the period of the New South Wales RFAs, the strategy for private forest management has been to maintain, if not increase the forested area, recognising that infrastructure and agriculture expansion will continue to act as a reducing agent on forest area. The total private-forest resource, in both spatial and product terms, varies as forest is harvested and reforested or converted to agricultural uses, and as agricultural land is converted to plantations. Because of these variations, most of the production from private land in the medium to long-term is likely to be based on planted forests.

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Table 3.8 Wood Production, North East RFA region 2000-2017

Year ended 30 June	Large sawlog		Small sawlog		Pulp	
	WSA	actual	WSA	actual	WSA	actual
2000	190,150	272,596	49,672	112,032	175,000	107,747
2001	190,150	211,803	49,672	85,492	175,000	272,126
2002	190,150	270,788	49,672	45,644	175,000	113,375
2003	190,150	226,398	49,672	51,220	175,000	153,954
2004	190,150	225,332	49,672	59,124	175,000	135,138
2005	190,150	187,610	49,672	54,830	175,000	120,622
2006	190,150	194,156	49,672	62,206	175,000	116,560
2007	190,150	166,308	49,672	61,572	175,000	134,267
2008	190,150	170,181	49,672	65,261	175,000	143,373
2009	190,150	163,139	49,672	65,608	175,000	191,104
2010	190,150	165,137	49,672	58,662	175,000	182,720
2011	190,150	128,650	49,672	47,524	175,000	195,737
2012	172,150	162,946	58,049	56,963	175,000	193,916
2013	172,150	149,281	58,049	49,316	175,000	85,782
2014	172,150	149,393	58,049	47,451	175,000	13,534
2015	172,150	134,427	58,049	46,420	175,000	15,735
2016	172,150	135,863	58,049	54,405	175,000	25,247
2017	172,150	134,915	58,049	48,464	175,000	31,073

Table 3.9 Wood production, Southern RFA region 2003-2017

Year ended 30 June	Large sawlog		Small sawlog		Pulp	
	WSA	Actual	WSA	actual	WSA	actual
2003	66,053	65,384	7,090	5,635	75,000	63,236
2004	66,053	72,496	7,090	6,980	75,000	78,291
2005	66,053	58,376	7,090	7,669	75,000	85,582
2006	66,053	62,539	7,090	9,307	75,000	109,691
2007	66,053	61,762	7,090	9,437	75,000	126,109
2008	66,053	70,538	7,090	7,472	75,000	115,319
2009	66,053	61,645	7,090	6,261	75,000	98,787
2010	66,053	39,826	7,090	5,238	75,000	82,219
2011	66,053	40,876	7,090	6,987	75,000	99,418
2012	66,053	41,661	7,090	7,705	75,000	74,658
2013	66,053	42,298	7,090	6,283	75,000	68,289
2014	66,053	41,643	7,090	5,671	75,000	28,103
2015	66,053	51,483	7,090	6,877	75,000	30,381
2016	66,053	45,629	7,090	5,729	75,000	30,089
2017	66,053	58,350	7,090	5,451	75,000	36,074

Table 3.10 Wood Production, Eden RFA region 2000-2017

Year ended 30 June	Large sawlog		Small sawlog		Pulp	
	WSA	actual	WSA	actual	WSA	actual
2000	22,080	23735	1,920	1950	504,000	352,282
2001	22,080	27056	1,920	2067	504,000	337,434
2002	22,080	25329	1,920	1125	504,000	279,854
2003	22,080	22018	1,920	1692	504,000	279,017
2004	22,080	26,441	1,920	1,262	504,000	320,681
2005	22,080	25,023	1,920	1,273	504,000	296,976
2006	22,080	24,806	1,920	1,765	504,000	310,603
2007	22,080	20,455	1,920	2,374	504,000	352,916
2008	22,080	23,191	1,920	2,608	504,000	316,067
2009	22,080	18,478	1,920	1,573	504,000	221,215
2010	22,080	20,788	1,920	1,237	504,000	246,705
2011	22,080	19,910	1,920	1,326	504,000	220,465
2012	22,080	18,598	1,920	2,510	504,000	194,338
2013	22,080	19,030	1,920	1,262	504,000	169,839
2014	22,080	21,387	1,920	2,118	504,000	217,636
2015	22,080	19,967	1,920	1,856	504,000	225,443
2016	22,080	18,743	1,920	3,169	504,000	198,243
2017	22,080	12,650	1,920	3,138	504,000	207,160

Indicator 2.1d Annual removal of non-wood forest products compared to the level determined to be sustainable

This indicator is used to assess the sustainability of the harvest of non-wood forest products. These products can represent a significant asset base supporting the livelihoods of remote communities.

While there are some state-wide data for this indicator available on removal of non-wood forest products, the data on sustainable yields of these products are very limited. The different levels of available data reflect market driven responses where demand for particular non-wood forest products determines what, if any, monitoring systems are developed.

There are no data available on indigenous resources collected or used for cultural activities.

In NSW, the NPW Act protects all native fauna (mammals, birds, reptiles and amphibians) and flora both inside the RFA regions and in other parts of the state. A licence is required to take protected fauna or flora. Regulation of non-native fauna is under the control of the *Non-Indigenous Animals Act 1987* (NSW). The TSC Act and the *Environmental Planning and Assessment Act 1979* (NSW) also have provisions relevant to the harvesting of non-wood forest products.

Apiary products are another important animal non-wood forest product. NSW has a significant beekeeping industry, and hives are placed in forest ecosystems based on the annual availability of flowering tree and understorey resources. The dependency of the beekeeping industry on forest resources is estimated at 70–90% in south-eastern Australia. NSW regulates apiarists through issuing permits and licences for apiary sites and hives. In 2007, NSW had 3,195 beekeepers, with 265,474 hives. A substantial per centage of hives are in multiple-use public forest.

Forests provide many products and services other than wood that is processed in sawmills. FCNSW monitors the supply and sale of specific non-wood forest products from State forests to help understand the extent to which native forests remain an important multiple-use resource, supplying a variety of products sought by the community.

Indicator 2.1e The area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation harvested and the proportion of that effectively re-established

This indicator reports on the extent of native forest harvested and the success of re-establishing regeneration on harvested sites. It also compares the area of plantation clear-felled with the area effectively replanted, and gives an indication of the success of the planting effort. This indicator is used to assess the success of the re-establishment of forests after harvesting. Re-establishment is critical to the maintenance of the productive capacity of the forest.

Native forest

Effective regeneration of native forest after wood harvesting is a fundamental component of sustainable forest management, since regeneration determines the long-term productivity, growth, dynamics and composition of forest stands. In this situation, regeneration is the establishment of a new tree crop following the harvesting event from natural seed fall, lignotubers or coppice.

This indicator is relevant to the public forest estate as there are no statistics for regeneration on harvested private property. For native forests, annual information is provided on the total area harvested, the area harvested where regeneration is a targeted outcome and the proportion of area effectively regenerated (**Table 3.11**).

Some types of silviculture practised on the public native forest estate do not include regeneration as a prescribed outcome of the harvesting intervention where the residual stand will contain adequate stocking of commercial species.

The major regeneration system for native forest within State forests is Single Tree Selection (STS) which has been modified for NSW conditions to provide for varying intensities (light, medium or heavy) of canopy removal, baring of mineral earth and retention of regrowth trees or stands of trees. Other regeneration systems practised are Australian Group Selection (AGS) for mixed age forest where groups of trees are removed in small patches large enough to allow regeneration to establish and grow without competition from overstorey trees, and seed tree or shelterwood systems which remove a substantial proportion of the stand but retain habitat trees, seed trees and well-formed regrowth trees. The latter system is practised mainly in the mixed age stands of the Eden RFA region as alternate coupe harvesting (FCNSW, 2015). Thinning systems do not seek to regenerate the stand but to thin out competing trees to allow retained trees to grow on to form higher value products.

Thinning and light-medium STS harvesting areas are generally not surveyed by the FCNSW for regeneration, as sufficient trees remain so that regeneration is not a primary objective from harvesting.

Regeneration oriented harvesting activity comprises alternate coupe harvesting in Eden RFA region and AGS or heavy STS in the other RFA regions (NSW EPA, 2017) With these sivicultural systems, regeneration assessments are essential for sustainable forest management, and it is a requirement of the IFOAs that regular and periodic assessments of

regeneration are carried out. These assessments are usually conducted from nine to twenty four months after harvesting was completed. In May 2010, the Forest *Practices Circular 2010/04 Regeneration Assessment in Native Forests* was released providing clear and consistent guidelines. This framework is designed to provide precise, unbiased estimates of regeneration success (OEH, 2010).

For harvested State forest areas under STS heavy, AGS or alternate coupe regeneration systems, NSW considers that successful regeneration has occurred when 65 per cent or more of plots in a harvested area are stocked with regeneration of commercial Eucalypt species. In NSW RFA regions, effective regeneration in multiple-use public native forests for the period 2004–05 to 2013–14 was generally above 70 per cent.

Low regeneration rates may be due to a range of factors including poor seed bank, unfavourable weather conditions including drought and competition from weeds. If the regeneration rates are generally low or low in specific locations within a harvested area, remedial action is undertaken where such areas are planted with seedlings of commercial species extant to the harvested area; hazard reduction burning is used to promote seedfall or stimulate the seed bank; or mechanical disturbance is used to stimulate the dormant seed bank.

FCNSW's commitment to regeneration of State forests following harvesting is embedded in its forest management systems. The forest zoning system has been implemented by the FCNSW for many decades and has, as a management guideline for Zone 4 General Management, 'the establishment and development of effective regeneration in native forest' (SFNSW, 1999).

Also, the *Forest Management Plan for the Coastal Forests of NSW* (FCNSW, 2016a) indicates that FCNSW has an obligation for ecologically sustainable wood supply to 'maintain forest cover by using appropriate silviculture during harvesting and ensure natural regeneration or rehabilitation where appropriate'

Eden RFA region

Information at the RFA region level reports only on overall per centage regeneration rate with no reference to the type of regeneration system(s), the area harvested under such system(s), or the forest type treated by the regeneration system.

From 1999/2000 to 2009/10 reporting was available[61] on the RFA region with the regeneration per centages having varied from the high-60 per cent to 100 per cent with no regeneration surveys conducted in 2001/02, 2004/05, 2005/06, 2007/08, 2008/09 and 2009/10 (DECCW, 2008).

From 2010/11 onwards, reporting has been undertaken at the state level as presented in **Table 3.11**.

North East RFA region

Information at the RFA region level reports only on overall per centage regeneration rate with no reference to the type of regeneration system(s), the area harvested under such system(s) nor the forest type treated by the regeneration system. For the North East RFA region, it is reported under its two constituent regions – UNE and LNE.

From 1999/2000 to 2009/10 reporting was available on the RFA region with the regeneration per centages having varied from the low 50s to 100 with no regeneration surveys conducted in 2000/01, 2001/02 and 2004/05. For all except one year in UNE, the per centages have been over 80 per cent with about half at 100 per cent (DECCW, 2008). Over all of the years surveyed, LNE has consistently attained between 80 and 100 per cent regeneration while UNE has been 100 per cent except for 2006/07.

From 2010/11 onwards, reporting has been undertaken at the state level as presented in **Table 3.11**.

Southern RFA region

Information at the RFA region level reports only on overall per centage regeneration rate with no reference to the type of regeneration system(s), the area harvested under such system(s) or the forest type treated by the regeneration system.

From 2002/03 to 2009/10 reporting was available on the RFA region with the regeneration per centages having varied from the low-40s per cent to 100 per cent with no regeneration surveys conducted in 2006/07 and 2009/10 (DECCW, 2008). Between 2004/05 and 2008/09, there has been between 90 to 100 per cent regeneration for the years surveyed.

From 2010/11 onwards, reporting has been undertaken at the state level as presented in **Table 3.11**.

[61] FCNSW Forest Agreement annual reports and EPA environmental reports

Plantation

Effective establishment of a plantation either on land not previously under plantation (afforestation) or as re-establishment of a previous plantation after clearfell harvesting (reforestation) is a fundamental component of sustainable plantation management in order to provide for long term and consistent wood volumes required by wood-processing industries.

In terms of monitoring plantation establishment on public forests, the planted area includes both new plantation establishment and plantation re-establishment. Establishment is measured one year after planting; the rate applies to the planted area in the previous year. Monitoring the effectiveness of the establishment of newly planted forest is undertaken by surveys of seedling survival in the first year after planting. If survival rates are generally low or low in specific locations mainly due to drought or frost, the failed areas are replanted. Secondary survival counting is sometimes undertaken if plant health, disease or adverse weather conditions warrant further examination.

Successful establishment is attained where 80 per cent of softwood seedlings and 90 per cent of hardwood seedlings survive. Follow-up replanting occurs as required to fully stock the planted site.

The data in **Table 3.12** is provided at a State level as there is no meaningful information provided by RFA region. The success in establishing and re-establishing public plantations in New South Wales varied widely for both softwood and hardwood plantations. In the case of the low 2009 hardwood establishment rate, much of the plantation estate was just below the 90% guideline threshold and required only a low level of supplementary planting to adequately stock the planted area.

Based on the most recent Statement of Corporate Intent (FCNSW, 2018) from FCNSW, there is a strategic objective to expand the public softwood plantation estate which assumes the continued re-establishment of clear felled areas into the future. As part of this objective, FCNSW acquired an 11,000 hectare softwood plantation estate in the Tumut and Oberon regions during 2017.

Also, the *Softwood Plantations Division Forest Management Plan* (FCNSW, 2016b), has a commitment that to meet a sustainable timber supply, it 'maintains the plantation estate by ensuring timely re-establishment'.

There is no RFA regional level information covering re-establishment of plantations or new plantations. This is essentially a state level reporting metric. Both hardwood and softwood plantations are measured for effectiveness of establishment whether re-establishment or new plantations.

For the public softwood plantations, over the 18 year period in **Table 3.12**, the per centage area successfully established has ranged from the low 70s to 100 (or fully stocked). Due to drought in 2006, establishment success was only 37% and re-planting was required. The period has also seen over 70 per cent of calendar years achieve 80 per cent or higher for establishment success.

For the hardwood plantations over the 18 year period in **Table 3.12**, the per centage of area successfully established has ranged from 70 to 100 (or fully stocked). There was one outlier year in 2009 where it was only 13 per cent. The period has also seen nearly 80 per cent of

calendar years achieve 80 per cent or higher for establishment success noting that records were not available for four years of the period.

Table 3.11 Native forest regeneration

Year	Area of native forest harvested[a] (hectares)	Area of native forest harvested in RFA regions (hectares)	Area of native forest surveyed for regeneration (hectares)	Proportion of area effectively regenerated (%)
1999-00	56,900	n.d.	3,644	98
2000-01	64,166	n.d.	2,157	95
2001-02	50,351	n.d.	1,325	68
2002-03	49,062	n.d.	5,410	87
2003-04	45,746	25,817	4,406	86
2004–5	42,923	25,649	3,878	83
2005–6	43,709	25,588	4,881	74
2006–7	45,945	34,672	3,709	63
2007–8	57,631	26,075	5,375	94
2008–9	31,252	16,751	3,616	81
2009–10	38,784	n.d.	3,845	95
2010–11	27,864	n.d.	5,382	92
2011–12	22,921	n.d.	7,837	77
2012–13	31,221	n.d.	5,812	69
2013–14	n.d	n.d.	6,268	67
2014–15	n.d.	n.d.	n.r.	81
2015–16	n.d.	n.d.	n.r.	91

Notes:

[a] Areas extracted from SEEing Reports (or equivalents), FCNSW; includes areas outside of RFA regions i.e. Cypress Pine and River Red Gum harvesting

n.d. no data

n.r. not recorded

Table 3.12 Public softwood and hardwood plantation planting in NSW, 2004–2017

Age class	Planted area (hectares)		Proportion successfully established (%)	
	Softwood plantation	Hardwood plantation	Softwood plantation	Hardwood plantation
1999	N/A	N/A	98	100
2000	N/A	N/A	96	95
2001[1]	5,951	2,005	95	n.r.
2002	5,500	1,680	81	97
2003	6,506	1,529	80	78
2004	6,764	1,164	93	100
2005	6,547	267	94	100
2006[2]	7,260 [6,547]	889 [264]	37 [94]	n.r. [100]
2007	6,037	462	74	n.r.
2008	9,874	945	74	n.r.
2009[3]	10,581	1,979	71	13
2010	9,942	1,104	78	91
2011	8,969	592	88	70
2012	7,813	470	77	95
2013	7,138	404	82	88
2014	9,285	132	80	100
2015	7,991	224	100	98
2016	7,712	275	85	100

Notes: n.r. not recorded
N/A not available

Source:
1. Figures to 2005 taken from corresponding Social, environmental and economic report (SEEing report) e.g. 2001/02, State Forests of NSW available at

www.forestrycorporation.com.au/__data/assets/pdf_file/0006/281229/State-Forests-Seeing-Report-2001-2002.pdf
2. Bracketed figures from 2005-06 SEEing report
www.forestrycorporation.com.au/__data/assets/pdf_file/0009/279828/seeing-report-05-06.pdf
3. FCNSW Annual Report 09/10 shows 9102hectaresare provided for softwood plantings and 2160hectaresare provided for hardwood plantings.

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Indicator 6.1a Value and volume of wood and wood products

This indicator presents information on the value and volume of wood and wood products that are directly generated by the forest and wood products industries and enables socio-economic benefits to be monitored by ascertaining trends in value and volume of wood production.

State Summary

Log harvesting from the hardwood native forest and plantation estate as well as the softwood plantation estate over the period of the NSW RFAs has changed significantly both in terms of volume and composition.

Log volume

Due to changes in the availability of data and terms utilised within the industry over the period of the NSW RFAs, the reporting format for the volume of harvested logs has varied and provides some challenges to interpret the data over time.

Table 3.13 presents data on annual log volumes for all of NSW (from both public and private land both within and outside the RFA regions) for the 1999-2000 to 2015-16 period. This table is an overall view of log production at the whole of state level by the three major forest sources; however, individual RFA regional level production is presented and discussed in the next section at a finer scale but restricted to the hardwood estate only.

During the 1999-2000 to 2015-2016 period, the total volume of logs harvested in the hardwood sector has shown a general decline from the native forest estate with annual between year fluctuations which has been augmented by a variable supply from hardwood plantations but generally trending downwards as well.

However, there is evidence of a long-term increase in softwood log production from the mid two million cubic metres per annum to the mid four million cubic metres per annum over the period.

Overall, NSW has increased its log output from the mid four million cubic metres per annum in 2000-01 to the mid five million cubic metres per annum in 2015-16 having reached high points of over six million cubic metres in 2007-08 and 2010-11.

Of the three major forest sources, the mix of products i.e. sawlog, pulplog and other log, on an annual basis, has fluctuated over the 1999-2000 to 2015-16 period with sawlog being the predominant product over the three product types usually over 50%, followed by pulplog varying between 30% and 40% and other logs generally running in single digit figures.

Over the 2005-06 to 2015-16 period, the per centages at the five year points of 2005-06, 2010-11 and 2015-16 were:

- Hardwood native forest sawlog – 69%; 49% and 65%
- Hardwood native forest pulplog – 28%; 47% and 30%
- Hardwood native forest other log – 3%; 4% and 5%
- Hardwood plantation sawlog – 50%; 51% and 55%
- Hardwood plantation pulplog – 39%; 46% and 44%
- Hardwood plantation other log – 11%; 3% and 1%

- Softwood saw log – 62%; 58% and 55%
- Softwood pulplog – 36%; 36% and 43%
- Softwood other log – 2%; 6% and 2%

The increasing softwood plantation log production reflects the steady growth in the housing market, the requirements of engineered wood product plants, and the expansion of the Visy pulp and paper mill in Tumut from a mature plantation estate which is re-establishing all harvested areas to ensure an ongoing and increasing supply of logs.

The decline in the total harvest of logs from the hardwood estate reflects the lack of markets from pulp grade logs following the global financial crisis, collapse of the north coast pulp log market, the finite plantation resource with age class distribution affecting availability of logs on an annual basis and various restrictions impacting on native forest yields.

Log value

The wood-processing industry in NSW is comprised of many different components from solid wood processing through engineered wood products to pulp and paper. Reporting on the value of this industry in relation to log production is available at the state level only with no figures available for each RFA region. Also, reporting methodology on the value of the industry has changed over the period of the NSW RFAs making direct comparisons difficult.

Over the 1999-2000 to 2015-16 period, the gross value of production for NSW saw a steady increase from the high $200 million to the mid $400 million by the end of the period. The lowest value during the period was $247 million in 2001-02 with the highest value of $466 million.

As it is gross value for all log production, there is no breakdown into the components or the sources that have increased or decreased in value. Overall, the industry has increased in value by 63 per cent from the 1999-2000 value as at the end of the period.

Data is available from 2006-07 to 2015-16 to provide some indication of the relative contribution of the three forest sources to the value of the industry with the:

- softwood sector showing an increasing contribution on a yearly basis through the period with the expectation of increasing higher value sawlogs contributing to the value increase
- hardwood native forest sector declining from around mid-$140 million to just over $100 million with the cut moving from multi-aged forests to regrowth forests and a diminishing log size and changing species mix
- hardwood plantation sector fluctuating between $5 million and $20 million which would indicate a wide variation in log quality i.e. mix of high quality and low quality sawlogs as well as pulplogs on a yearly basis (AFWPS, 2016).

Based on the data, it can be projected that the trajectories would be maintained into the future with the hardwood component contributing around 20 - 25 per cent of the overall value and the softwood component providing the balance.

Wood products

New South Wales' wood products include the sawmilling, wood-based panels, and paper and paperboard product sectors.

Hardwood sawnwood production has steadily declined from 522.6 thousand cubic metres in 2004-05 to 275.9 thousand cubic metres in 2012-13. Only national level data is available for 2013-14 and 2014-15.

In terms of softwood sawnwood production, it has steadily increased from 1043.5 thousand cubic metres in 2004-05 to 1298.5 thousand cubic metres in 2007-08 and can be inferred to have continued to increase through latter years but this cannot be confirmed due to combining of data for certain states not allowing separation for NSW.

Volume

This section and associated tables examine the three RFA regions and the provision of hardwood wood products only, in line with volume commitments made in RFAs which relate exclusively to hardwood volumes.

The seven categories of wood products align with detailed data captured by the state's forest management agency.

Eden RFA region

The wood resource in the Eden RFA region can be categorised into two main components:

- the multi-aged forest of unlogged or very selectively logged forest; and
- the essentially even-aged regrowth forest originating from broad area bushfires especially in the years of 1952, 1968, 1972 and 1980.

The Eden RFA region has mainly produced various grades of hardwood sawlogs and pulpwood with virtually no poles, piles and girders, and veneer as well as miscellaneous grades of wood products as presented in **Table 3.14**.

The high quality large sawlog (HQL) commitment from the Eden RFA was for 25 000 m^3 p.a. for the first five years of the RFA followed by 24 000 m^3 per annum for the balance of the RFA, from native forest only. The commitments have only been achieved in four years with supply generally running under commitment, but has averaged around 23 400 m^3 p.a. for the middle and latter part of the period. Despite being less than RFA commitments, supply generally met customer demand in most years.

The Eden RFA HQL volume has been augmented by 1 000 m^3 p.a. of Alpine Ash (*Eucalyptus delegatensis*) logs from Ingebirah State forest within the Tumut sub-region. This volume has been supplied just under the allocation including small sawlogs and pulpwood but on a variable basis as the viability of an operation in the remote location requires aggregating a number of years of committed volume to be harvested in a single operation in a short timeframe based on weather and access conditions.

As a consequence of the HQL commitment, small sawlogs and low quality sawlogs have been supplied with small sawlogs at a low but constant rate and low quality sawlogs at a high level in the first half of the RFA period but declining in the latter half. It should be noted

that the small sawlog supply has increased in the four years since 2013/14 and is an indication of the future resource from the RFA region based on even-aged regrowth forest.

Except for two years, there has been no supply of poles, piles and girders (PPG) and veneer logs as the resource doesn't have suitable species for PPG over the most of the State forest estate and the region is too remote from any veneer customers.

The pulpwood commitment from Eden RFA region was for a minimum of 345 000 tonnes per annum but this was achieved in only two years with the supply generally declining over the period especially with the change in resource with the near completion of harvesting in the multi-age forest resource and the increase in output from the thinned regrowth forest resource but constrained by number of operations in suitably aged forest.

There was a very low output of miscellaneous wood product grades in the first half of the period but this has increased in the latter half of the period.

North East RFA region

The wood resource of the North East RFA region is based on a significant number of both coastal and tablelands species which have been utilised for many years by customers in supplying well established markets. They are renowned for strength, durability and appearance for end products.

The resource on State forest is mainly from selectively harvested stands with a range of treatments ranging from single tree selection through to extensively harvested followed by supplementary seeding or planting of valued forest types e.g. Blackbutt (*E. pilularis*), Flooded Gum (*E. grandis*) or Sydney Blue Gum (*E. saligna*) where natural regeneration falls below accepted levels.

The North East RFA region has mainly produced high volumes of low quality sawlogs and declining pulpwood volumes with a steady supply of poles, piles and girders, and veneer as well as a variable supply of miscellaneous grades of wood products based on market requirements as presented in **Table 3.15**.

The high quality large sawlog (HQL) commitment from the North East RFA region (combined sub-regions) was initially for 269 000 m^3 per annum. The commitments were not achieved up to 2006 with sawlog supply running under commitment from both native forest and hardwood plantations. As a consequence of land tenure transfers, changes to the volumes from the North East RFA region occurred during the period to move the contracted HQL volume to 209 500 m^3 per annum. A further reduction occurred in 2012, to reduce the volume to 185 777 m^3 per annum. Even with the two reductions, the supply didn't meet commitments over the reporting period.

As a consequence of the HQL commitment, small sawlogs and low quality sawlogs have been supplied with small sawlogs commencing at a high level but declining to around 50 per cent and less by the end of the period and low quality at a high level which was sustained to 2012/13 before a slight decline before increasing to a figure above the contracted HQL supply in the latter half of the period.

The PPG and veneer logs supply has been constantly in the high 20 000 to 30 000 m^3 with some years over 40 000 m^3 from both native forest harvesting and hardwood plantation

thinning or clearfells. There has also been a steady supply of between 10 000 to 20 000 m^3 of veneer logs which has the same basis as PPG in source.

The pulpwood commitment from North East RFA region was for 182 000 tonnes per annum but this was achieved only once in the first half of the period but supply generally increased in the early years of the second half of the period before declining significantly at the end of the period. The decline would be attributed the closure of the woodchip export facility at Kooragang Island, Newcastle.

There was a highly variable output of miscellaneous wood product grades in the period with volumes ranging from a low of 964 m^3 to a high of 38 882 m^3 but this has generally been between 5 000 to 15 000 m^3 per annum based on market requirements.

Southern RFA region

The data presented in **Table 3.16** has full regional level coverage from 2002/03. It should also be noted that the Southern RFA region figures show combined volumes for the South Coast and Tumut sub-regions.

The Southern RFA region contains a mosaic of different forest types varying from the Alpine Ash forests of the Tumut/Tumbarumba region through to the Spotted Gum (*Corymbia maculata*) forests of Batemans Bay. Some types are dominated by a single species, but most are a mixture of eucalypts. These forest types give rise to either wet or dry sclerophyll forests. The majority of these forests have been subjected to selective harvesting especially on the coastal areas and the Bago/Maragle Alpine Ash resource.

The Southern RFA region has mainly produced various grades of hardwood sawlogs and pulpwood with minor volumes of poles, piles and girders, and veneer as well as an increasing volume of miscellaneous grades of wood products.

The HQL commitment from the Southern RFA region (combined sub-regions) was for 96 500 m^3 per annum. The commitments have not been achieved over the period with supply running below commitments from native forest only. Supply was generally met for commitments to sawmill customers in the South Coast sub-region but was not to the levels envisaged in the Southern RFA.

As reported in the second and third five-yearly review report, the volume from Tumut sub-region declined dramatically in 2009-10 due to issues around the listing of yellow-bellied gliders (*Petaurus australis*) on the Bago Plateau as an endangered population and changes in sawmill customer base. The yellow-bellied gliders issue was resolved in 2013 and volumes have been steadily increasing since 2014-15. While the Southern RFA region has commitments in the Tumut sub-region by Alpine ash and mixed hardwoods, the volumes in the HQL figures aren't differentiated by species.

As a consequence of the HQL commitment, small sawlogs with a commitment of 7935 m^3 per annum and low quality sawlogs have been supplied with small sawlogs at a constant but moderately high rate including two years that achieved over the commitment. Low quality log supply was at a high level in the first half of the RFA period but declined in the latter half by around 50-60 per cent of the HQL volume on a yearly basis.

PPG and veneer logs have been supplied at a constant but low rate mainly on an as available supply based on suitable species for PPG and market conditions for veneer logs.

The pulpwood commitment from Southern RFA region was for 97 000 tonnes per annum but this was achieved in only five years with the supply generally declining over the period to around 30-50 per cent of commitment at the end of the period. As with the HQL sawlogs from the Tumut sub-region, the supply of pulpwood crashed to zero in some years and has only been supplied at low volumes as the resource has come back on stream following the resolution of the yellow-bellied glider issues.

There was a low output of miscellaneous wood product grades in the first half of the period but volumes have increased significantly in the latter half to between 25-50 per cent of the volume produced for HQL on a yearly basis.

Table 3.13 New South Wales volume and value of logs

Log type	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08
Hardwood native ('000 m^3)	N/A	1850	1749	1904	1906	1846	1881	1836	1706
Hardwood plantation ('000 m^3)	N/A	116	91	131	142	187	137	129	229
Softwood ('000 m^3)	N/A	2485	2970	3304	3298	3519	3634	3827	4071
Total volume ('000m^3)	4920	4452	4810	5340	5346	5551	5652	5792	6005
Total value ($m)	281	255	247	294	307	330	343	350	379

Notes: N/A Not available

Table 3.14 New South Wales volume and value of logs (*continued*)

Log type	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Hardwood native ('000 m^3)	1441	1355	1080	1119	914	883	924	876
Hardwood plantation ('000 m^3)	228	216	174	108	98	66	57	63
Softwood ('000 m^3)	3766	4324	4828	4518	4397	4449	4575	4651
Total volume ('000 m^3)	5435	5895	6082	5745	5409	5398	5556	5590
Total value ($m)	353	375	380	373	334	428	466	458

Table 3.15 Eden RFA region – volume of logs

Log type	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08
High quality large sawlog (m^3)	23 735	27 056	25 329	22 018	26 441	25 023	24 806	20 455	23 191
High quality small sawlog (m^3)	1950	2067	1125	1692	1262	1273	1765	1277	688
Low quality sawlog (m^3)	4089	9303	9294	10 909	18420	14 365	12 464	9413	7762
Poles, piles and girders (m^3)	-	-	-	-	-	-	-	-	-
Pulp-grade logs (tonnes)	352 282	337 434	279 854	279 017	320 681	296 976	310 603	352 916	316 067
Miscellaneous grades[1] (m^3)	-	221	279	9	43	280	-	160	-

Note: 1 –Miscellaneous grades includes products which have been classified as 'residue' in five-yearly implementation report and 'fencing, landscape and sleepers (sawn)' in EPA annual reports.

Table 3.16 Eden RFA region – volume of logs (*continued*)

Log type	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
High quality large sawlog (m^3)	18 478	20 788	19 910	18 598	19 030	21 387	19 967	18 743	12 650
High quality small sawlog (m^3)	1573	1237	1326	2510	1262	2118	1856	3169	3138
Low quality sawlog (m^3)	5309	3856	2246	3348	3203	2888	1668	1130	1234
Poles, piles and girders (m^3)	237	79	-	-	-	-		-	-
Veneer (m^3)	62	50	-	-	-	-		-	-
Pulp-grade logs (tonnes)	221 215	246 705	220 465	194 338	169 839	217 636	225 443	198 243	207 160
Miscellaneous grades[1] (m^3)	23	49	132	920	233	1481	1067	1326	4430

Table 3.17 North East RFA region – volume of logs

Log type	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08
High quality large sawlog (m^3)	272 596	211 803	270 788	226 398	225 332	187 610	194 156	166 308	170 181
High quality small sawlog (m^3)	112 032	85 492	45 644	51 220	59 124	54 830	62 206	61 573	65 261
Low quality sawlog (m^3)	243 438[a]	200 127	230 955	233 315	255 802	234 113	227 747	221 296	266 886
Poles, piles and girders (m^3)	28 325[a]	38 747	29 462	24 913	32 328	33 081	38 474	38 224	38 175
Veneer (m^3)	13 377	15 296	8192	418	3794	12 378	12 824	15 538	16 621
Pulp-grade logs (tonnes)	107 747[a]	272 126	111 375	153 954	135 138	120 623	116 560	134 267	143 372
Miscellaneous grades (m^3)	21 779	3280	38 882	1403	1009	964	1888	2989	1532

Note: 1 –Miscellaneous grades includes products which have been classified as 'residue' in five-yearly implementation report and 'fencing, landscape and sleepers (sawn)' in EPA annual reports.

Table 3.18 North East RFA region – volume of logs (*continued*)

Log type	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
High quality large sawlog (m^3)	163 139	165 137	128 650	162 947	142 282	149 394	134 427	135 863	134 915
High quality small sawlog (m^3)	65 608	58 663	47 475	56 963	49 316	47 450	46 420	54 405	48 464
Low quality sawlog (m^3)	236 868	238 247	242 178	234 1350	197 405	208 930	193 479	187 841	150 272
Poles, piles and girders (m^3)	36 418	35 574	40 803	48 870	44 669	30 585	32 385	31 778	42 329
Veneer (m^3)	16 283	14 975	10 940	12 690	15 477	13 585	6667	14 937	16 783
Pulp-grade logs (tonnes)	191 104	182 720	195 737	193 915	85 782	13 534	15 735	25 247	31 073
Miscellaneous grades (m^3)	3570	6879	6943	14 756	25 716	14 471	11 976	13 034	11 377

Table 3.19 Southern RFA region – volume of logs

Log type	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08
High quality large sawlog (m^3)	N/A	N/A	N/A	65 384	72 496	58 376	62 539	61 761	70 538
High quality small sawlog (m^3)	N/A	N/A	N/A	5635	6980	7669	9307	9437	7472
Low quality sawlog (m^3)	N/A	N/A	N/A	59 299	53 210	62 214	52 675	40 009	42 283
Poles, piles and girders (m^3)	N/A	N/A	N/A	-	155	180	522	1337	819
Veneer (m^3)	N/A	N/A	N/A	-	173	27421	181	244	569
Pulp-grade logs (tonnes)	N/A	N/A	N/A	63 236	78 291	85 582	109 691	126 109	115 319
Miscellaneous grades (m^3)	N/A	N/A	N/A	-	620	2223	3150	3805	8794

Note: 1 –Miscellaneous grades includes products which have been classified as 'residue' in five-yearly implementation report and 'fencing, landscape and sleepers (sawn)' in EPA annual reports.

Table 3.20 Southern RFA region – volume of logs (*continued*)

Log type	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17
High quality large sawlog (m^3)	61 644	39 827	40 876	41 661	42 298	41 643	51 483	45 629	58 350
High quality small sawlog (m^3)	6261	5238	6987	7705	6283	5671	6877	5729	5451
Low quality sawlog (m^3)	34 693	24 831	26 826	23 395	25 540	32 136	28598	28 984	29 556
Poles, piles and girders (m^3)	796	798	1082	540	1057	601	819	257	143
Veneer (m^3)	358	-	181	376	290	183	288	212	-
Pulp-grade logs (tonnes)	98 787	82 219	99 418	74 658	68 289	28 103	30 381	30 089	36 074
Miscellaneous grades (m^3)	8853	11 518	13 351	28 966	20 996	14 442	16 292	31 693	30 200

Notes: N/A Not applicable

Reference: AFWPS (2016). Australian forest and wood products statistics: September and December quarters 2016, ABARES, 2017

Indicator 6.1b Values, quantities and use of non-wood forest products

This indicator enables socio-economic benefits to be monitored by ascertaining trends in quantities, values and usage of non-wood forest products against management objectives.

Monitoring the supply and sale of specific non-wood forest products from forests helps forest managers understand the extent to which forests remain an important multiple-use resource, supplying products sought by the community.

Discussion

The non-wood forest products or activities sourced from or utilised on State forest vary by RFA region. While there are biological and non-biological (inert) products, there are also man-made structures or infrastructure that contributes to the socio-economic fabric of the RFA region as well as providing financial gain for the forest manager and regional or local employment opportunities.

For the purpose of measurement against this indicator, non-wood forest products in State forests have been determined to be those products that are not supplied to sawmills or wood-based processing plants. Non-wood forest products may be for personal use or as part of a commercial enterprise.

The main products range from firewood, wood chop blocks, seed, gravel, sand and hard rock with activities and infrastructure including apiculture, grazing, communication sites, powerlines/pipelines/cables and other infrastructure sites. Other less common non-wood forest products which are utilised for specific commercial purposes include charcoal, craft timbers, eucalypt leaf/oil, bark and native (protected) plants including tree ferns and wildflowers. There are other non-wood forest products that are collected for personal use and usually without cost e.g. wild berries and mushrooms, with no statistics maintained over collections.

Over the period of the three NSW RFAs, the types of data collected for non-wood forest products from State forest, and the levels of monitoring by relevant agencies has varied significantly. This implies that consistent reporting and assessment of this indicator across the reporting periods is neither complete in data nor feasible to interpret relevant trends. Accordingly, information on this indicator is presented in varying formats for different time periods.

While the information in the tables presented for this indicator is from State forest, a significant non-wood forest product derived from the NPWS estate is honey from around 916 sites used by apiarists in the three RFA regions. It is estimated that three per cent of NSW's NPWS estate is accessed by bees from these apiary sites in any one year with around 25 sites in Eden RFA region, 548 sites in North East RFA region and 343 sites in Southern RFA region.

It should be noted that native plants are protected in New South Wales by the BC Act. Under the BC Act, it is an offence to pick, possess, buy or sell native plants listed in the BC Act for

commercial purposes without a licence. Licensing, through OEH, helps regulate the cut-flower and whole-plant industries to sustainably harvest and cultivate protected native plants for sale

Overall, the availability of data varies with complete data from 1999/00 to 2008/09, partial data for 2009-10 and only State-level data for 2010-2011 to 2015-16 (which hasn't been included as it would not be compatible with data at the RFA region level). FCNSW and its predecessor's record or recorded most of these non-wood forest products through a Permits and Licence System.

The value of the non-wood forest products resource isn't reported at RFA region level but as a state based metric i.e. it covers the value of other products not sourced form RFA region as well as RFA region value. As an example of the value that non-wood forest products generates, in 2005-06 it provided $6.242M in revenue and peaked at $6.461M in 2006/07 but had declined by 2010-11 to $5.037M in revenue. Due to changes in reporting over the period, there are no value figures prior to and post these examples.

Eden RFA region

The Eden CRA report revealed that that the Eden RFA region has a low level of non-wood forest products mainly as a consequence of low populations in the region, large distance to major markets for commonly produced products and a limited range of products.

The main products sourced from the Eden RFA region prior to the RFA signing were:

- Firewood at 700 – 1000 tonnes per annum
- Fencing and landscape timbers at 150 – 200 cubic metres per annum using red wood species as well as Yellow Stringybark (*Eucalyptus muelleriana)*
- Variable seed sales depending on eucalypt flowering with Shining Gum (*E. nitens*) and Maidens Gum (*E. maidenii*) as the principal species
- Grazing was noted as a minor usage based on low demand which was satisfied by existing Crown leases or occupation permits for specific time periods on suitable forest sites
- Apiary activities dependent upon Eucalypt species producing honey and bees wax from 64 sites within State forest.

The main and consistent non-wood forest products sourced over the life of the Eden RFA and currently from or utilised in the State forest of the Eden RFA region are:

- Apiary sites for honey production and bees wax
- Firewood collected by individuals or commercial collectors for domestic use in heating at mainly the local community level
- Grazing of sheep or cattle on selected forested sites based on suitable grass cover under existing Crown leases or occupation permits for specific time periods
- Quarrying of hard rock and removal of gravel and sand with a permanent hard rock quarry accounting for much of the production
- Infrastructure – communication sites on selected elevated sites; other structures for community or specific usage and powerlines/pipelines/cables traversing the region to provide services both within and without the region.

Other opportunistic non-wood forest products are wood chop blocks and seed collection which depend on local agricultural shows and suitable species availability or a bountiful seeding season for certain eucalypt species respectively.

In the case of the nature conservation estate, there has been a regular use of apiary sites since 1999-2000 with between 21 to 25 sites occupied each year.

Over the life of the Eden RFA, firewood, grazing and infrastructure have been fairly consistent and in line with the levels of pre-RFA operations. The apiary industry had expanded over that time but in the mid period there seems to have been a crash or reporting isn't accurate considering the previous data trend. The major increase in products has come from quarrying of hard rock and removal of gravel and sand which, while varying in some years, has ramped up production significantly.

Based on an analysis of the trends from **Table 3.18**, the flow of non-wood forest products into the future would seem to be consistent with the past levels whilst accounting for yearly fluctuations based on seasonal issues or demand.

North East RFA region

While the Eden CRA report had a small amount of detail on non-wood forest products, the North East CRA report(s) provided minimal detail on the type and extent of non-wood forest products in the North East RFA region. It can be gleaned from CRA reports that the following non-wood forest products were identified during the assessment, although annual monitoring by the forest regulator reveals a wider range:

- Sleeper logs for railway sleepers – a small volume which was decreasing due to harvesting regulation and reduced demand for timber sleepers
- Wood chop blocks – increasing volume with the sport gaining in popularity but dependent on the agricultural show circuit
- Fencing and landscape timbers – an ongoing demand for local/regional use especially for the durable species of Tallowwood (*E. microcorys*), the Ironbarks (*E. paniculata*, *E. siderophloia* and *E. sideroxylon*), Grey Gums (*E. punctata* and *E. propinqua*) and White Mahogany (*E. acmenioides*)
- Apiary activities with high level of usage based on Eucalypt resource with about 4000 sites in UNE of which 24 per cent were on State forest and about 1400 sites in LNE of which 30 per cent were on State forest – also, the region is used for overwintering bees and in spring for building up queen bee breeding populations
- Grazing over extensive areas of State Forest with over 385 000 hectares in UNE and over 141 000 hectares in LNE, all for beef cattle, usually for around six months a year, with State forest grazing integrated with grazing of private holdings of lessees or permits on other crown lands.

The main and consistent non-wood forest products sourced over the life of the North East RFA and currently from or utilised in the State forest of the North East RFA region are:

- Grazing of selected forested sites based on suitable grass cover and tenure classification i.e. Crown leases or where forest permits are issued for grazing over State Forest
- Apiary sites for honey production and bees wax
- Firewood for domestic use in heating at mainly the local community or regional levels

- Quarrying of hard rock and removal of gravel and sand
- Infrastructure – communication sites on selected elevated sites; other structures in specific locations associated with approved usage of the area or complementing adjoining land usage and powerlines/pipelines/cables
- Protected plant species salvaged in conjunction with wood harvesting operations and sold under a biodiversity conservation licence with NPWS tags to verify legality of origin.

Other opportunistic non-wood forest products based on availability are craft timbers from sought after species or from trees with specific wood properties salvaged in harvesting operations; burls from selected fallen trees and bark.

Opportunistic non-wood forest products based on seasonality are seed which depends on a bountiful seeding season for certain eucalypt species, or based on scheduling are wood chop blocks required for local agricultural shows.

Over the life of the North East RFA, apiary activities, firewood, grazing and infrastructure have been fairly consistent although fluctuating on a yearly basis but in line with the levels of pre-RFA. The quarrying of hard rock and removal of gravel and sand and salvaging of protected plants have shown substantial fluctuations over the period in response to demand or supply respectively. Burls, craft timber, leaf/oil, seed and wood chop blocks have all declined over the period but are supplied when available or there is a demand.

Based on an analysis of the trends from **Table 3.18**, the flow of non-wood forest products into the future would seem to be subject to yearly fluctuations for the lesser utilised products based on seasonal issues or demand, but the major products demonstrate a year on year availability.

Southern RFA region

The Southern CRA reporting repeats the minimal details of the North East CRA reporting with the following information made available:

- Wood chop blocks – increasing volume with the sport gaining in popularity but dependent on the agricultural show circuit
- Fencing and landscape timbers – an ongoing demand for local/regional use especially for the durable species of the Ironbark (*E. tricarpa*), Wollybutt (*E. longifolia*), Coastal Grey Box (*E. bosistoana*) and Yellow Stringybark
- Apiary activities with a significant level of usage based on Eucalypt resource with about 785 sites on State forest and 157 sites on Crown land used by 175 apiarists with Eucalypts accounting for 70 per cent of honey production – also, the region is used for overwintering bees and in spring for building up queen bee and package bee sales.

The main and consistent non-wood forest products sourced over the life of the Southern RFA and currently from or utilised in the State forest of the Southern RFA region are:

- Firewood for domestic heating at the local community level and supply to the Canberra market
- Grazing of selected forests based on suitable grass cover and tenure classification i.e. Crown leases or where forest permits are issued for grazing over State Forest
- Apiary sites for honey production

- Seed collection for select eucalypt species for nurseries or re-vegetation programs
- Infrastructure – communication sites on selected elevated sites; other structures like dams and water towers and powerlines/pipelines/cables as linear features that require access through State forest e.g. water and gas pipelines, electricity lines, telecommunication cables
- Wood chop blocks for agricultural shows especially the Royal Easter Show in Sydney

Other opportunistic non-wood forest products based on availability are craft timbers from sought after species salvaged in harvesting operations, protected plant species salvaged in conjunction with wood harvesting operations and sold with NPWS tags to verify legality of origin and quarrying of hard rock and removal of gravel and sand.

Over the life of the Southern RFA, honey, grazing, infrastructure and seed have been fairly consistent products although displaying yearly fluctuations but in line with the levels of pre-RFA. The firewood industry has expanded over that time most likely due to its proximity to the Australian Capital Territory and a higher population in the region. There has been low level output, which also has fluctuated, for craft timber, protected plants and quarrying of hard rock and removal of gravel and sand. The only product to have declined was leaf/oil.

Allowing seasonal and with demand based variation, data in **Table 3.18** suggests that the flow of non-wood forest products into the future would be consistent with the past levels.

Apiculture

Honey bees play an essential role in agriculture, not only producing honey and beeswax but also pollinating a vast number of food crops.

Beekeeping is a unique primary industry, depending on native flora for about 80 per cent of its production. Nectar and pollen are produced seasonally and beekeepers must often move their hives large distances to be successful (NSW DPI, 2018). The main honey-producing plants that beekeepers use flower irregularly, with most species flowering once every 2–4 years.

Beekeepers have traditionally had access to native plants on public and private land. When Crown land containing existing beekeeping sites is reserved or added to a park, NPWS may permit the beekeeping operations to continue if they are compatible with the park's conservation values and the needs of other park users.

Table 3.21 Proportions of honey production from public and private land, NSW, 2015–16

Land tenure	Proportion of honey production, 2015–16 (%)
State forests	26
National parks	14
Other public land	1
Total public land	**41**
Private land	**59**
Total	**100**

Source: van Dijk *et al*. (2016).

Table 3.22 Eden RFA region – non-wood forest products

Non-wood forest product[1]	99/00	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10
Apiculture (sites)	56	57	84	159	164	162	102	164	1	1	
Grazing (hectares)[2]	7151	4876	7545	9647	8515	8721	7037	6636	9243	10 730	
Firewood (tonnes)	691	n.d.	937	935	384	865	689	700	505	993	
Wood chop blocks (number)	86	90	90	112	-	-	-	-	-	-	
Communication sites (number)	6	5	8	8	7	8	8	8	5	2	7
Powerlines (km)	21	50	50	50	50	50	50	50	50	50	50
Other structures (number)	6	-	2	3	7	7	7	7	3	3	7
Gravel, sand & hard rock (tonnes)	21 000	24 892	25 016	43 236	76 203	54 103	56 616	47 829	57 770	22 574	76 203
Seed (kg)	n.d.	n.d.	n.d.	n.d.	-	-	-	-	4	2	-

Notes: n.d. No data

1. Data only available at a regional level for the period 99/00 to 08/092. Includes dedicated Crown Leases, Grazing Permits and Occupation Permits

Table 3.23 North East RFA region – non-wood forest products

Non-wood forest product	99/ 00	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	05/ 06	06/ 07	07/ 08	08/ 09
Apiculture (sites)	1357	1356	1399	608	639	1369	1316	1286	1001	1029
Grazing (hectares)	347 787	351 603	287 944	360 742	196 610	298 673	255 369	255 332	249 929	247 614
Firewood (tonnes)	5239	n.d.	3705	1800	2297	2216	1858	1004	2173	1948
Wood chop blocks (number)	1295	-	-			-	-	-	-	-
Communication sites (number)	67	69	70	77	56	83	83	79	83	93
Powerlines (km)	475	517	490	107	104	98	66	28	26	24
Other structures (number)	92	60	54	72	175	67	56	57	87	66
Gravel, sand & hard rock (tonnes)	23 141	13 659	9876	11 000	11 212	812	300	1268	17 369	10 777
Seed (kg)	216	2353	40	-	13	11	3	-	-	-
Craft timber (m^3)	17	13	161	3	2	-	3	-	12	-
Protected plants (pieces)	149 178	9680	4313	3406	12 582	102 464	3767	[3494]	[414]	[435]
Leaf/oil (kg)	6050	-	-	-	-	-	-	n.d.	n.d.	n.d.

Non-wood forest product	**99/ 00**	**00/ 01**	**01/ 02**	**02/ 03**	**03/ 04**	**04/ 05**	**05/ 06**	**06/ 07**	**07/ 08**	**08/ 09**
Bark (tonnes)	35	10	8	5	4	-	-	n.d.	n.d.	n.d.
Burls (tonnes)	6	12	1	3	1	-	-	n.d.	n.d.	n.d.

Notes: n.d. No data

Table 3.24 Southern RFA region – non-wood forest products

Non-wood forest product	99/ 00	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	05/ 06	06/ 07	07/ 08	08/ 09
Apiculture (sites)	n.d.	n.d.	n.d.	1055	1055	1148	1193	1238	17	17
Grazing (hectares)	n.d.	n.d.	n.d.	82 750	73 243	84 615	112 353	100 496	56 753	37 401
Firewood (tonnes)	n.d.	n.d.	n.d.	5011	6838	4673	5786	4087	3881	3344
Wood chop blocks (number)	-	-	-	4500	4226	-	3750	3750	-	-
Communication sites (number)	n.d.	n.d.	n.d.	11	20	34	31	36	12	11
Powerlines (km)	n.d.	n.d.	n.d.	533	534	394	1052	762	122	2
Other structures (number)	n.d.	n.d.	n.d.	12	20	29	25	22	7	2
Gravel, sand & hard rock (tonnes)	n.d.	n.d.	n.d.	-	-	51 722	42	1895	1513	14
Seed (kg)	-	n.d.	n.d.	25	512	290	50	50	96	165
Craft timber (m^3)	n.d.	n.d.	n.d.	-	4	5	3	30	-	13
Protected plants (pieces)	n.d.	n.d.	n.d.	50	1375	888	53	[50]	[40]	[1250]
Leaf/oil (kg)	n.d.	n.d.	n.d.	1000	81	-	-	-	-	

Notes: n.d. No data

Indicator 6.1c Value of forest based services

This indicator measures forest-based services such as ecosystem services, carbon credits, salinity mitigation and ecotourism. Forest-based services provide economic values and contribute to the sustainability of forests by providing significant social and environmental benefits.

In general, there is limited data on the value of forest based services (ABARES, 2013).

Five-yearly NSW RFAs reviews

The first five-yearly RFA review progress with implementations report did not report on this indicator or "forest based services", however, does mention the NSW greenhouse gas abatement scheme, which is an example of a payment for a forest based service:

> *"The expansion of Forests NSW plantation estate, which takes place largely on land previously managed for agriculture, is also creating long-term change in land use and a new store of carbon. It not only maintains equilibrium, but also takes extra carbon out of the atmosphere, thereby providing a positive contribution to the environment. This extra carbon can be used to create certificates under the NSW Greenhouse Gas Abatement Scheme.*
>
> *In addition to developing a carbon accounting system that is sufficiently robust to gain accreditation under the NSW Greenhouse Abatement Scheme, Forests NSW has been heavily involved in developing state, national and international standards and guidelines to enable carbon accounting and trading."*

The combined second and third five-yearly review progress with implementation report stated that forests in NSW provide a range of services, such as carbon sequestration, soil conservation, watershed protection, ecotourism and biodiversity conservation. Markets exist for few of these services.

In July 2008, the NSW Government introduced the Biodiversity Banking and Offsets Scheme (OEH 2016) (BioBanking) to help address the loss of biodiversity values, including threatened species, due to habitat degradation and loss.

BioBanking is a market-based scheme that provides a streamlined biodiversity assessment process for land use development, a rigorous and credible offsetting scheme as well as an opportunity for rural landowners to generate income by managing land for conservation.

BioBanking enables 'biodiversity credits' to be generated by landowners and developers who commit to enhance and protect biodiversity values on their land or site through a biobanking agreement. These credits can then be sold, generating funds for the management of the land or site. Credits can be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development. The credits can also be sold to those seeking to invest in conservation outcomes, including philanthropic organisations and government.

A new Biodiversity Offsets Scheme under the BC Act commenced on 25 August 2017. The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (OEH 2017).

Domestic visitation to NSW national parks

In 2016, national park visitation was estimated at a total of 51.77 million visits, accrued from 42.49 million adult and 9.28 million child visits . This is an increase of 31.3% on 2014 results.

Table 3.25 National Park visitation 2008-2016

NPWS Park Visitation by Year	2008	2010	2012	2014	2016
Adult Visitation	31,128,875	27,262,279	28,745,337	31,466,415	42,495,513
Child Visitation	6,798,741	6,581,347	6,750,287	7,700,954	9,281,310
Total Visitation	37,927,616	33,843,626	35,495,624	39,167,370	51,776,823

Source: http://www.environment.nsw.gov.au/research/NSWparkspopularity.htm

Table 3.26 Bushwalking visitors to major forested tourism regions

'National landscapes' Region	Annual average numbers of bushwalkers ('000) 2011–12 to 2015–16			
	National visitors, overnight trips	National visitors, day trips	International visitors	Total
Australian Alps, NSW and Victoria	424	199	14	637
Greater Blue Mountains, NSW	350	791	60	1201
Northern NSW and south-east Queensland	196	283	122	601

Source: Tourism Research Australia, Australian Trade and Investment Commission; derived from survey data based on Tourism Australia's "national landscapes" regions.

Indicator 6.1d Production and consumption and import/export of wood, wood products and non-wood products

This indicator measures the consumption of forest-based products in Australia. Consumption trends over time provide a measure of the ability of Australian forest and timber industries, through both domestic production and importation, to meet Australian society's demand for forest-based products and the industries contribution to the economy.

This indicator provides a measure of the trends in the production and consumption of wood and wood related products in Australia (including imports),, and the export of those products from Australia. Within NSW, ongoing access to interstate and international markets is fundamental in ensuring the viability of the forestry and forest-based industries sector.

Information on the production, consumption and trade of non-wood forest products is often difficult to obtain because of the generally small size of industries based on these products and their dispersed nature. Non-wood forest products can include honey, flowers, water, minerals, animal skins and bark.

Australian consumption data

SOFR 2013 states that Australia is a net importer of wood and wood products. The trade deficit in wood products increased slightly from $1.91 billion in 2006-07 to $1.93 billion in 2010-11. This was attributed to an increase in sawn wood and wood-based panel imports, linked to the strong Australian dollar, and an international oversupply of wood products, because of a slowdown in the United States housing market.

In 2010-11, the highest proportion of imported wood products into Australia, by value, was printing and writing paper at 30.6%. The production of paper products in Australia declined in 2010-11 by 1.4% compared to 2006-07 production. The consumption of paper products still exceeded Australia's production of paper products, despite this consumption declining by 4.3% over the 2006-07 to 2010-11 period.

Woodchips were the highest value export category for wood products in 2010-11, at $884.4 million. The majority of export woodchips went to Japan over the 2006-07 to 2010-11 period, but in recent years exports to China have increased.

Sawn wood consumption in Australia decreased by 6% from 5.3 million cubic metres in 2006-07 to 5.0 million cubic metres in 2010-11. This was due to a downturn in hardwood sawn wood consumption from 1.23 million cubic metres to 748 thousand cubic metres over the period. Consumption of softwood sawn wood increased, from 4.1 million cubic metres to 4.3 million cubic metres.[62]

Uses of New South Wales forest products

Sawn timber or other sawn or processed products from NSW forests is used for a variety of applications including furniture, housing construction, flooring, weatherboards, railway sleepers, bridge girders, wharf piles, electricity and telephone poles, fence posts; props for underground mining and pulpwood for paper and building boards[63]. According to FCNSW, in 2010-11 one in four houses in Australia was built using their pine plantation timber[64]. Other non-wood forest products sourced from NSW State forest include fuel wood, essential oils for medicinal and industrial use, charcoal, brush for brush fencing, seeds, nuts and honey (NSW DPI, 2008). The values and quantities of these non-wood forest products are reported on in Indicator 6.1b of this report.

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[62] Data in this section sourced from ABARES – State of the forest report 2013

[63] NSW Department of Primary Industry (DPI) 2008. Primefacts 687, Forests and Forestry in NSW. Accessed on 16 May 2018 at www.forestrycorporation.com.au/__data/assets/pdf_file/0010/420859/Forests-and-forestry-in-NSW.pdf

[64] Forests NSW, Undated. Forests NSW Facts and Figures 2010-11. Accessed on 16 May 2018 at www.forestrycorporation.com.au/__data/assets/pdf_file/0007/438460/Facts-and-Figures-2010-11.pdf

Five-yearly reviews of NSW RFAs

This indicator was not reported on in the first five-yearly review of NSW RFAs. The Independent Assessor also did not mention this indicator or consumption trends in their report[65].

The combined second and third five-yearly RFA review progress with implementation report briefly reported on this indicator, using Australia wide information from the SOFR series, as follows:

"Apparent consumption in Australia, calculated as domestic production plus imports and minus exports, is changing over the period 2005–06 to 2014–15. Hardwood, particleboard, and newsprint, printing and writing paper consumption has been falling. Softwood, plywood, medium density fibreboard, sanitary, household and packaging and industrial paper consumption has been rising. Total sawn wood and wood-based panel consumption has been rising, while total paper and paperboard consumption has been falling."[6667]

[65] Spencer, S. 2009. Final Report on Progress with Implementation of NSW Regional Forest Agreements: Report of Independent Assessor November 2009. Available from www.agriculture.gov.au/forestry/policies/rfa/publications/annual-reports/nsw

[66] NSW EPA 2017, *A report on progress with implementation of the New South Wales Regional Forest Agreements: Second and third five-yearly reviews, July 2004 to June 2014*, NSW Environment Protection Authority, Sydney. Accessed on 16 May 2018 at www.epa.nsw.gov.au/your-environment/native-forestry/about-public-native-forestry/regional-forest-agreements-assessments/review-regional-forest-agreements

[67] NSW EPA 2017, *A report on progress with implementation of the New South Wales Regional Forest Agreements: Second and third five-yearly reviews, July 2004 to June 2014*, NSW Environment Protection Authority, Sydney. Accessed on 16 May 2018 at www.epa.nsw.gov.au/your-environment/native-forestry/about-public-native-forestry/regional-forest-agreements-assessments/review-regional-forest-agreements

Indicator 6.1e Degree of recycling of forest products

This indicator measures the extent to which recycling or reuse of forest products occurs. As global demand for forest products increase, there is a growing need to meet societal demands for recycling of forest products.

Background

Information of the levels of recycling or reuse of forest products in Australia and more specifically in NSW is limited and dependent on the type of product i.e. solid, processed or paper/paperboard. The existing data is not available for each of the NSW RFA regions, and therefore the data quoted in this report is for the whole of NSW. As forest products produced in one region often end up in many different areas of the State, inter-state and also exported to other countries, assigning recycling levels to one region is problematic. Recovery options include direct recycling into other wood products, indirect recycling into non-wood products (e.g. mulch), reuse and energy generation (FWPA 2008). As indicated in the NSW RFA review report (NSW EPA 2017): "forest and mill residues and waste are generally sold as woodchips. Some residue is also used as fuel in mill boilers for generation of heat and electricity, and for gardening, animal bedding or domestic fuel." In this section "wood" includes wood and wood products (e.g. engineered wood products).

Recycling or reuse of forest products varies significantly depending on the product type and available markets. Estimates of recycling or reuse rates of wood vary over time but are typically much lower than for paper/paperboard products. The majority of the wood in the waste stream is derived from construction and demolition (C&D) and commercial and industrial (C&I) sources (NSW EPA 2017a). Typically types of wood salvaged from building demolitions works include roof beams, ceiling battens, sub-floor timbers and flooring, interior wall framing timbers (if not contaminated with asbestos) and others. Approximately 77% of wood that is reused is used in new dwelling construction as flooring, internal wall and ceiling panelling, and external cladding. The rest is mostly used in outdoor furniture, mulch, animal bedding and firewood (Ximenes et al 2008). Recycling of paper products is more easily tracked and the estimates available are more consistent over time than values available for wood.

Statistics on recycling of wood in NSW

Early reports (e.g. C4ES 1999) point to discrepancies in wood disposal data available in NSW, suggesting that defining a reliable baseline then was not possible. There are challenges in estimating total volumes of wood waste generated, volumes of wood sent to landfills, and also in tracking the variety of different applications. These challenges may explain fluctuations in estimates over time, with recycling figures for wood ranging from 16 to 34% between 2002 and 2009. In 2002, it was suggested that for the Sydney metropolitan area, 16% of the wood waste generated was recycled (Resource NSW 2002) – Sydney accounts for approximately 80% of the waste generated in NSW. A report by the then NSW Department of Environment and Conservation suggested that 29% of the wood waste was recovered in NSW in 2002-03 (DEC 2004). In 2006-07, it was estimated that approximately 70,000 tonnes of C&D wood was recycled in NSW (NTPSG 2008). A 2007 review of utilisation of post-consumer wood found that almost 500,000 tonnes was utilised for mulch, biofuel, salvaged

from demolitions or used to make chicken bedding or particleboard. The overall recovery rate for wood in NSW was estimated to be approximately 20% (NTPSG 2007). In 2008-09, recovery rates for wood in the C&I stream were estimated at 16% (DECCW 2010).

There have been efforts to increase recycling levels for specific wood product types such as pallets and electricity poles, as these products have well-defined supply chains and collection points. For example, the National Timber Product Stewardship Group (NTPSG) was an initiative of the timber and wood products industry to increase recycling levels, with focus on products such as pallets and electricity poles (NTPSG 2007). It was estimated that 636,000 cubic metres of wood were used to make wood packaging in Australia in 2005-06 (NTPSG 2007). While a high proportion of this packaging is reusable pallets, it was estimated that 290,000 tonnes of wood packaging is disposed of to landfills around Australia each year (NTPSG 2007). A survey carried out in 2008 found that 140,000 tonnes (49%) of wood in the mixed C&I waste stream was made up of mainly wood pallets and crates (NTPSG 2012). A protocol was developed in 2008 (TDA 2008) to "provide guidance to infrastructure managers and dedicated timber recyclers to improve the recovery of timber from the demolition of timber bridges and renewal of power distribution infrastructure in New South Wales".

In Table 3.23 the most recent figures for recycling of wood in NSW are presented. The recycling figures for 2014-15 were the highest reported, confirming the overall trend for an increase in recycling rates for wood, notwithstanding some fluctuation in the actual values over time.

Challenges in increasing recycling levels of wood in NSW

A barrier to growing the recycling and reuse market in NSW is the increasing mechanisation of demolition works, which makes it more difficult for salvage operations to take place, and increases the potential for high value timbers to be damaged (Hyder Consulting 2011). Some large demolition contractors have established specialised timber recovery operations to address this issue, where it is economically viable to do so (Hyder Consulting 2011).

Another challenge in increasing recycling rates for wood products such as sawn timber used in residential construction is the difficulty in separating untreated from preservative-treated wood. Treated wood is estimated to account for around 6% of total C&D waste wood in NSW, and contamination with even small levels of treated material presents a barrier to recovering more from the mixed wood waste stream (Hyder Consulting 2011). Also the presence of resins in engineered wood products such as particleboard and plywood is restrictive for some uses. The NSW EPA does not allow engineered wood products to be used as mulch (EPA 2016). Nor does it allow any treated wood, most painted or coated wood, or most engineered wood products to be used as replacement fuel sources (EPA 2016a).

Statistics on recycling of paper and paper products in NSW

Nationally, ABARES publishes statistics on recycling of paper products at a national level (ABARES 2018). A range of reports have included estimates for paper recycling levels in NSW over the years. In NSW, recycling levels for newsprint in 1990 were low at 28% (NTPSG 2007a). In 2002-03, recycling of newsprint had increased substantially to 77%, while 51% of the total paper and cardboard waste was recovered for recycling (DEC 2004). The total

estimated amount of paper recycled in 2006-07 was 58% (DECC 2008), whereas for 2008/09 it was estimated recovery rates for paper and cardboard was 53% (DECCW 2010).

More recent figures for paper recycling in NSW are included in the NSW EPA *Waste Avoidance and Resource Recovery (*WARR) reports. Although recycling rates for paper products are still high, there was an overall decline for the most recent year reported (2014-15). This drop seems to have been driven largely by a reduction in recycling levels for office paper compared to the previous year reported. Overall, the trajectory of recycling of paper products in NSW has been of growth, especially when compared to the recycling levels reported in the early 2000's.

Table 3.27 Recycling levels for wood and paper products in NSW

Products	Recycling (%)		
	2010/11	2012/13	2014/15
Wood	24.8	33.3	41.0
Paper & cardboard			
Cardboard	84.0	76.2	78.6
Liquid paperboard	66.6	69.2	69.2
Newsprint / magazines	87.3	84.6	85.2
Office paper	47.9	62.2	45.6
Total Paper	78.6	76.4	64.5

Challenges in increasing recycling levels for paper in NSW

A proportion of the paper currently recovered in Australia and, in NSW, has been exported to China, as the export market for waste materials has grown substantially in the last ten years (ABS 2013). Approximately 1.5 million tonnes of scrap paper and paperboard were exported for the 2017 calendar year (Australian Packaging Covenant Organisation 2018). However, a recent ban imposed by China on imports of low-grade waste has had an impact on export volumes to that country – during the first half of 2017, China and Hong Kong were the dominant markets for Australian exports of paper or paperboard (62.8% by weight); during the second half of 2017 this fell to 45.3% of paper or paperboard. This shortfall has been for the moment largely absorbed by other countries, though with substantial dropping in prices, and fears that other nations will follow China in restricting imports of waste material (Australian Packaging Covenant Organisation 2018). In the long-term however, industry analysts believe that waste paper exports will trend upward again as more processing is undertaken in Australia before exporting (www.businessinsider.com.au/council-rates-china-waste-recycling-2018-2).

NSW recycling strategy

In November 2009, the environment ministers of the Australian, state and territory governments endorsed the National Waste Policy (DoEE 2010), which aims to reduce the amount of waste that is generated and disposed of by industry and households. The policy includes strategies to increase the recycling of waste products.

The *NSW Waste Avoidance and Resource Recovery Strategy 2014–2021* (WARR Strategy) sets objectives and targets for NSW to avoid and reduce waste generation (NSW EPA 2014*)*. Areas for priority recycling action cover forest products, including paper/cardboard and timber wastes (from both C&I, and C&D waste streams). Progress in recycling and diversion across all waste sectors is reported every two years in the WARR Strategy Progress Report.

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Indicator 6.2a Investment and expenditure in forest management

This indicator quantifies investment and expenditure in developing, maintaining, and obtaining goods and services from forests. It provides an indication of the long-term and short-term commitment to forest management, further processing and other forest uses.

Summary

Sustainable forest management is an evolving process and the manner in which it is conducted changes over time based on scientific information and the needs and aspirations of the community. The NFPS provided a framework that integrated environmental, social and commercial objectives to ensure a balanced return from all forest uses. This enables the governments to achieve cooperatively their vision for sustainable management of Australia's forests. The NFPS laid the foundation for the creation of the RFAs. The CRAs of the environment, heritage, social and economic uses and values of the forests underpinned how the forests were to be managed based on their values within the RFA regions.

Essentially forest management in NSW can be broadly described as the management of native and plantation forests on public and private land. For the purposes of this indicator the description of forest management will be largely confined to the public forest estate.

In NSW, individual statutes regulate the national park estate, plantation forests, public native forests and private native forestry (PNF). The relationship between these statutes is outlined in **Figure 3.1**. While other statutes may impact upon specific forest management activities (such as workplace health and safety or the control of pests and feral animals), the following discussion focusses on the principal Acts which regulate forest management activities.

The NPW Act regulates forest management within national parks and nature reserves, which constitute the majority of the NSW NPWS estate as well as other reserves in that estate.

Both softwood and hardwood plantations, are regulated under the PR Act.

The *Forestry Act 2012* (NSW) (Forestry Act) establishes the FCNSW as a State Owned Corporation (SOC), subject to the *State Owned Corporations Act 1989* (NSW), and regulates forest management on Crown-timber land, including State forests.

The Forestry Act is primarily administered by the NSW Forestry Minister. Exceptions are parts 5A and 5B of the Act relating to FAs and IFOAs, which are administered by the NSW Minister for the Environment.

PNF in NSW must comply with the requirements of the BC Act, the Forestry Act, and the PNF Code[68].

The current framework of the principal legislative and other regulatory instruments for forest management in NSW is shown schematically in **Figure 3.1** .

[68] PNF in NSW was previously regulated under the NV Act. With repeal of the NV Act, the regulatory requirements for PNF have been incorporated into the LLS Act through the insertion of a new Part 5B.

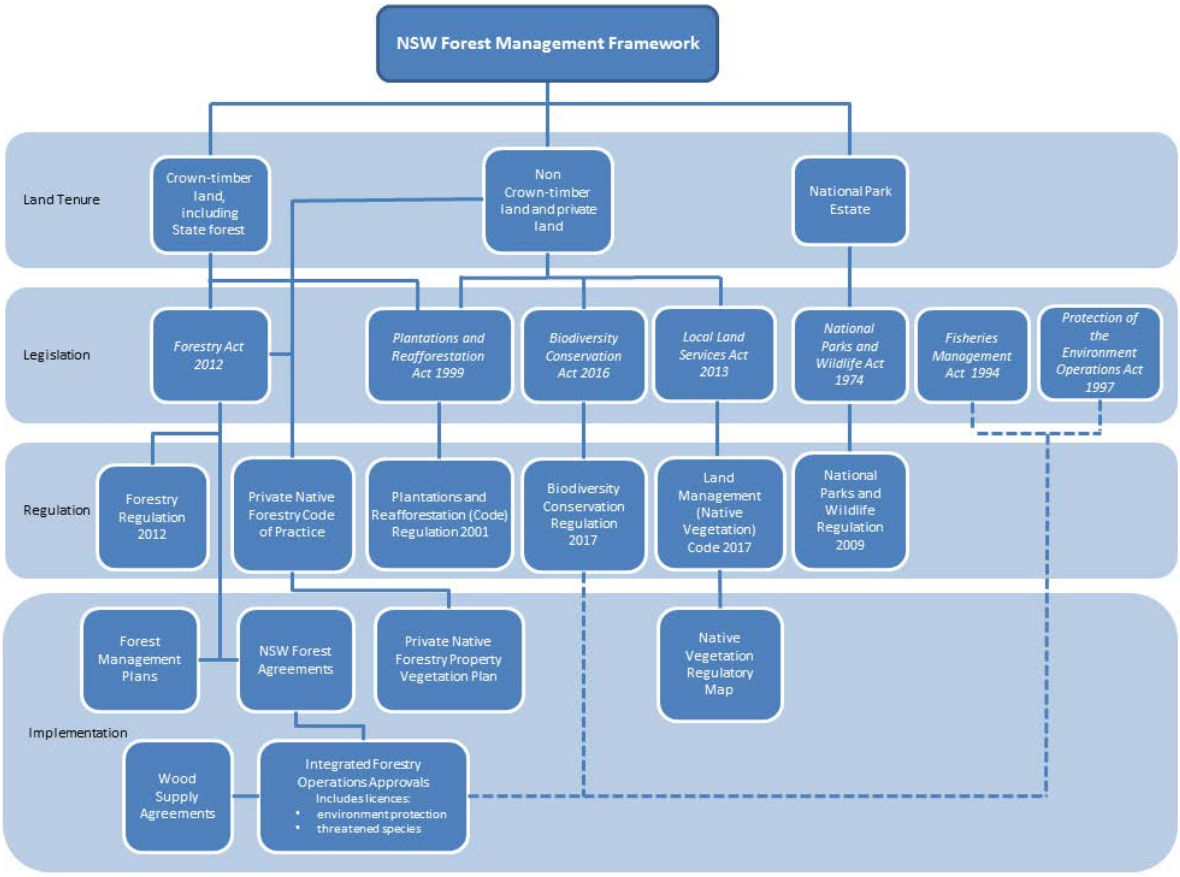

Figure 3.1 Forest management framework

Agencies involved in forest management in NSW

Several NSW Government agencies are involved in aspects of public and private forest management.

Office of Environment and Heritage

OEH, through the NPWS, is responsible for managing the NPWS estate, including the forests which lie within it. It advises the NSW Minister for the Environment and administers programs to protect vulnerable species and communities.

The NPWS manages about eight per cent of the total land area of NSW, or seven million hectares of NPWS estate. This includes 870 reserves which are comprised of forest and non-forest areas. The operational management of these reserves includes; fire and incident management; pest and weed management; Aboriginal and historic heritage; threatened species and communities; soils and water; infrastructure and asset maintenance; and visitor services. In 2016/17, the NPWS total expenses, excluding losses, was $513 million.

The NPW Act is the key statute for management of the NPWS estate in NSW. The NPW Act sets out the framework for managing the broad range of protected areas in NSW, including forest ecosystems. The objects of the NPW Act are the conservation of nature, the conservation of objects, places and features of cultural value in the landscape, fostering public appreciation of nature and cultural heritage, and providing for the management of land preserved under the NPW Act.

Department of Primary Industries

DPI (Forestry) advises the NSW Minister for Lands and Forestry and the NSW Minister for Primary Industries on forestry policy, undertakes forest science research, and is responsible for the development and application of plantations policy and regulation.

DPI (Fisheries) advises the NSW Minister for Primary Industries on matters related to the FM Act including those related to threatened species licences, which form part of the IFOAs.

NSW Environment Protection Authority

EPA is the primary environmental regulator in NSW. It leads development of environment protection policy and statutory instruments administered by the Minister for the Environment, and implements priority research and compliance programs. It is an independent statutory body.

The NSW EPA is responsible for regulation and compliance of native forestry operations on both public (Crown) land and private land in NSW. EPA monitors the operations of FCNSW to ensure that native forest operations on public land are undertaken in accordance with the IFOAs and their licences. It also monitors compliance[69] of private landholders with the requirements of their PNF Private Vegetation Plans[70] and PNF Code.

NSW Local Land Services

NSW Local Land Services (LLS) are a regionally based NSW Government agency delivering services to:

- improve agricultural productivity
- control and regulate management of declared pests
- maintain market confidence in agricultural products
- manage and improve our natural resources.

LLS is governed by the LLS Chair and Board of Chairs, who are responsible for the performance of the organisation across NSW. Regionally, local Boards set the local strategic direction and are an important link to local communities.

Monitoring and compliance functions in relation to PNF are currently being transferred to LLS as part of NSW forestry legislative reform.

Independent Pricing and Regulatory Tribunal and Natural Resources Commission

The Premier may request advice on issues related to forest management from the Independent Pricing and Regulatory Tribunal (IPART) or the Natural Resources Commission (NRC).

IPART is an independent statutory authority which advises the NSW Government on issues relating to the level and structure of prices, industry structures and competition, particularly with regard to NSW Government services. The NSW Government may ask IPART to

[69] Monitoring and compliance is in the process of being transferred to NSW Local Land Services
[70] Private vegetation plans have now been replaced by private native forestry plans under the BC Act.

undertake investigations. IPART also undertakes a range of regulatory and licensing functions.

The NRC is an independent statutory authority. Section 12 of the *Natural Resources Commission Act 2003* (NSW) provides that the NRC is to provide the NSW Government with independent advice on natural resource management (NRM). For example while outside the RFA regions, in 2009, the Premier asked the NRC to recommend sustainable land use and water requirements in the Riverina river red gum (*Eucalyptus camaldulensis)* and south west cypress pine (*Callitris glaucophylla*) forests.

Forestry Corporation of NSW

FCNSW is a SOC established by the Forestry Act, with:

- principal objectives that include being a successful business and operating in compliance with the principles of ecologically sustainable development; and
- functions that include carrying out forestry operations on Crown-timber land; selling, supplying or processing timber; establishing and maintaining plantations; and managing forestry areas.

This allows forestry operations to be undertaken by an entity that has neither a regulatory role nor responsibility for policy development and implementation. As noted above, the EPA is responsible for forestry regulation management and DPI (Forestry) is responsible for forestry industry policy advice.

Table 3.28 Expenditure ($, 000) on forest management by FCNSW in NSW State forests

Activity	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Harvest Management Supervision and environmental compliance – native forests	6 157	6 009	6 219	5 164	5 561	5 454	5 184	5 750	6 580	7 358	5 458	5 902	6 378
Harvest management Harvest planning and pre-harvest surveys	N/A	N/A	N/A	N/A	3 997	4 755	5 022	5 729	5 471	5 275	4 469	5 049	5 635
Other forest management activities Firefighting and fire prevention – wildfire	2 200	1 400	3 050	1 800	1 000	2 400	100	300	1 800	N/A	N/A	N/A	N/A
Other forest management activities Hazard reduction burning	6 700	6 800	8 180	9 800	9 600	8 300	5 700	6 200	8 200	N/A	N/A	N/A	N/A
Other forest management activities Weed management	669	963	779	597	899	1 125	1 019	1 506	1 421	1 014	1 114	1 125	981
Other forest management activities	546	688	586	546	585	591	392	872	717	694	653	855	578

Activity	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Animal pest management													
Recreation and tourism Recreation and tourism	2 409	1 918	2 721	2 092	2 437	2 547	2 408	2 537	2 538	N/A	N/A	N/A	N/A
Training and employee development Training	1 920	2 920	2 260	2 200	1 800	1 850	2 680	1 890	1 390	N/A	N/A	N/A	N/A

Notes: N/A not available

Native forest management

FCNSW manages about 1.8 million hectares of native forest, which is comprised of more than 200 forest ecosystems. It also manages timber harvesting on other Crown-timber lands. FCNSW must abide by the conditions within the IFOA as a component of its forest management. An IFOA integrates the regulatory regimes for environmental planning and assessment, protection of the environment and threatened species conservation. The IFOAs integrate licensing under each of the POEO Act, the BC Act (or previously the TSC Act and the FM Act, allowing FCNSW to conduct forestry operations, provided they comply with terms of the IFOA. They also include non-licence conditions relating to forestry and logging operations, ongoing forest management, ancillary road construction and other activities.

The overall expenditure on harvest management and planning in **Table 3.24** has remained reasonably constant in recent years. There have been advances in the use of technology for harvesting operations, such as the introduction of electronic harvesting plans which are contained on suitable hardware within the cabin of the mechanical harvester.

Plantation forest management

Both softwood and hardwood plantations, are regulated under the PR Act.

Forest plantation management includes the establishment phase which involves planting, fertilising and weed control where required. Some plantations are grown on short rotations of 10-12 years for pulpwood production. This is the case with the majority of hardwood plantations. There are a proportion of hardwood plantations grown on long rotations of 25 to 35 years for high quality log products at clear fall age with poles and low quality logs produced as intermediate thinnings.

However, the majority of softwood plantations are grown on longer plantations of about 30-40 years. These longer rotation plantations can be thinned on up to three occasions prior to the final clear-fall. Once clear felled the plantation rotation cycle re-commences with the establishment phase.

As at 2015-16, the total area of forest plantation in NSW was 394,400 hectares, comprised of 87,100 hectares of hardwood plantations, 307,100 hectares of softwood plantations and just under 200 hectares of other plantations. As the largest forestry plantation manager in NSW, FCNSW manages 257,787 hectares of plantations, comprised of 223,405 hectares of softwood plantations and 34,382 hectares of hardwood plantations.

The establishment of new plantations by FCNSW has decreased significantly, with no new plantations established since 2012 as per Table 3.25. The last period of significant plantation establishment by FCNSW was in 2009-2010 which was the year of the collapse of the forestry managed investment scheme (MIS) in Australia.

Table 3.29 Area and cost of plantings in state-owned plantations managed by FCNSW

Activity	Age class (calendar year)										
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
New plantation established (hectares)	1,350	370	1,596	472	352	206	50	0	0	0	0
Re-established plantations (hectares)	6,799	6,129	9,223	12,088	10,694	9,355	8,232	7,862	9,417	8,215	7,985
Total established plantations (hectares)	8,149	6,499	10,819	12,560	11,046	9,561	8,282	7,862	9,417	8,215	7,985
Cost ($' million)	15.8	13.7	20.8	20.9	17.2	14.5	13.9	13.9	16.3	16.1	16.1

Indicator 6.2b Investment in research, development, extension and use of new and improved technologies

This indicator monitors the investment in, and adoption of, new or improved technologies in forest management and in forest-based industries. It also quantifies the level of research and development. Investment in research, development and new technologies can significantly underpin continual improvements to forest management practices.

Australian Bureau of Statistics (ABS) data shows that, between 2005–06 and 2008–09, total expenditure on research and development (R&D) reported by businesses in the forest and wood product sector declined from $164 million to $137 million (ABARES 2013) - this is a decline of $27 million (16%) from 2005-06. As only partial data on R&D expenditure are available from the ABS for 2009–10 and 2010–11, it could not be reported. Forest-sector business R&D expenditure declined as a proportion of total business R&D expenditure from 1.6% in 2005–06 to 0.8% in 2008–09.

From 2005–06 to 2010–11, the ABS reported that business R&D expenditure increased from $15.6 million to $33.2 million in the forestry and logging subsector, but decreased from $76.3 million to $62.4 million in the wood product manufacturing subsector. Business R&D expenditure in the pulp, paper and converted paper product manufacturing subsector declined from $72.2 million in 2005–06 to $53.8 million in 2008–09 (ABARES 2013) with no figures available for 2009–10 and 2010–11. Adjusted for inflation, expenditure on forestry and forest products R&D declined by 13.4% between 1981–82 and 2007–08.

Table 3.30 Business R&D expenditure in the forest and wood products sector, and proportion of total business R&D expenditure, 2005-06 to 2010-11

Parameter	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Forestry and logging ($ million)	15.6	20.1	22.0	26.0	37.6	33.2
Wood product manufacturing ($ million)	76.3	55.2	51.3	57.1	57.5	62.4
Pulp, paper and converted paper product manufacturing ($ million)	72.2	70.7	71.1	53.8	—	—
Total research expenditure in forestry ($ million)	164	146	144	137	—	—
Total business expenditure in Australia ($ million)	10,434	12,639	15,047	17,264	16,685	17,880
Proportion of expenditure that is forestry expenditure (%)	1.6	1.2	1.0	0.8	—	—

— = not available

Note: Totals may not tally due to rounding.

Source: ABARES SOFR 2013

Chronology of NSW RFA related R&D priority settings

A significant amount of forest ecology research was undertaken prior to the signing of the NSW RFAs as part of the CRA process, covering specific forest flora, fauna and impacts on forest ecology such as fire and climate change.

The initial CRA process (1999) identified that the major priority of future research in NSW would be an understanding of the environmental impacts forest management practices and the development of appropriate mechanisms to monitor and continually improve their sustainability.

Since then, the refocusing and development of research priorities has been an ongoing process and continues to be a feature of forest R&D activity. In the initial five year period since the signing of the RFAs, a number of priority themes for future forest management research in NSW were identified. These themes included:

- Silviculture
- Flora and fauna conservation
- Fire ecology
- Stem defect and wood quality in regrowth forests
- Climate change
- Biological inventory
- Value added end use
- Sustainability indicators
- Aboriginal and non-aboriginal heritage.

State-wide research has continued along these themes. After the formation of the DPI in July 2004, the then Forests NSW (now FCNSW) was established and retained two of five original programs (Tree Breeding and Silviculture), while three programs (Forest Health, Forest Ecology and New Forests) were transferred to the Resources Research Branch, NSW DPI Science & Research which was to later to become the Forest Resources Research Unit.

From 2004-2009, the forest research sub-program delivered by the Forest Resources Research Unit included three themes which together covered research activities in forest ecology and sustainability, forest resource assessment and security, and forest carbon, bioenergy and biofuels. During 2009-2014, Forests NSW was dissolved and FCNSW was established as a SOC on 1 January 2013. Beyond this period, current R&D themes are developed by interactions with industry, funding bodies and government priorities. Research priorities for NSW and the changing R&D environment has been reported annually through the progress reports on the implementation of NSW FAs and IFOAs. In addition, FCNSW published an annual report on its forest research activities, which includes a compilation of all publications and conference papers by FCNSW staff published throughout the year.

Major collaborative programs for R&D matured or emerged from 2004 to 2014. These included the Cooperative Research Centre (CRC) for Forestry and the National Primary Industries Research, Development and Extension (RD&E) framework. These initiatives developed sector strategies for R&D for the forest and wood products sector but limited progress was made due to constraints on resources.

Forest and Wood Products Australia (FWPA) was established in 2007 as an industry owned company, replacing the Forest and Wood Products Research and Development Corporation. FWPA promotes joint R&D projects, which continue to be a feature of R&D activity. The

forest and wood products forum in 2014–15 initiated a process of strategy development designed to ensure that RD&E meets the future needs of the forest and wood products sector and the Australian public. NSW was a core partner in the development of many of these strategies. They were compiled on the basis of extensive stakeholder consultation with representatives of the forest and wood products sector, government, and the providers and funders of forest and wood product R&D. Industry levies are matched by a Commonwealth contribution and are allocated by FWPA to R&D priorities for industry development.

In addition to these developments, the CRC for Forestry began operating in late 2005, following the conclusion of operations of the CRC for Sustainable Production Forestry (1997–2005).

Resource allocation for conservation forest science research priorities is generally funded by state-based agencies with specific and targeted interests

Summary and future management of economic values

A key goal of sustainable forest management is to maintain the productive capacity of native and plantation forests. To fully consider the economic values relating to forests, both quantitative resource volume and value metrics are required. Together, these illuminate the complex interactions affecting environmentally and economically sustainable forest management.

Over the period of the NSW RFAS there has been significant change in the structure of the production forest estate and its management.

The area available for harvesting within NSW in 1995-96 (before the RFAs were entered into) was 2,352,000 hectares. This reduced dramatically following the signing of the three RFAs between 1999 and 2001, to 1,516,000 hectares in 2000-01 – a reduction of 836,000 hectares.

In 2004-05, the annual area of native forest harvested was 42,923 hectares and this area did increase slightly in the next two years and reached a peak in reporting period of 45,945 hectares in 2006-07. The area harvested began a gradual decline post 2006-07 and has remained fairly constant, at less than 20,000 hectares since 2013-14.

In 2016-17, the state-wide, public native forest area harvestable in NSW was 996,973 hectares and the area harvested was 17,482 hectares or less than two per cent. There has been a consistent state-wide downward trend in the area harvested of NSW public managed forests. This is consistent with the NSW RFA regions, in the period 2002-2016. The total area harvested in the NSW RFA regions was 21,669 hectares in 2002 and has reduced to 16,350 hectares in 2016, resulting both from additional reservation and adaptive management taking additional areas out of production.

This reduction is commensurate with an increase in the area of nature conservation reserves as a result of tenure changes agreed in the NSW RFAs which impacted on available wood yields. The removal of significant areas of production forests has not diminished the responsibility of the governments to ensure that the productive capacity of remaining production forests, and certainty of resource access, is maintained.

Nevertheless, reduced areas required to supply wood yields have resulted in lower wood supply commitments. However, NSW research completed in 2017 found that about

2.9 million hectares of the North Coast region's forests are in private ownership. The research found that a large portion of the properties surveyed could be actively managed for sustainable wood production.

In addition, plantations are also able to support economic development objectives of the RFAs. At the time of the NSW CRAs, there was 234,600 hectares of softwood plantation (primarily radiata pine), and 25,540 hectares of hardwood plantation (primarily Eucalypt species) growing in the NSW RFA regions. The plantation area in NSW in 2016-17 was 394,000 hectares, of which 307,000 hectares were softwoods and 87,000 hectares were hardwoods (Downham and Gavran 2017). Between July 2004 and June 2014, nearly 50,000 hectares of softwood plantation and 63,000 hectares of hardwood plantation were established, though only modest increases have since been made.

The Australian and NSW governments have committed to harvesting at or below sustainable yield of the available production estate over the period of the NSW RFAs. The periodic analysis and independent review of sustainable yield from public forests, undertaken in accordance with commitments under the NSW RFAs, confirms that harvesting from public land has remained at or below the sustainable yield of public forests managed for wood production. Actual harvest levels in the NSW RFA regions has been consistently about the same or slightly below wood supply commitments to industry each year, and well below the calculated sustainable yield.

The decline in the total harvest of logs from the hardwood estate also reflects the structural changes in the industry and the lack of markets for pulp grade logs following the global financial crisis, collapse of the north coast pulp log market, the finite plantation resource with age class distribution affecting availability of logs on an annual basis, and various restrictions impacting on native forest yields. Sawn timber or other sawn or processed products from NSW forests support economic activity which results in wood products being used in a variety of applications including furniture, housing construction, flooring, weatherboards, railway sleepers, bridge girders, wharf piles, electricity and telephone poles, fence posts; props for underground mining and pulpwood for paper and building boards[71].

Over the 1999-2000 to 2015-16 period, the gross value of production for NSW forests saw a steady increase from around $200 million to more than $400 million by the end of the period. Overall, the industry has increased in value by 63 per cent from 1999-2000 to 2015-16. The hardwood native forest sector however, has declined from over $140 million to just over $100 million with reduced areas available, the cut moving from multi-aged forests to regrowth forests, and a diminishing log size and changing species mix.

Throughout the NSW RFAs period, publicly-owned production forests in the RFA regions have remained available for multiple-uses. Non-wood related forest products continue to be sourced from NSW's forests. The monitoring of productive capacity, particularly in relation to the collection of non-wood products remains difficult. Available evidence indicates that all monitored removals of non-wood products remain within environmental limits based on species populations and dispersal.

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[71] NSW Department of Primary Industry (DPI) 2008. Primefacts 687, Forests and Forestry in NSW. Accessed on 16 May 2018 at www.forestrycorporation.com.au/__data/assets/pdf_file/0010/420859/Forests-and-forestry-in-NSW.pdf

A significant non-wood forest product derived from the nature conservation estate is honey. Apiarists use around 916 sites in the three RFA regions. It is estimated that three per cent of NSW's nature conservation estate is accessed by bees from these apiary sites in any one year with around 25 sites in the Eden RFA region, 548 sites in the North East RFA regions and 343 sites in the Southern RFA region.

Forests in the RFA regions are also becoming increasingly important elements of the visitor and tourism economy. As areas are transferred from wood production tenures to the reserve estate, the economic contribution shifts somewhat from predominantly direct wood sales and wood products processing value chains, to other sectors such as tourism and the visitor economy. It is important to note however that the economic contribution of production forests, while dominated by wood production, may also be based on a range of activities including apiary, tourism, and other aspects of the visitor economy.

Expenditure in forest management and investment in new operations is ongoing, with responsibility for forest management dispersed between NSW public and private land owners and managers. Market conditions generally drive investment in the sector and this has been strongly influenced by, in the case of private land owners, owner intent.

Improved forest management and harvesting strategies will be implemented in the renewed NSW RFAs as a result of ongoing investment in research and development. From 2005-06 to 2010-11 private investment in forestry industry research and development increased from $15.6 million to $33.2 million. A proportion of this will have been matched and leveraged with government co-contributions. In June 2018, the NSW Government announced a $9.2 million investment in world class mapping and monitoring to underpin a sustainable forestry industry.

The renewed NSW RFAs will cover the period in which new, innovative wood products and technologies will develop. Through R&D investments, the renewed NSW RFAs will aim to support an internationally competitive wood production and wood products industry into the future.

The renewed NSW RFAs intend to support the NSW forest industry so that it has a strong and sustainable future and to provide additional certainty to industry and the community into the future. The updated documents seek to maintain a stable regulatory and investment environment, which will assist in providing for socio-economic stability and opportunities for additional competition, productivity increase and market growth.

The renewed NSW RFAs will continue to support ongoing access by the forest industry to public native forests and plantations for wood production. Further, the renewed RFAs will continue to require periodic review of the sustainable yield of high quality sawlogs to reflect changes in forest inventory and management initiatives. The renewed NSW RFAs will also continue to ensure NSW's RFA forests remain accessible for a range of recreational and tourism related pursuits, as well as other uses such as apiary and the harvesting of non-wood forest products. This demonstrates that the renewed 20 year RFAs with five year rolling extensions will maintain and enhance economic values.

Future RFA five-yearly reviews will be focussed on outcomes and the objectives of the NSW RFAs. Monitoring and reporting arrangements will also be strengthened and streamlined, and where possible indicate the impact of management prescriptions.

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4. Social Values

Indicators in this section illustrate the extent to which NSW forests contribute to local and state economies, benefit personal and community wellbeing, and support cultural values. Socio-economic data are important measures of the monetary and non-monetary value and benefits of forests to society. In addition, local communities, especially Indigenous communities, have strong social, spiritual and cultural attachments to forests, whether for traditional needs, provision of wood and non-wood forest products and other benefits, direct and indirect employment, or active and passive recreation.

Social values include:

- Production and consumption
- Investment
- Tourism and recreation
- Cultural, spiritual and social values
- Employment, worker welfare, and community resilience.

This section includes analysis of the following Montréal Process indicators:

- Indicator 6.3.a – Area of forest available for general recreation/tourism
- Indicator 6.3.b – Range and use of recreational/tourism activities available
- Indicator 6.4.b – Registered places of non-indigenous cultural values in forests that are formally managed to protect those values
- Indicator 6.4.d – The importance of forests to people
- Indicator 6.5.a – Direct and indirect employment in the forest sector
- Indicator 6.5.b – Wage rates and injury rates within the forest sector
- Indicator 6.5.c – Resilience of forest dependent communities to changing social and economic conditions

Indicator 6.3a Area of forest available for public recreation and tourism

This indicator measures the area of forest available for use by the community for recreation and tourism purposes. This provides an indication of the emphasis placed by society on the management of forest for recreation and tourism.

Analysing the area and proportion of forests available for recreation and tourism assists in understanding the emphasis placed by society on managing forests for recreation and tourism uses, and the extent to which forest management is providing for the recreational needs of local and regional communities. An area of forest is considered to be available for recreation and tourism if there is no formal prohibition on access for recreation and tourism activities.

During the initial CRAs for NSW RFA regions, recreational and tourism values of public native forests were considered on a regional scale. Since then, the proportion of public forest available for recreation and tourism has been broadly reported on a state-wide basis.

As reported in the first five-yearly *Draft Report on Progress with Implementation of the New South Wales Regional Forest Agreements (RFAs) (2009)*, the overwhelming majority of both multiple-use public forest and nature conservation reserves in NSW were available for recreation and tourism at the time of the first five-yearly independent review. 96 per cent of the State forest estate was considered available for forest-related recreational activities, with visitation rates high across the four NSW RFA regions.

SOFR 2013 stated 99% (2,002,000 hectares) of multiple-use public forest and 88% (4,911,000 hectares) of nature conservation reserves were available for recreation and tourism. In 2018, 7 million hectares of other public land are considered available for recreation across NSW (Waller, 2018). Virtually all State forest is open for recreational use, and the vast majority of land reserved under the NPW Act allows for recreation and tourism activities (NSW and Australian Governments, 2017).

FCNSW has generally increased the area of State forest managed specifically for, or with an emphasis on recreation and visual aesthetics over the reporting period in line with multiple-use objectives (Table 4.1.).

Whilst access to areas of certain public forest is restricted at times due to harvesting operations, fires, natural hazards or disease (DAFF, 2008). There is a lack of data relating to area of private forests available for recreation and tourism.

Overall, during the period of the NSW RFAs, there has been an increase in total forest area available for recreation and tourism across NSW public forests, with the vast majority of both the nature conservation reserves and multiple-use public forests now accessible for recreation and tourism activities.

Table 4.1 State forest managed by FCNSW for recreation and visual aesthetics (hectares)

Year ended 30 June	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Area zoned primarily for recreation	4,754	2,406	2,329	2,002	2,017	3,147	4,323	4,490	4,749	6,164	6,090	4,741	4,696	4,744	4,799	4,789
Area zoned primarily for visual aesthetics	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	31,109	40,233	39,957	40,187	40,900	40,187
Expenditure ($ '000)	n.d.	2,085	1,681	1,688	2,121	1,918	2,409	2,721	2,092	2,437	2,547	2,408	n.r.	n.r.	n.r.	n.r

Notes: n.r. = not reported

n.d. = no data

Indicator 6.3b Range and use of recreation/ tourism activities available

This indicator assesses the range and number of recreation and tourism facilities provided in forests, their level of use and their contribution to the broader tourism sector. Appropriate and well managed facilities help to optimise visitor satisfaction as well as minimising environmental impacts associated with recreation and tourism.

A range of recreation and tourism activities and facilities may be made available in public forests, and the frequency of their use may vary widely. Activities may be provided for at a specific location or localities, such as campgrounds or self-guided forest drives, or be generally allowed without being related to a specific site, including scenic touring and swimming. Likewise, facilities may be provided to directly meet the needs of tourists and visitors (i.e. picnic facilities, toilets, BBQs, walking and riding tracks), or indirectly support recreational uses alongside other management value (i.e. roads).

During the initial social and economic reports for the CRAs of NSW RFA regions, stakeholders expressed a growing interest in tourism and recreation activities in forests in the Eden, North East and Southern RFAs. In the Southern RFA region, bushwalking was seen as a high importance activity in both State forests and national parks, alongside camping and educational activities (JCRFASC, 2000). Off-road recreation and hunting showed comparatively low community support across forest tenures, with a similar sentiment expressed in the Eden RFA region (Gillespie Economics, 1997). Here, it was found that people were attracted to the 'quiet and restful atmosphere' of national parks. Noisy activities such as off-road vehicle use and trail biking were seen as incompatible with this atmosphere, even in State forests (Gillespie Economics, 1997). Ecotourism was, however, seen as a growing use of the forested estate, and this was echoed in the North East RFA region, and it was noted that the progress of such activities in RFA regions would be dependent on the development of appropriate facilities into the future (NSW PWS, 1998).

During the initial CRAs, both State forest and national Parks were found to provide a range of recreation opportunities such as bushwalks, camping, picnicking, swimming, four wheel driving, horse riding, mountain bike riding, mushrooming, fossicking, authorised hunting, and fishing. These uses continue today, though activities such as hunting and fossicking permitted only in certain land tenures. It is interesting to note that while off road vehicle use, trail bikes and use of generators were seen as incompatible with the 'peace and quiet' being sought in national parks and State forests in the Eden CRA (Gillespie Economics, 1997), they continue to bring large numbers of visitors to the public forest estate. Community consultation for renewal of the NSW RFAs has revealed further alternative uses of forests in the state. There was significant interest in using forests for ecotourism in areas including Lismore and Bateman's Bay. This would, however, also limit the range of recreational activities able to be undertaken in such areas, as the conservation estate allows different activities compared to State forests.

Most activities have seen increases over time, particularly bushwalking. Available facilities have varied across years in State forest and national parks (Table 4.3). This variation is also evident on spatial scales; while some areas may contain simple unpaved walking tracks in remote locations, others offer suspended walkways and visitor centres, reflective of the

numbers and types of visitors generally associated with proximity to major population centres.

There has been significant investment in, and recognition of, a number of tourism ventures across NSW forests. Several national parks have won tourism awards, including Cape Byron State Conservation Area (SCA) (Tourist Attractions, Gold Award, 2012), and Arakwal Dolphin Dreaming, (Cape Byron SCA, Indigenous Tourism, Silver Award, 2014).

Similarly, State forests have been recognised for their tourism initiatives. Strickland State Forest has become a well-recognised and award-winning ecotourism destination in the LNE RFA region (NSW and Australian Governments, 2017). The 'Friends of Strickland' initiative has allowed a group of volunteers to care for the protected flora, fauna and heritage values of the forest, increasing community engagement with the work of FCNSW. Similarly, the newly created Gumgali Track, the first Aboriginal interpretive walk in a State forest, has allowed partnerships to form between Coffs Harbour and District LALC, Coffs Elders Group, FCNSW and the general public in the Coffs Harbour area of UNE RFA region (FCNSW, 2017). Old Bottlebutt, the largest Red Bloodwood (*Corymbia gummifera*) tree in Australia found in the Burrawan State Forest near Wauchope, has similarly shown the success of tourism projects in NSW State forest. The Old Bottlebutt Walking Track run by FCNSW was awarded the gold winner for best new tourism development at the 2014 NSW Tourism Awards and the 2014 North Coast Tourism Awards, and has increased community understanding of the natural values managed in State forestry operations.

The total number of permits issued by then Forests NSW showed no consistent trend from 2004-2012, varying between approximately 300 to 550, a variance largely attributable to changes to public liability insurance and increasing premiums for 'high risk' activities (NSW and Australian Governments, 2009). Permits were issued for activities including car rallies and club sporting events, with the greatest number of permits issued for fossicking in State forests (**Table 4.5**).

Despite this, visitation to tourist destinations in NSW public forests has generally increased over time, largely centred on the nature conservation reserve estate. The associated range of uses for forest areas remains varied, with increases in certain activities originally considered inappropriate or inapplicable (i.e. off-road driving) suggesting further unexpected uses may become of interest into the future.

Table 4.2 Facilities provided by Forestry Corporation of NSW at designated recreation sites

Year ended 30 June	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Camping area	266	115	160	87	86	79	78	61	57	74	93	45	49	48	48	48	48
Caravan site	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	29	16	16	19	19	19	19	19
Fireplace/bbq	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	92	84	61	59	59	61	57	n.r.
Picnic area	119	87	64	63	53	50	60	63	63	67	103	65	67	67	69	65	n.r.
Rubbish collection	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	76	48	32	27	27	30	26	n.r.
Toilets	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	60	62	58	60	60	61	58	n.r.
Water (not for drinking)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	39	87	40	n/r	40	40	41	n.r.
Wheelchair accessible toilets	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	12	11	8	6	7	6	6	n.r.

Source: Sustainability Supplements to the Annual Report.

Notes: Data are for all forests managed by FCNSW;

n.r. = not reported.

n.d. = other metrics were measured for these years

Table 4.3 Facilities provided by NPWS at designated recreation sites?

Year ended 30 June	2012	2016
Camping sites	485	524
Picnic area	851	857

Source: Office of Environment and Heritage, New South Wales

Table 4.4 Use of nature conservation reserves for recreation and tourism activities on land managed by NPWS, 2011–12 and 2015–16

Activity	Number of visitors (thousands)	
	2011–12	2015–16
Riding or walking animals	n.d.	500
Cycling	1,400	1,900
Driving (includes motorbikes)	700	1,400
Walking or running	17,300	23,500
Climbing, caving and canyoning	1,000	1,000
Enjoyment and appreciation of nature	1,000	1,400
Camping (includes roofed accommodation)	1,700	2,900
Picnicking and playing	6,200	6,700
Snow activities	700	1,000
Water-based recreation	6,200	9,600

n.d. = no data reported due to inadequate sample size.
Source: NPWS, Office of Environment and Heritage; derived from commissioned market research and park visitation data; data are for all nature conservation reserves managed by the NPWS and therefore include use of non-forested areas.

Table 4.5 Number of permits issued by Forests NSW for organised recreational activities in NSW State forests

Activity	1999-2000	2000-01	2001-02	2002-03	2003-04	2004–05	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Bow hunting/ archery	20	14	1	2	-	2	-	2	2	3	2	10	4
Bushwalking	8	21	2	6	6	16	14	8	6	5	8	7	4
Car and bike rallies/ events	42	39	36	32	33	43	44	49	54	32	40	48	17
Ecotourism/ four-wheel drive	87	50	41	41	25	33	12	21	5	21	7	14	8
Education/ outdoor education	272	575	20	31	32	33	27	49	46	27	11	9	7
Fossicking[1]	n.r	n.r	n.r	n.r	n.r	n.r	n.r.	44	22	116	152	320	275
Horse, trail and endurance	32	45	32	22	30	31	23	29	25	24	24	28	9
Mountain bike rallies	5	20	17	17	14	31	16	35	46	51	38	42	22
Orienteering/ mountain runs	34	21	16	9	24	21	14	22	29	22	26	24	9
Training/ exercises	84	79	68	52	35	45	43	29	17	35	34	56	17
Other	29	28	55	79	76	62	55	125	288	181	126	10	34
Total	613	892	283	291	275	317	248	413	540	517	468	568	406

Source: FCNSW SEEing reports, annual reports (Part 1) and sustainability supplements to annual reports

Table notes: Number of permits issued is not reported in annual reports after 2011–12, i.e. 2012–13 and 2013–14.
n.r. – not reported in the source document
(1) The number of fossicking permits has increased over time, partly because permits are now issued to individuals rather than groups; the actual number of participants may not have increased.

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Indicator 6.4d The importance of forests to people

This indicator measures the range of attitudinal values that communities and individuals place on their forests. The importance of forests to society is exemplified through the value that people place on biodiversity, clean air and water, social equity or simply the knowledge that Australia's forests exist.

Management of New South Wales' forest estate provides a range of benefits to society, based on the environmental, social and economic values within the forest estate. The current management approach reflects changes in community priorities and values over time, including a greater emphasis on conservation, while also developing a robust forest practices system to ensure sustainable supply of woodland non-wood forest products.

Forests are valued in the community for a range of attributes, from a source of inputs to processing facilities income and job security to broader values encompassing renewable resources, biodiversity, climate change mitigation, clean air and water.

This was acknowledged in the first five-yearly NSW RFA independent review report, where the Independent Assessor highlighted "*the importance of both forestry activities and forest related recreational and cultural considerations in the fabric of the NSW community, especially but not limited to, non-metropolitan NSW*"[7273].

Forests also hold important spiritual, cultural, historic, scientific and social values for Aboriginal communities throughout NSW[74].

In the wider Australian community, more than 40% of the respondents to an Australia-wide series of surveys agreed with a survey statement that Australia's native forests were being managed sustainably[75]. The proportion of respondents who agreed that 'we should not be cutting down any trees for wood products' decreased between 2009 and 2012, and the proportion of respondents who agreed that 'we should use more wood because it is more environmentally friendly than alternative materials' increased.

The level of understanding about the role of forests in carbon storage is high and increasing. In 2012, more than 90% of respondents to the same series of Australia-wide surveys agreed that trees absorb carbon dioxide, and 71% (up from 52% in 2008) agreed that 'carbon is stored in wood, even after the tree is harvested'.

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[72] Spencer 2009, Final Report on Progress with Implementation of NSW Regional Forest Agreements: Report of Independent Assessor November 2009. Available from www.agriculture.gov.au/forestry/policies/rfa/publications/annual-reports/nsw

[73] Spencer, S 2009, Final Report on Progress with Implementation of NSW Regional Forest Agreements: Report of Independent Assessor November 2009, available from www.agriculture.gov.au/forestry/policies/rfa/publications/annual-reports/nsw

[74] Forestry Corporation NSW, 2017, Aboriginal Partnerships. , available from http://www.forestrycorporation.com.au/management/aboriginal-partnerships (accessed on 14 May 2018)

[75] ABARES, 2013, *Australia's State of the Forest Report 2013*, available from www.agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2013 (accessed on 9 November 2016)

About 80% of respondents to a survey in south and central rural NSW indicated that they would consider planting trees for carbon sequestration, and nearly 70% indicated that being paid for carbon sequestration would increase the likelihood that they would plant trees for purposes such as reducing land degradation and providing shelter for stock.

Studies on Social attitudes to forests

As part of the NSW CRAs, peoples' attitudes to environmental issues and forests were surveyed. These included broad surveys across the state of NSW as well as region-specific surveys in the Eden, Southern, UNE and LNE RFA regions.

In all four region-specific CRA social attitudes studies, the environmental issues of primary concern to survey respondents were pollution and forest related issues[76]as identified in the Joint NSW/Commonwealth CRA/RFA Steering Committee, 1999a[77] and 1999b[78]; and the Joint Commonwealth NSW RFA Steering Committee, 2000[79]).

Respondents to the NSW CRA surveys indicated the main reason they valued forests was for aesthetics; the beauty, space and natural experiences forests provide. The next most popular reason was the conservation of forest ecosystems; valuing the knowledge that they exist and are able to survive. The third most popular in all the regions was spiritual; with respondents valuing forests for the way they make them feel. The fourth most popular reason differed across the regions. In the Eden and Southern RFA regions, it was economic; valuing forests for its provision of income and employment. In the North East RFA region, it was intergenerational equity; valuing forests as they can be enjoyed and used by future generations.

Across all the studies it was found that "*forests have a very strong symbolic environmental value that people want to preserve*" but whether they were willing to trade off other sustainability outcomes for this varied in the NSW RFA regions.

In the Eden and Southern RFA regions: *"the general trend was that unemployment was a high priority as a macro-scale issue but the distinctions became less clear at a micro-scale or when put in a forest context. Forests have strong symbolic environmental values that people want to*

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[76] DPIE, 1998. Social Values of Forests Eden CRA region; a report undertaken for the NSW CRA/RFA Steering Committee. Accessed on 14 May 2018 at www.agriculture.gov.au/SiteCollectionDocuments/rfa/regions/nsw-eden/social-economic/nsw_ed_ne02es_1.pdf

[77] Joint NSW/Commonwealth CRA/RFA Steering Committee, 1999a. Social Assessment NSW Upper North East CRA Regions. Accessed on 14 May 2018 at www.agriculture.gov.au/SiteCollectionDocuments/rfa/regions/nsw-north-east/social-economic/social-assessment/lower-ne-nsw/social-assessment-report-lne.pdf

[78] Joint NSW/Commonwealth CRA/RFA Steering Committee, 1999b. Social Assessment NSW Upper North East CRA Regions. Accessed on 14 May 2018 at www.agriculture.gov.au/SiteCollectionDocuments/rfa/regions/nsw-north-east/social-economic/social-assessment/upper-ne-nsw/social-assessment-report-une.pdf

[79] Joint Commonwealth NSW Regional Forest Agreement Steering Committee, 2000. Social Assessment Report Southern Region New South Wales. Accessed on 14 May 2018 at www.agriculture.gov.au/SiteCollectionDocuments/rfa/regions/nsw-southern/social-economic/nsw_sthn_sar.pdf

preserve. The only time the majority of the sample considered it justified to conciliate these environmental values was when the social structures and services of small local communities became jeopardised."

In the UNE and LNE RFA regions, the respondents valued environmental objectives at a macro-scale more highly than economic objectives such as employment. This was also reflected in the prioritisation of environmental values at the micro-scale in the forest context. In these regions the respondents wanted to preserve the symbolic environmental values of forests even if it is seen to cause economic and social difficulties.

In all of the RFA regions, the majority of respondents valued the conservation and the preservation of animal and plant species over economic objectives such as jobs and forestry products.

The majority of respondents in all NSW RFA regions, however, disagreed with the statement 'environmental protection cannot co-exist with forestry industries' meaning the majority of those surveyed felt that environmental protection can co-exist with forestry industries.

Public consultation

Public comments, as part of the combined independent second and third five-yearly review of the NSW RFAs, were sought on the progress with implementation of the NSW RFAs between 18 December 2017 and 23 February 2018. In total, 5245 submissions were received from individuals and organisations, including form submissions.

In addition, the NSW and Australian Governments sought the views of all stakeholders on further improvements to the sustainable management of NSW native forests and the renewal of NSW RFAs. Consultation included a public submissions process from 24 January until 12 March, as well as a series of stakeholder meetings and community drop in sessions across the state throughout February 2018. These meetings and drop in sessions were independently facilitated, and conducted in Lismore, Coffs Harbour, Bulahdelah, Eden, Batemans Bay and Tumut, as well as stakeholder meetings in Sydney. In total, over 3200 submissions were received and approximately 255 people attended the stakeholder meetings and drop-in centres.

Indicator 6.5a Direct and indirect employment in the forest sector

This indicator measures the level of direct and indirect employment in the forest sector. Employment is an important measure of the contribution of forests to viable communities and the national economy.

Direct employment

Direct employment in the forest sector is split into two categories; forestry and wood products industry and, non-wood forests products and services. The ABS generates employment statistics for the first category only.

The forestry and wood products industry

Over 17,500 people are directly employed in the New South Wales forestry and wood products industry (ABS 2016 Census). Employment in the industry comprises a diverse range of job types with 23 distinct employment fields recognised by the ABS. For reporting purposes, these employment fields are grouped into five employment categories:

- Forestry and Logging
- Forestry Support Services
- Wood Product Manufacturing
- Pulp and Paper Product Manufacturing
- Timber Wholesaling.

Employment in this industry is widely distributed with jobs in 83% (n=108) of all NSW LGAs (n=132). Dependence on the industry for jobs is much greater in regional areas than it is in metropolitan areas with 19 of the top 20 most forestry and wood products industry dependent LGAs located within regional NSW (**Figure 4.1**).

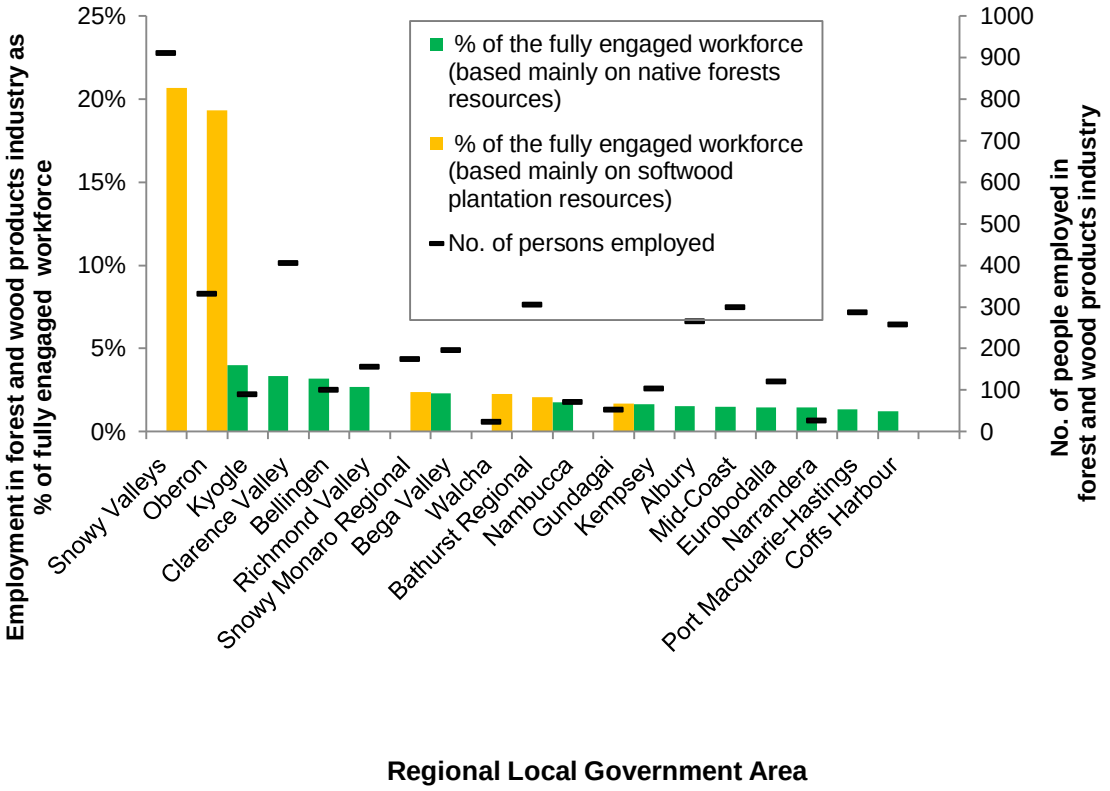

Figure 4.1 Direct employment in the forest and wood products industry in dependent regional local government areas (data source: 2016 Census)

Over one third (35%) of the people employed in the industry reside in one of the three RFA regions (Eden, Southern and North East). Within the three NSW RFA regions, wood product manufacturing is the single largest employment category supporting over 3,500 jobs. Within this group the largest employment fields are 'log sawmilling', and 'wooden structural fitting & component manufacturing'.

Outside the NSW RFA regions, the greatest concentration of forestry and wood products jobs is on the Central Coast and in western Sydney. The LGAs with the highest number of jobs include Central Coast, Fairfield and Blacktown followed by Liverpool, Penrith, Canterbury-Bankstown and Campbelltown. The bulk of these jobs are in 'wooden structural fitting & component manufacturing'.

This assessment is principally concerned with employment that is based on native forests and hardwood plantations within the NSW RFA regions. Employment statistics collected by the ABS do not, however, differentiate between wood types and all three NSW RFA regions are known to include both hardwood and softwood timber industry jobs. Hardwood and softwood industry jobs can be differentiated to some degree using finer scale geographic boundaries. For example, within the Eden RFA region, the softwood sector is reasonably represented by the job statistics for the Snowy Monaro LGA while the native industry is best represented by Bega Valley LGA data. Similarly, in the Southern RFA region, the softwood industry is concentrated around Tumut which is within the Snowy Valleys LGA while the hardwood sector can be reasonably represented by data for Eurobodalla, Shoalhaven and Queanbeyan-Palerang Regional LGAs. In the North East RFA region, the softwood plantation sector is much smaller and mostly confined to the Walcha and Richmond Valley LGAs.

Unfortunately, both these LGAs also support hardwood industry jobs that prevent them from being extracted.

Changes in employment over the term of the NSW RFAs have been captured through the national five-yearly Census. Employment data for 2001 is not readily retrievable so trends are limited to the last 10 years (2006, 2011 and 2016).

In the Eden RFA region, employment in the native industry (represented by Bega Valley LGA) declined by 39% over the 10 year monitoring period (**Figure 4.2**). Job losses principally occurred in wood product manufacturing.

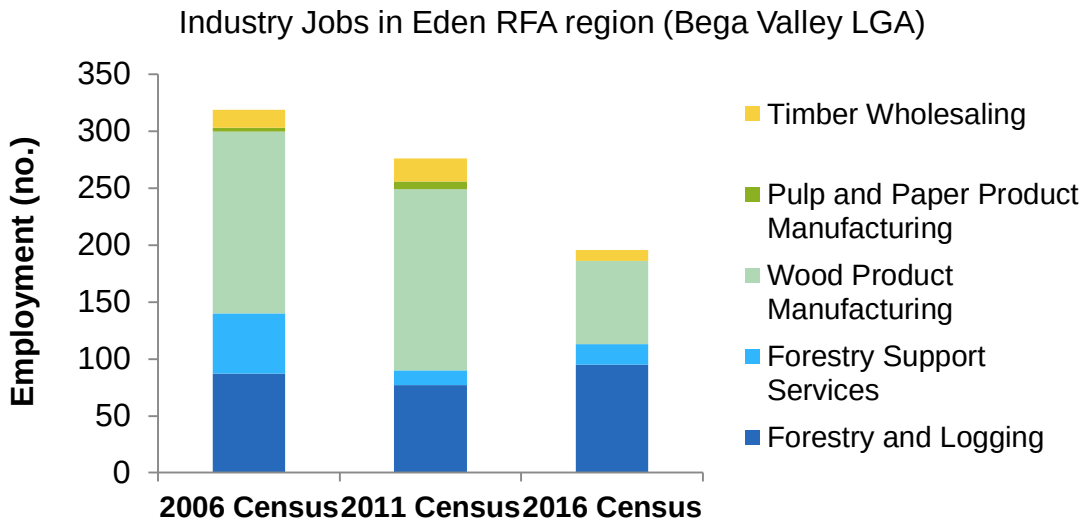

Figure 4.2 Direct employment in the forest and wood products industry in the Bega Valley LGA which covers the coastal native forests within the Eden RFA region

In the Southern RFA region, employment in the native forest industry (represented by Eurobodalla, Shoalhaven and Queanbeyan-Palerang Regional LGAs) also experienced a decline. Over the 10 year period, the decline in employment was 27% when pulp and paper product manufacturing jobs (which are not based on native forest wood) were excluded (**Figure 4.3**).

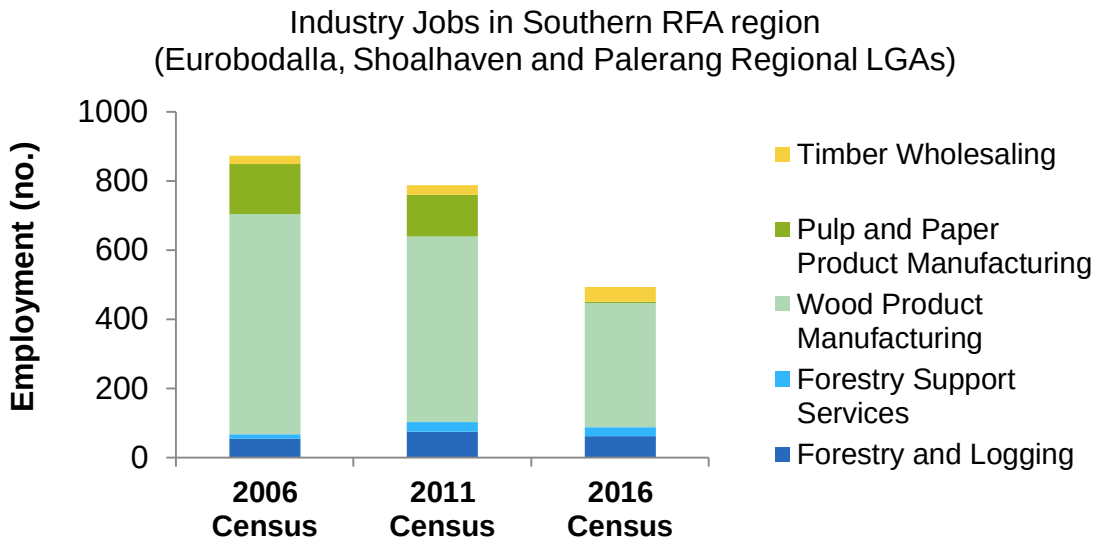

Figure 4.3 Direct employment in the forest and wood products industry in the Southern RFA region

Of the three NSW RFA regions, employment in the North East RFA region is the most significant with over 4,000 direct jobs. Industry employment in this region has fluctuated, peaking in the 2011 Census. Between 2006 and 2016, there has been an overall reduction in employment of 14% (**Figure 4.4**).

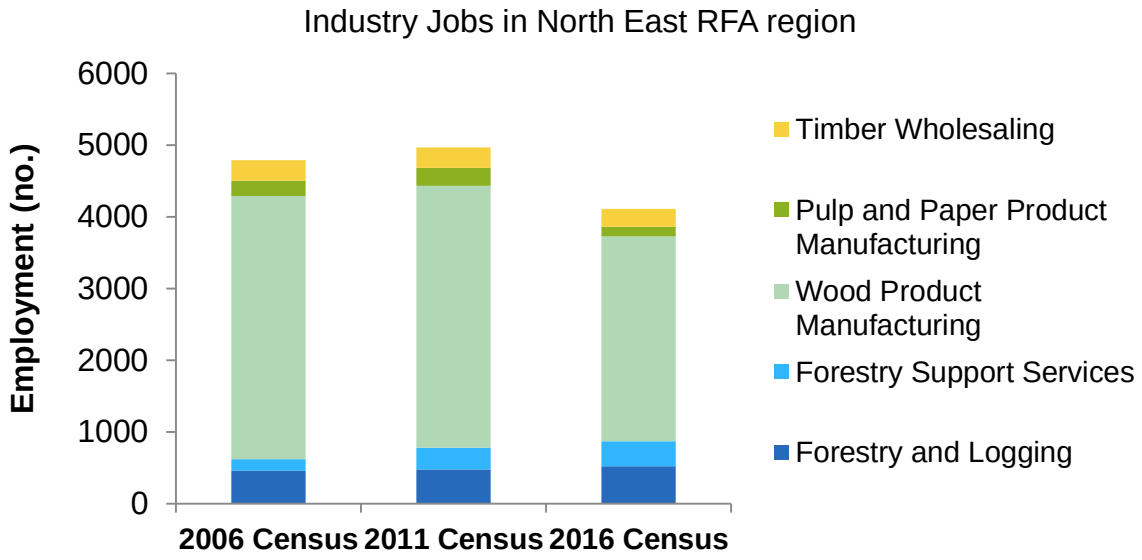

Figure 4.4 Direct employment in the forest and wood products industry in the North East RFA region (27 LGAs represented)

Declines in employment across all three NSW RFA regions have been most pronounced within the wood product manufacturing sector (**Figure 4.5**).

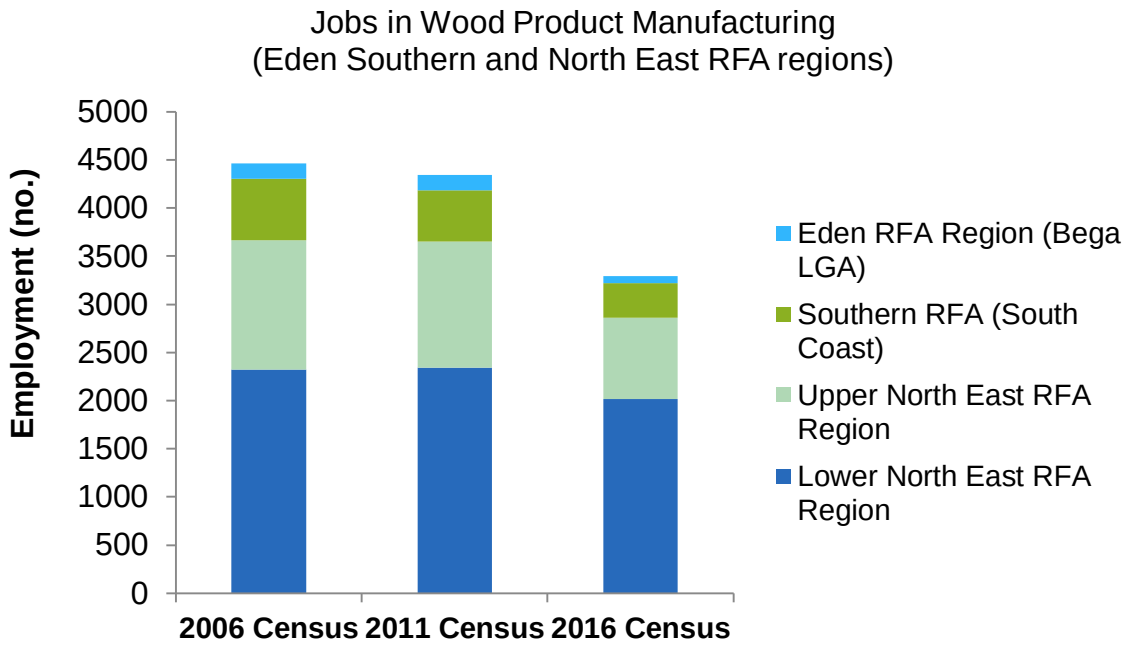

Figure 4.5 Direct employment in wood product manufacturing over 10 years (3 national census surveys) in native forest LGAs within the Eden, Southern and North East RFA regions

The wood product manufacturing sector comprises both primary and secondary wood processing jobs. State wide, secondary wood processing facilities supports around three times more jobs than primary processing facilities. Within the NSW RFA regions the job ratio between secondary processing and primary processing is about two to one. Job losses over the last three Censuses were experienced in both primary and secondary processing. When compared with the rest of NSW, the NSW RFA regions performed better, than those regions not covered by an RFA losing a higher number and higher proportion of jobs (**Figure 4.6** and **Figure 4.7**).

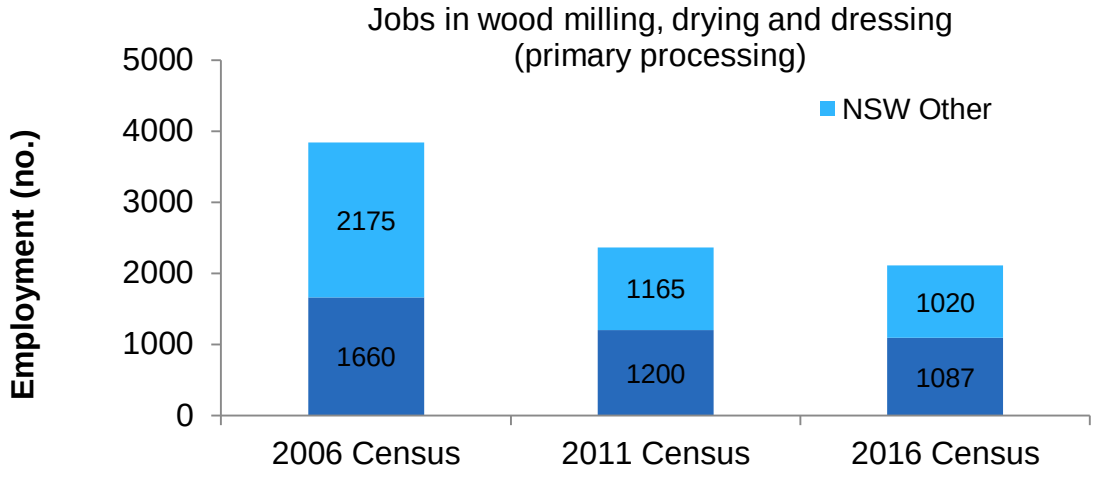

Figure 4.6 Direct employment in primary processing (milling, drying and dressing) over 10 years (3 national census surveys) in NSW RFA regions (native LGAs) and the NSW Other.

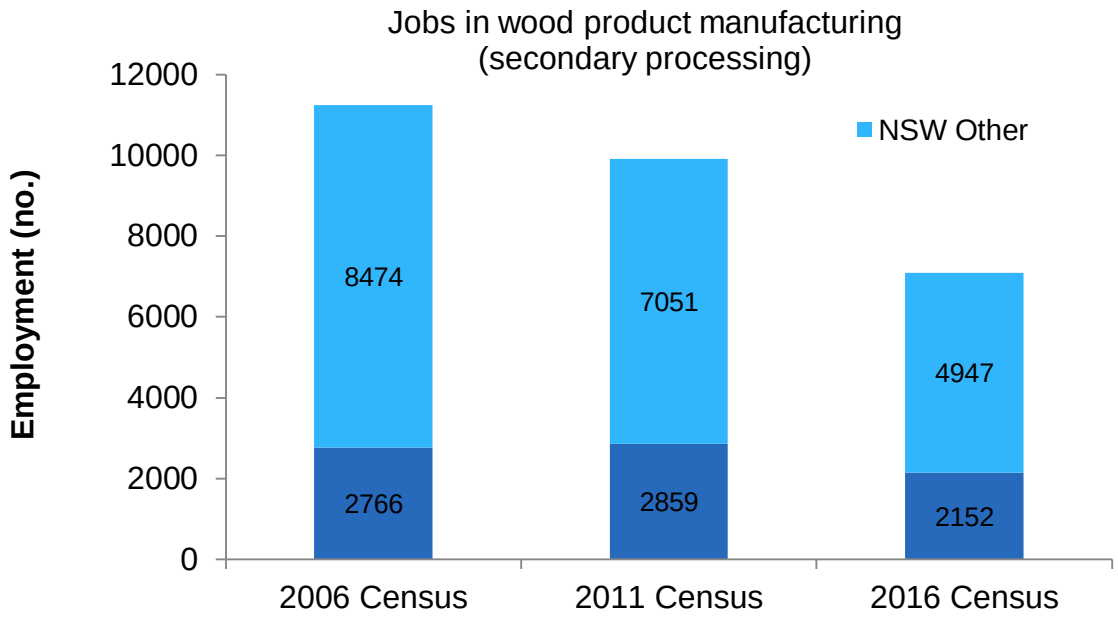

Figure 4.7 Direct employment in secondary processing (wood product manufacturing) over 10 years (3 national census surveys) in NSW RFA regions (native LGAs) and in NSW Other.

The decline in employment in the wood manufacturing sector jobs is consistent with a general decline in Australian manufacturing. This decline has been attributed to increasing international competition, particularly from developing countries that have lower labour costs. The 2009 global financial crisis also had an effect on wood manufacturing jobs as a consequence of reduced demand. In the lead up to the last Census (2016) demand for hardwood wood products rebounded and has remained strong in 2017. The fall in wood manufacturing jobs between 2011 and 2016 occurred mainly in secondary processing which is more exposed to international competition. Job losses in primary processing jobs were much smaller and may be mainly attributed to reductions in available supply.

FCNSW is the State's largest supplier of wood to the wood-processing industries and the industry's largest employer of forestry workers. Over the last twenty years, employment within the organisation has steadily fallen. Between 2000 and 2012, employment reductions were roughly in line with reductions in the forest area under management[80]. Since the organisation was corporatised in 2012, the forest area under management has remained relatively stable while the number of people employed has continued to decline. This decline has seen a steady increase in the area of State forest per employee (**Figure 4.8**). This trend is largely due to the organisation's greater focus on financial performance.

[80] Between 2000 and 2012, the total area of the forest estate went from 3,073,320 hectares to 2,204,315 hectares. The total area of the forest estate in 2017 was 2,185,383 hectares.

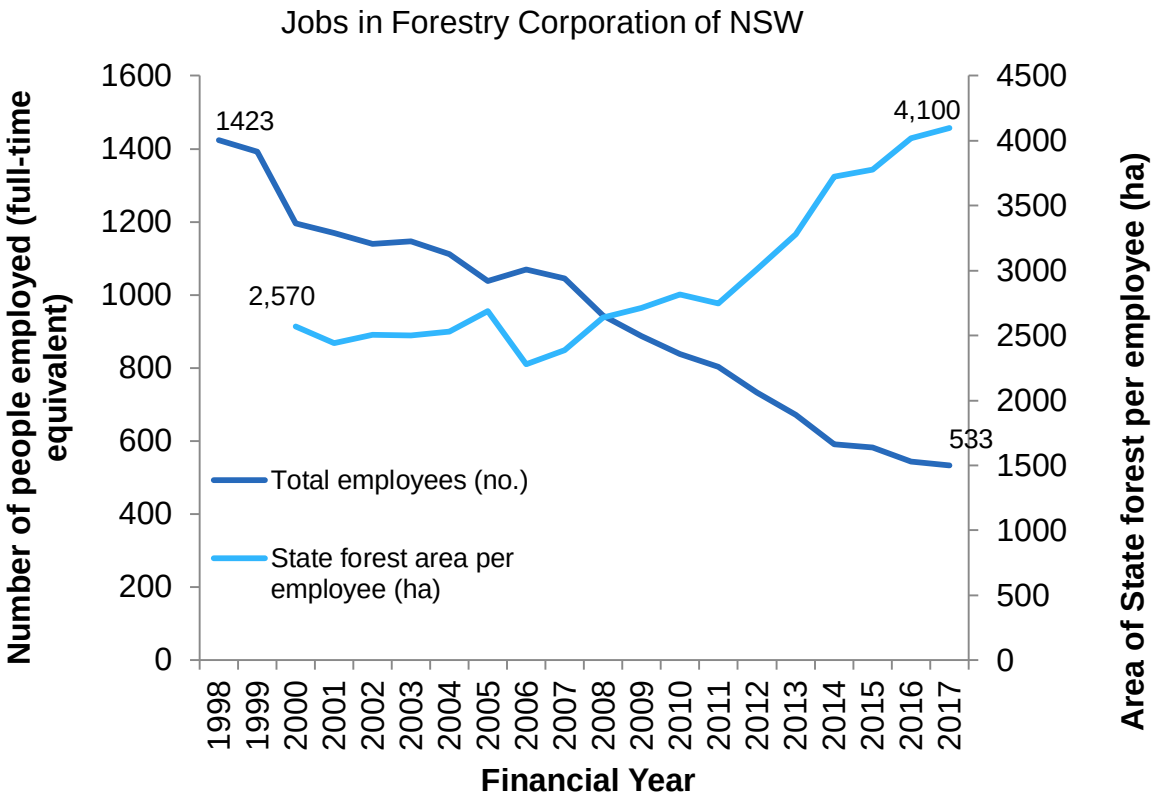

Figure 4.8 Change in employment by FCNSW over the RFA period (data source: FCNSW annual reports)

There are numerous industry job types which are not captured by forestry and wood products employment statistics. Examples include; forestry sector haulage which is mostly classified by ABS in the 'transport' industry; road maintenance and construction contractors; wood craft; firewood wholesaling; retail timber sales; import/export of timber products; wooden furniture and upholstered seat manufacturing, and; forest policy development.

Non-wood forests products and services

As indicated previously, the forest sector produces many products and services other than forestry and wood products. These include; apiary, grazing, sand, rock and gravel extraction, telecommunication sites, and forest based tourism. Employment associated with the collection, processing and sale of these other products and services is classified by ABS in non-forestry categories that cannot be isolated.

Within the three NSW RFA regions, 70% of the dedicated public forest (3.5 million ha) is in nature conservation reserve estate. The balance (30% or 1.5 million ha) is in State forest. The NPWS provide direct employment for the management of national parks and other conservation reserves. These jobs are additional to those generated by the forest and wood products industry.

Employment data for the NPWS is based on agency records which are incomplete. Available data is shown in **Figure 4.9**. At the state level, the data reveals that between 1999 and 2017 the number of direct jobs has increased by 18.5%. During the same period, the area under NPWS management increased by 44%[81].

In 2017 the area of national park and other conservation reserves per employee (for the whole of NSW) was 3,844 hectares. This figure is similar to the area of State forest per FCNSW employee which is 4,100 hectares.

[81] In 2000, the NPWS managed 5,099,674 hectares. In 2017, the NPWS had 7.3 million hectares of land under management

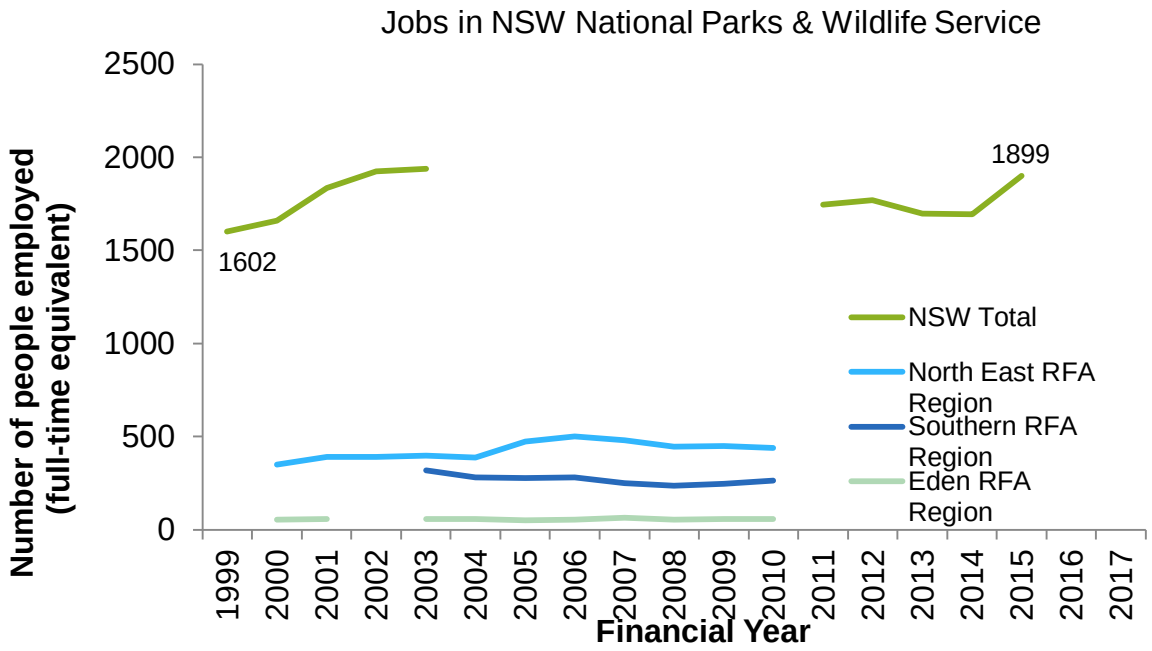

Figure 4.9 Employment in NSW National Parks & Wildlife Service for the whole of NSW and by RFA region (note gaps in data are due to incomplete records) (data source: OEH annual reports and NSW Forest Agreement Implementation reports)

Indirect employment

Like any economic activity, the forest sector creates indirect ('flow on') employment as a result of spending by forest sector businesses and workers.

There is limited up to date data on indirect employment for the forest sector. Many input–output studies have been undertaken to identify downstream impacts of the industry as a whole for a defined region, but this has still resulted in reasonably limited coverage of different regions, and has rarely examined the downstream impacts of native forest and plantation related activities separately (Schirmer et.al. 2008).

The most comprehensive input-output study undertaken for the forest and wood products industry was undertaken in 1995 by Margules Groome Poyry Pty Ltd. This study found that flow on impacts varied considerably between regions and between employment fields. In the study's coastal native forest regions (which were similar to NSW RFA regions) it was found that between 0.47 and 0.74 indirect jobs were created for every direct job. Following the signing of the NSW RFAs (1999-2000), there was considerable investment in value-adding of native forest timbers and this is known to have had a positive effect on indirect employment. Further work is needed, however, to understand the magnitude of the downstream impacts.

Since 1998, the OEH and its predecessors has produced a number of studies using input–output analysis to estimate the flow-on impacts of individual parks and other reserves on local economies. One of these was undertaken on the regional economy of north-east NSW (Gillespie Economics, 2006). Another study (Powell et. al., 2006) was focused on Eurobodalla and Bega Valley LGAs which are located, respectively, within the Southern and Eden RFA regions. In the north-east region study, it was estimated that the national parks and other

conservation reserves in the area were visited by almost six million people each year and that visitor spending represented the equivalent of 1,650 indirect regional jobs. For the Eurobodalla and Bega Valley LGAs it was estimated that visitor spending helped generate the equivalent of 813 indirect jobs. Together these studies highlight the connection which exists between the public forest sector and the broader regional service industry.

Census employment data for the accommodation and food and beverage service sector shows consistent growth within the RFA regions highlighting that opportunities may exist to create more employment in forest-based tourism and recreation.

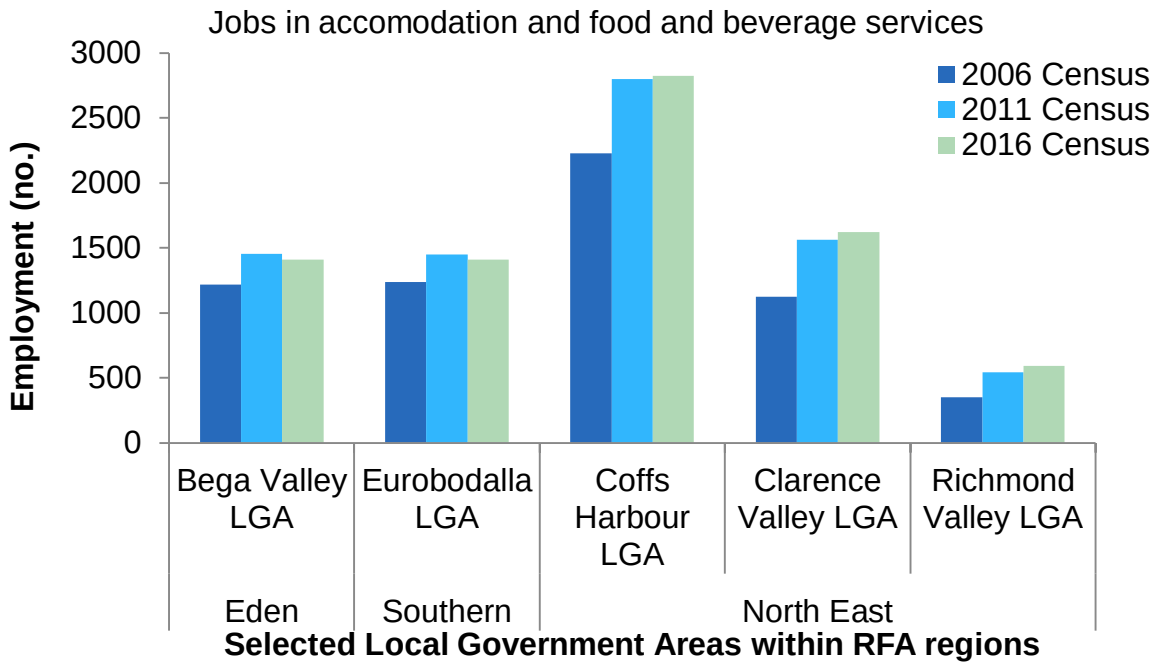

Figure 4.10 Employment trends in the accommodation and food and beverage service industry within Local Government Areas that have large public native forest estates

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Powell, R., Chalmers, L. & Bentham, A. (2006) Impact of National Parks on the regional economies of the NSW Far South Coast. Final Report to the NSW Department of Environment and Conservation. Centre for Agricultural and Regional Economics Pty Ltd. September 2006. 56pp.

Schirmer J., Loxton E., and Campbell-Wilson A. (2008) Monitoring the social and economic impacts of forestry: Recommended indicators for monitoring social and economic impacts of

forestry over time in Australia. Report prepared for Department of Agriculture, Fisheries and Forestry by the Fenner School of Environment and Society, Canberra

Indicator 6.5b Wage rates and injury rates within the forest sector

This indicator measures the level of wage and injury rates in the forest sector. A sustainable industry will ensure high levels of workforce health and welfare and wage rates comparable with national averages for other occupations.

Wage rates

Individuals aged 65 and under typically receive the majority of their income from a salary or wages earned from a job. Information on wage rates in the forest sector contributes to an understanding of employment opportunities in the sector and the contribution it makes to the economy.

Knowing about industry wage rates is also important to employers including those who run commercial businesses. Earnings paid to employees typically represent a significant component of operating costs. Changes in wages can impact on the productivity of a business and its competitiveness in a global market. Changes in average earnings can also reflect the impact of the economic cycle on the labour market, or sectors within the labour market (ABS, 2017).

How much an individual earns from wages and salaries and other sources[82] (personal income) affects their well-being.

The national minimum wage is set at $694.90 per 38 hour week or $36,135 per year before tax (Fairwork Ombudsman, 2017) noting that on 1 July 2018, the Fairwork Commission increased the national minimum wage by 3.5% to $719.20. The original concept of a minimum wage was an income sufficient to support a wage earner in 'reasonable and frugal comfort'[83]. Wage levels above the minimum wage provide individuals with more economic discretion. Individuals on higher wages have greater life choices than those on lower wages, including the opportunity to become financially secure more quickly.

The ABS collects earnings data using a range of employer and household surveys. This particular assessment is limited to data collected by the ABS through the Census of Population and Housing. The Census is a national household survey undertaken every five years.

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[82] Other sources include: bonuses (irregular, one-off); salary sacrificed amounts; non-cash benefits (including wages and salary in-kind) - free or subsidised goods and services from an employer such as the use of motor vehicles and subsidised housing; and severance and termination payments. It can also include other monetary receipts such as government pensions and benefits, investment income, profit or loss from an unincorporated business, and private transfers (such as superannuation, child support etc).

[83] The term 'reasonable and frugal comfort' was coined in 1907 by J. Higgins J. in a Court of Conciliation and Arbitration ruling known as the 'Harvester Judgement'. In this ruling employers were challenged to formulate wages on the basic needs of their employees rather than being solely concerned with the company's profits.

Weekly earnings are affected not only by changes in the rate of pay, but also by any changes in the composition of the workforce, including: diversity of employment arrangements; number of hours worked; the extent of part-time and casual employment; and mix of industries and occupations (ABS, 2017). Analysis of these factors was unable to be undertaken as part of this assessment due to constraints on scope.

Within the forest sector, there are two distinct employment categories; forestry and wood products industry, and non-wood forests products and services.

Wages in non-wood forests products and services come principally from the NSW public sector. In 2017, the median salary of persons employed full time in the NSW public sector was $83,689 (Public Service Commission, 2017). Employment in the NSW public sector accounts for just over 10% of the total number of people employed in the State (Public Service Commission, 2017). A similar proportion of NSW public sector workers make up the forest sector workforce. The principal employer of this workforce is the NPWS. A lesser number of people are employed by NSW Department of Industry – Crown Lands. No wage data is available for the private sector.

The forestry and wood products industry is the principal source of wages within the forest sector. Wages paid by FCNSW are included within this category. The distribution of personal income within the forestry and wood products industry is similar to other NSW industries with one notable difference; income is more concentrated in the middle income brackets (i.e. between $650 and $1,249 per week or between $33,800 and $65,000 per year). This concentration results in a smaller proportion of people with either very low or very high personal incomes (Figure 4.11).

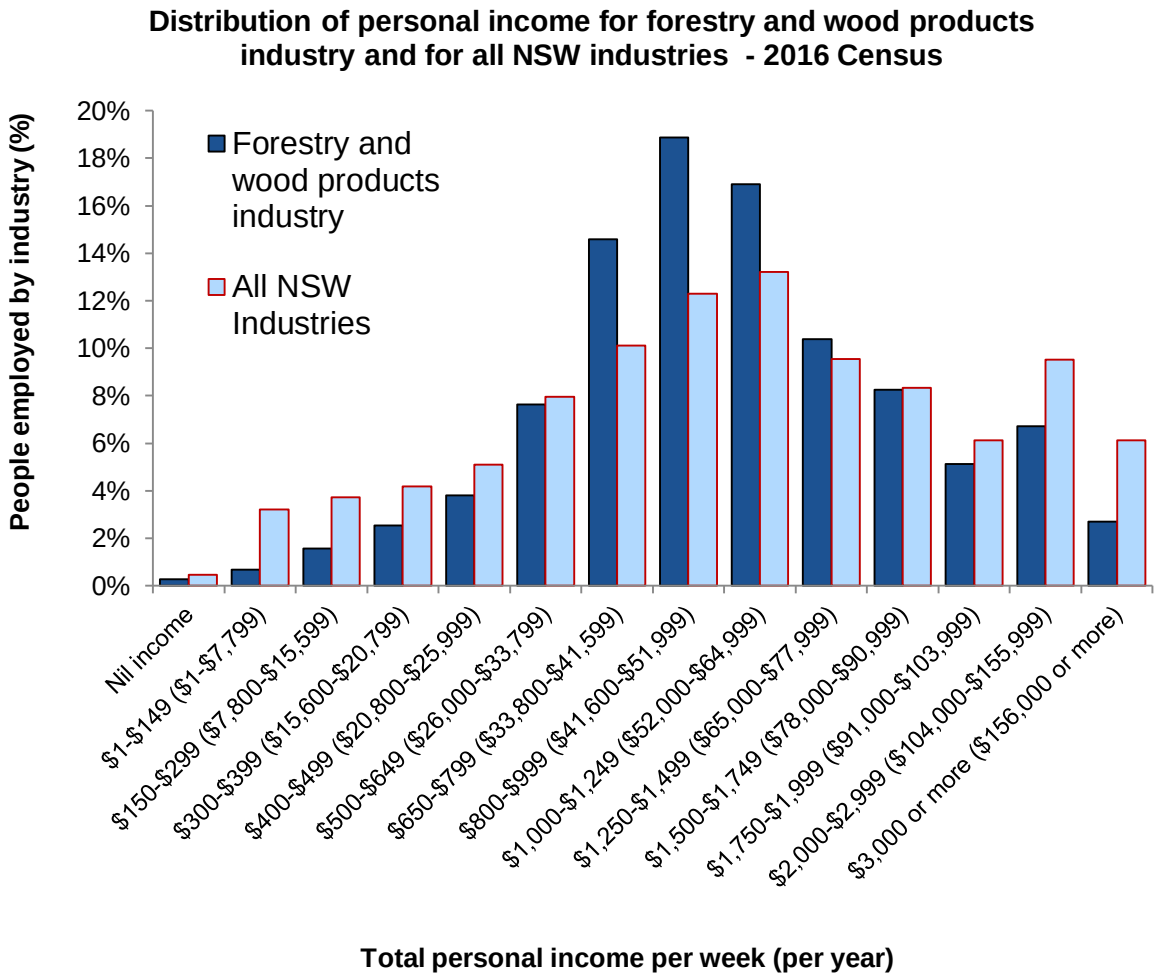

Figure 4.11 – Distribution of personal income for employees in the NSW forestry and wood products industry and for all NSW industry employees.

Personal incomes in the forestry and wood products industry are higher than those in the agriculture and fishing industries (Figure 4.12). When compared to the mining industry, however, personal incomes are much lower. It is generally accepted, however, that the mining industry does not enjoy the same level of employment stability as the other primary industries.

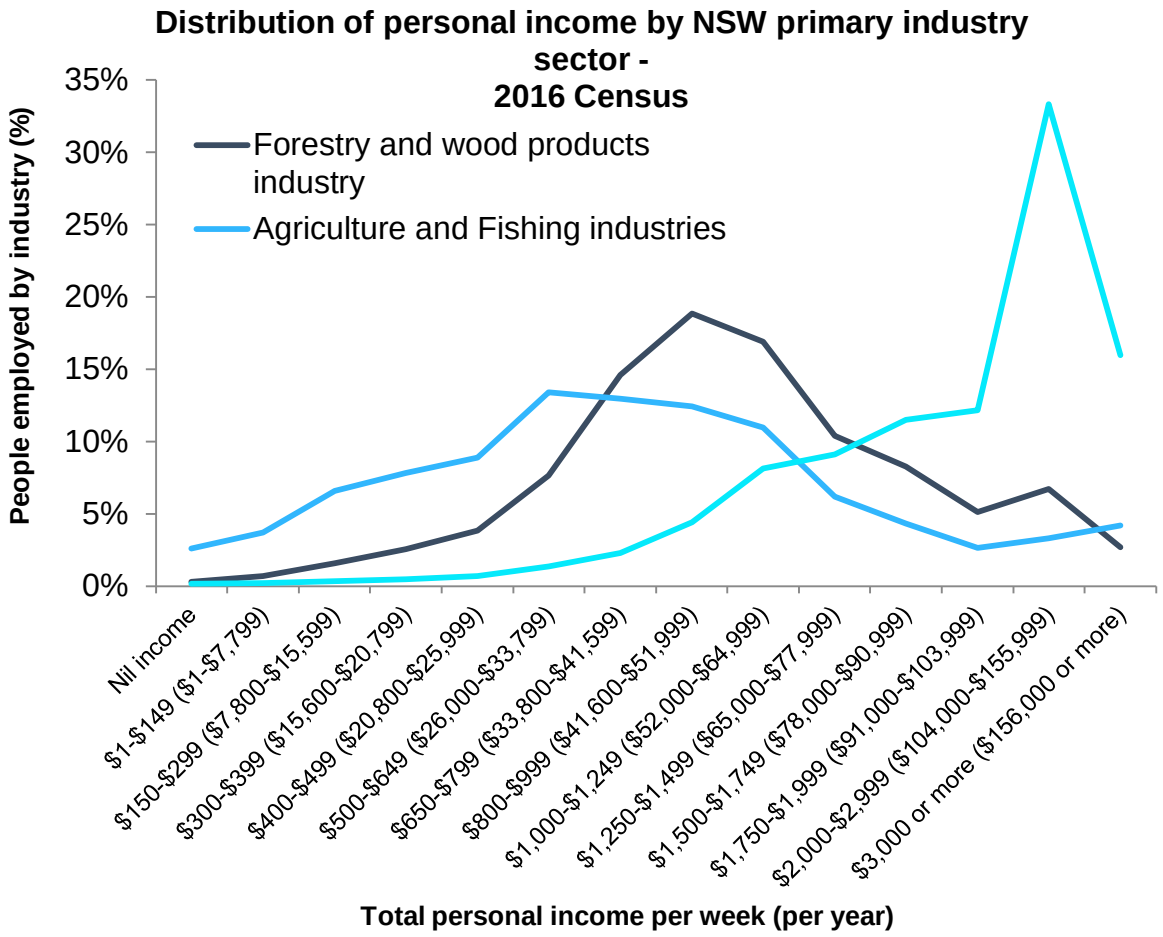

Figure 4.12 – Comparison of the distribution of personal income in the NSW forestry and wood products industry with the NSW agriculture and fishing industry and the NSW mining industry

Over the last ten year period, personal incomes in the forestry and wood products industry have grown, capturing the benefits of Australia's growing economy. Over the same period, the distribution of personal income has flattened out with a higher proportion of people in the higher income brackets (i.e. > $1,250 per week or > $65,000 per year) (Figure 4.13). This trend in wages makes the industry more attractive to workers seeking higher incomes.

Differences in personal income exist between the various sectors which make up the forestry and wood products industry. Of the four recognised employment categories – forestry support services, logging, primary processing, and secondary processing; workers employed in forestry support services and logging earn more on average. Workers employed in forestry support services in particular have higher personal incomes with 36% of the workforce earning more than $1,500 per week (or $78,000 per year) (Figure 4.14).

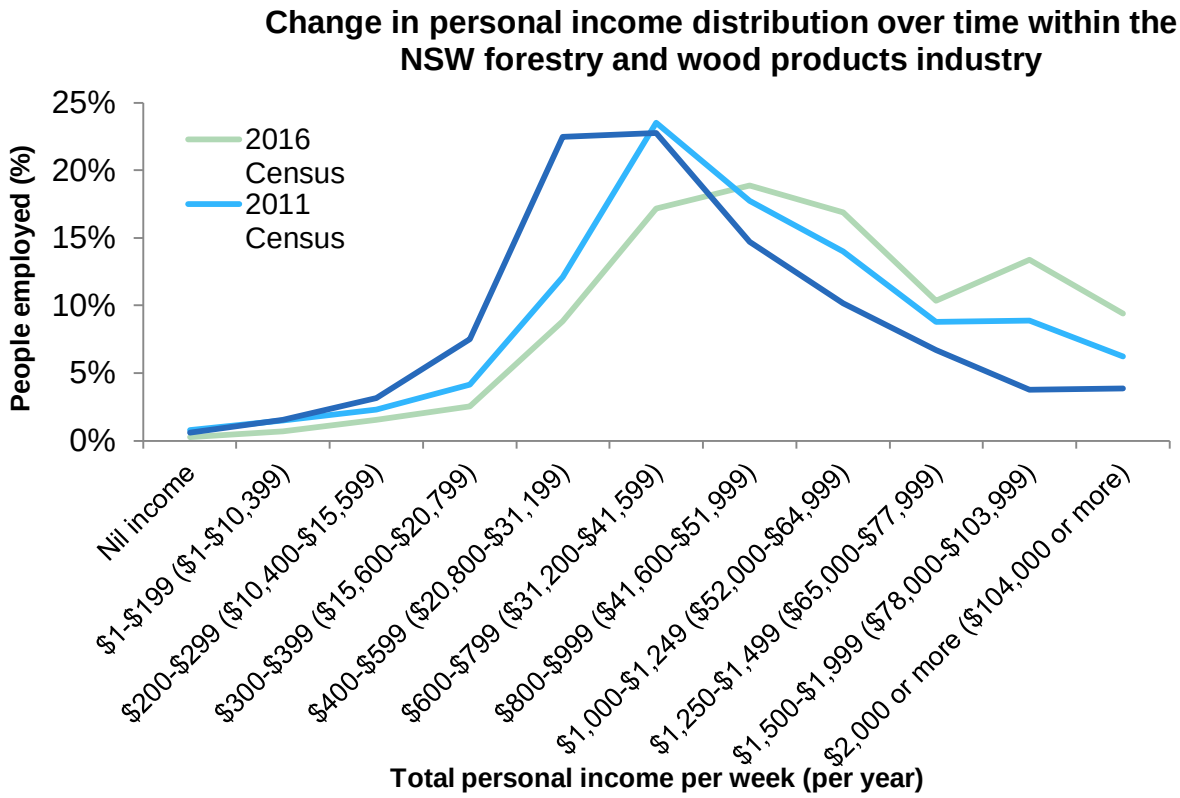

Figure 4.13 – Change in the distribution of personal income in the NSW forestry and wood products industry between 2006 and 2016

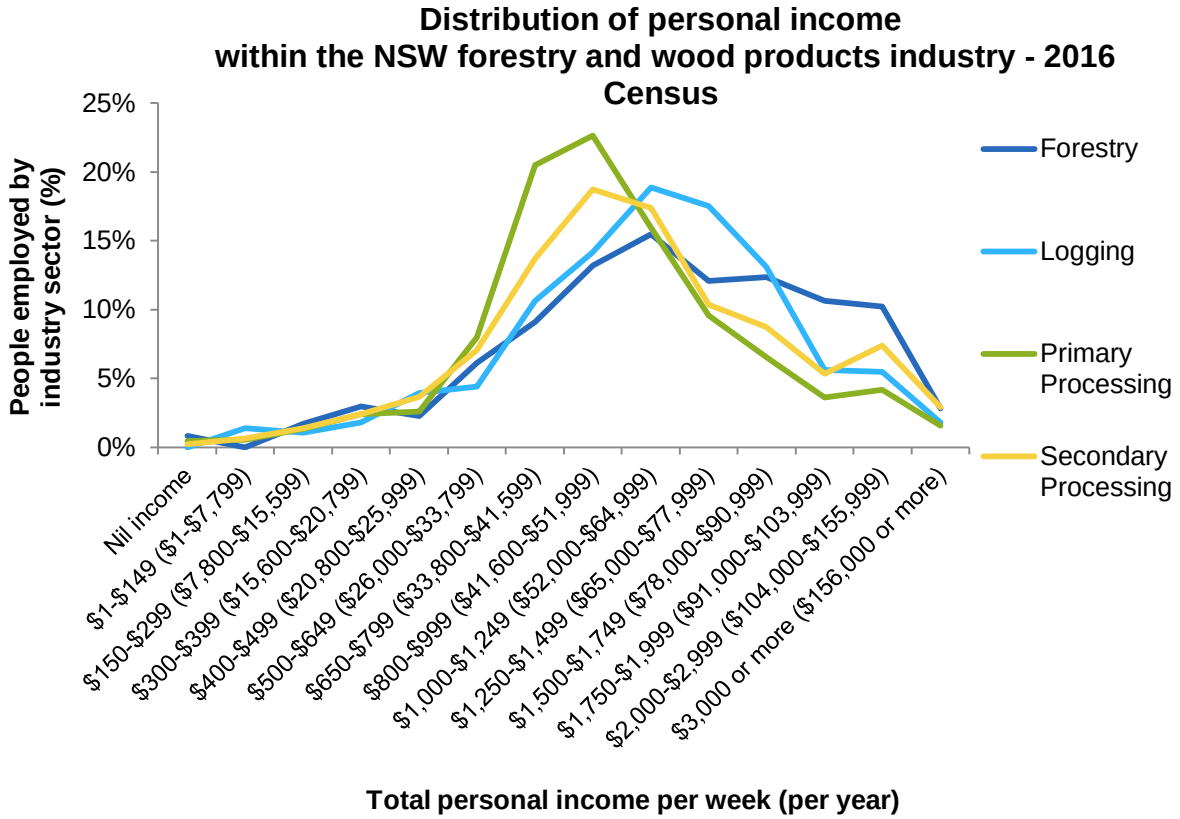

Figure 4.14 - Comparison of the distribution of personal income for sectors within the NSW forestry and wood products industry

Within regional NSW, the forestry and wood products industry provides a valuable source of personal income.

In Bega Valley LGA which covers the Eden RFA region's coastal forests, the average personal income[84] is $762 per week and two thirds all income earners receive less than $800 per week ($41,600 per year). In contrast, the average income of forestry and wood products industry workers in the LGA is $1,326 per week and 78% of these workers have personal incomes that exceed $800 per week (Figure 4.15).

The economic contribution of the forestry and wood products industry is even more pronounced within the Snowy-Monaro LGA which covers the Eden RFA region's tableland forests. In this LGA, the average income of a forestry and wood products industry worker is $1,323 per week and 70% of workers have personal incomes of more than $1000 per week ($52,000 per year). In comparison, the average personal income of all persons that receive income in the LGA is $907 per week and 69% of these people earn less than $1,000 per week (Figure 4.16). It should be noted that industry employment in Snowy-Monaro LGA is based on both plantation softwood and native forest resources.

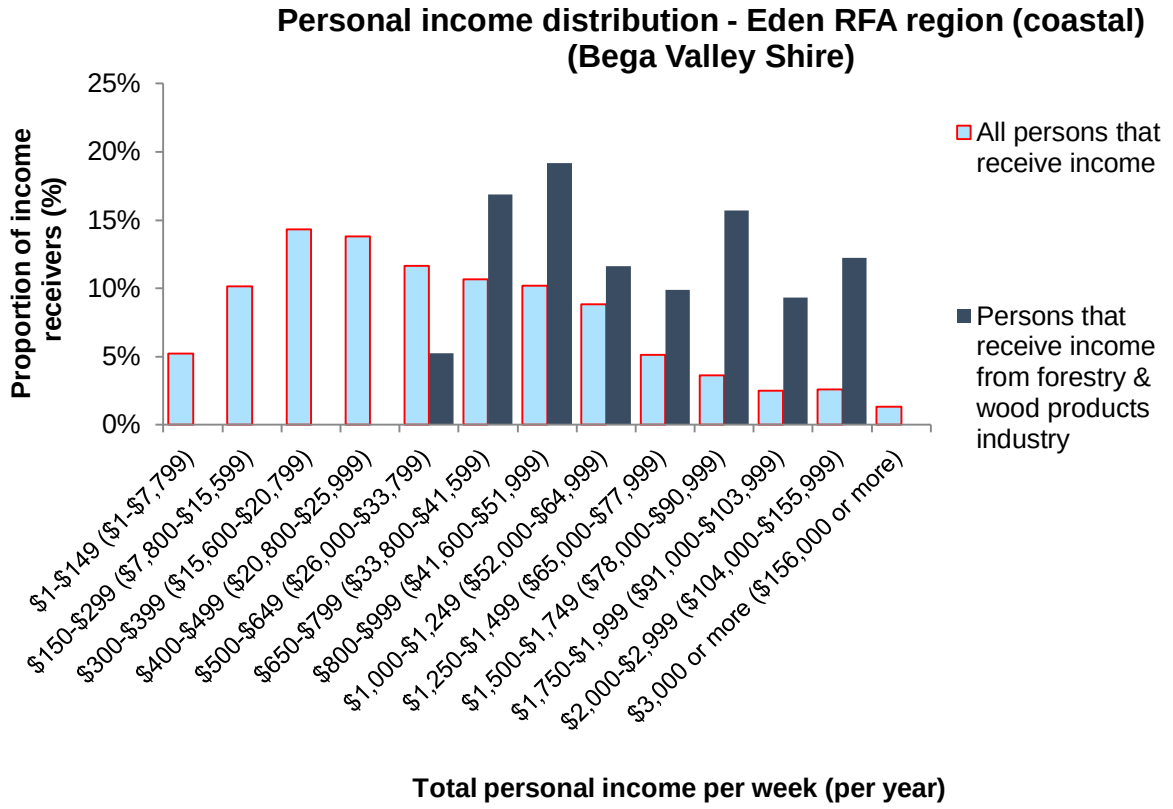

Figure 4.15 – Personal income distribution in Eden RFA region (coastal) for persons in the forestry and wood products industry and for all persons that receive income

[84] Average personal income is a derived estimate or approximation. It is based on 2016 Census – Employment, Income and Education data which has been grouped into 13 personal income brackets. To calculate average personal income the midpoint of each income bracket was multiplied by the number of people within that bracket. The total for each bracket was then summed and divided by the total number of income receivers to generate an average personal income. Note for a person earning $3,000 or more per week the assumed average income was assumed to be $3,500.

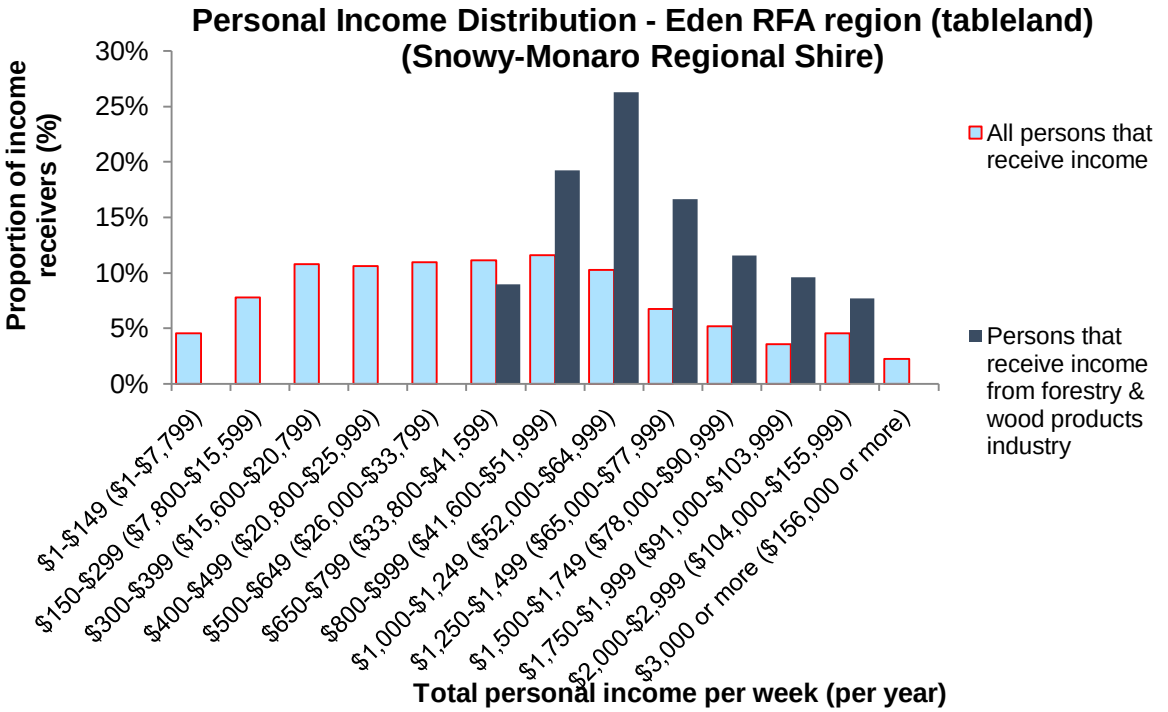

Figure 4.16 – Personal income distribution in Eden RFA region (tableland) for persons in the forestry and wood products industry and for all persons that receive income

The south coast forests of the Southern RFA region are covered by three LGAs – Eurobodalla, Shoalhaven and Queanbeyan-Palerang Regional. The average personal income a forestry and wood products industry worker receives in these LGAs is $1,039 per week or $54,023 per year. In comparison the average personal income of all people within these LGAs is $884 per week or $45,986 per year (Figure 4.17).

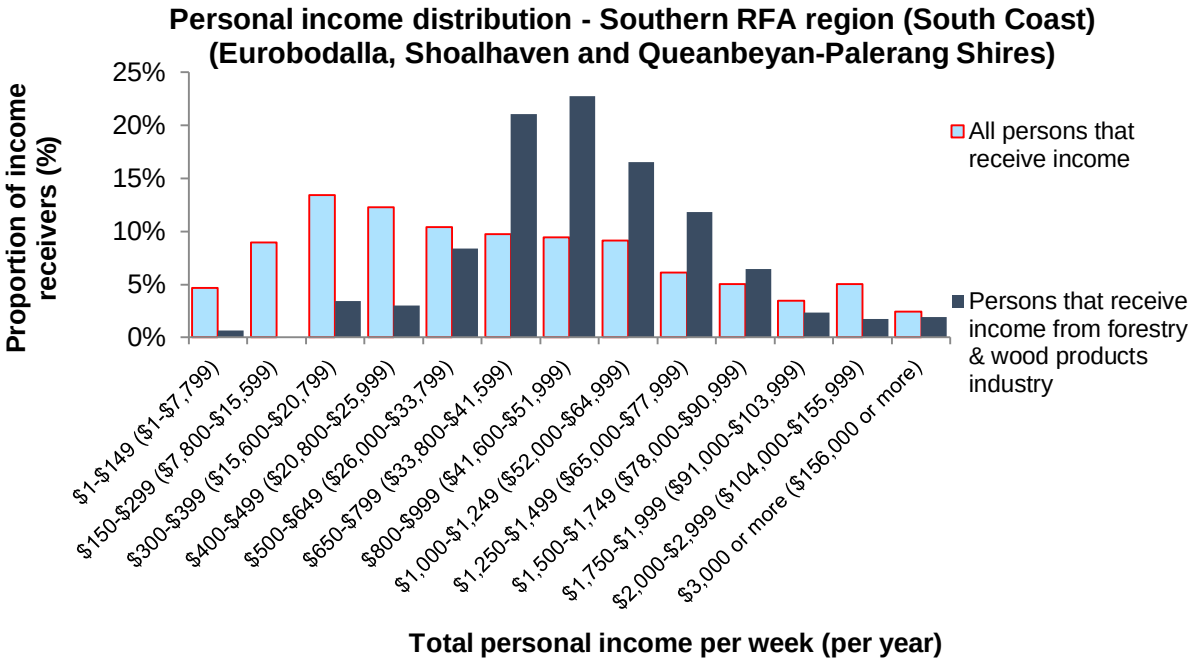

Figure 4.17 – Personal income distribution in Southern (South Coast) RFA region for persons in the forestry and wood products industry and for all persons that receive income

The Tumut sub-region forests of the Southern RFA region fall within the Snowy Valleys LGA. The economic contribution of the forestry and wood products industry in this LGA is more pronounced than any other within the state. In this LGA, employment is predominantly plantation softwood based with native forest resources playing a minor role. In the Snowy Valleys LGA the average personal income of forestry and wood products industry workers is $1,444 per week or $75,086 per year and 72% of workers have personal incomes of more than $1000 per week ($52,000 per year). In contrast the average personal income of all income earners in the LGA is only $842 per week or $43,769 per year (Figure 4.18).

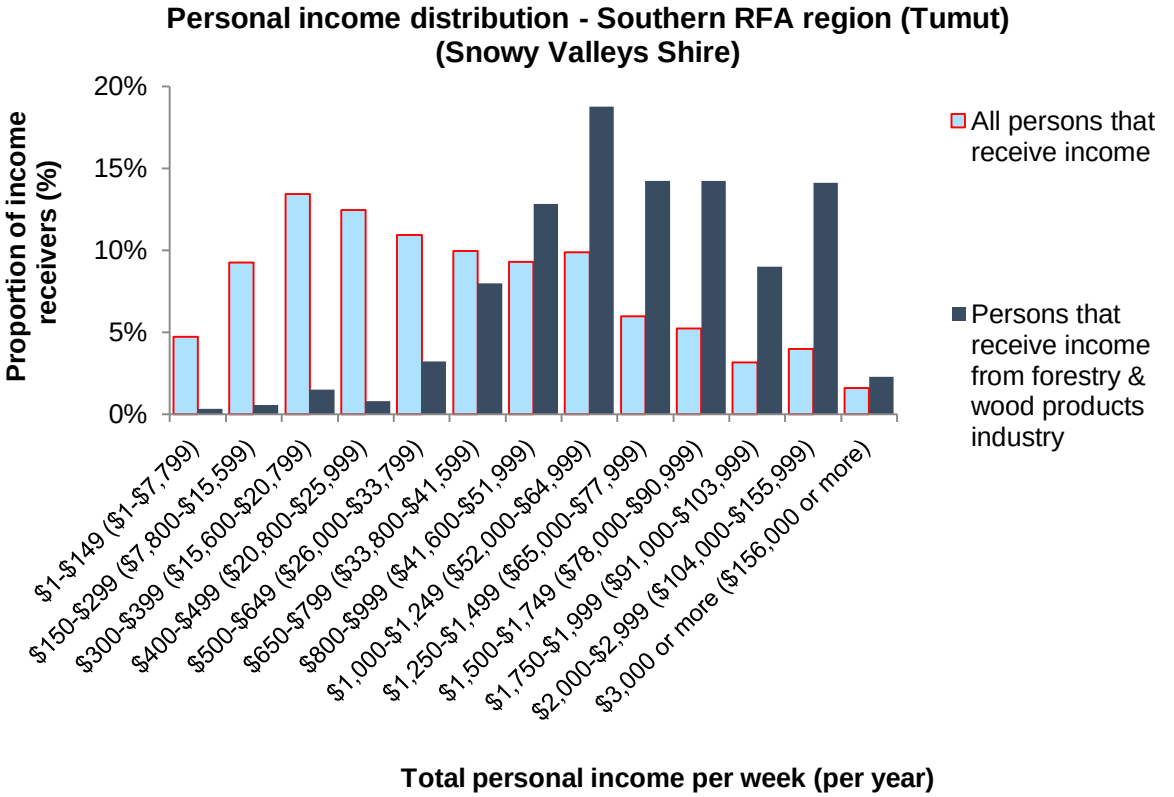

Figure 4.18 – Personal income distribution in Southern (Tumut) RFA region for persons in the forestry and wood products industry and for all persons that receive income.

The North East RFA region is the largest regional employer of forestry and wood products industry workers with employment based largely on native forest resources. In this region, the average personal income of forestry and wood products industry workers is $985 per week or $51,206 per year. In contrast the average income of all persons that receive income is $804 per week or $41,829 per year (Figure 4.19).

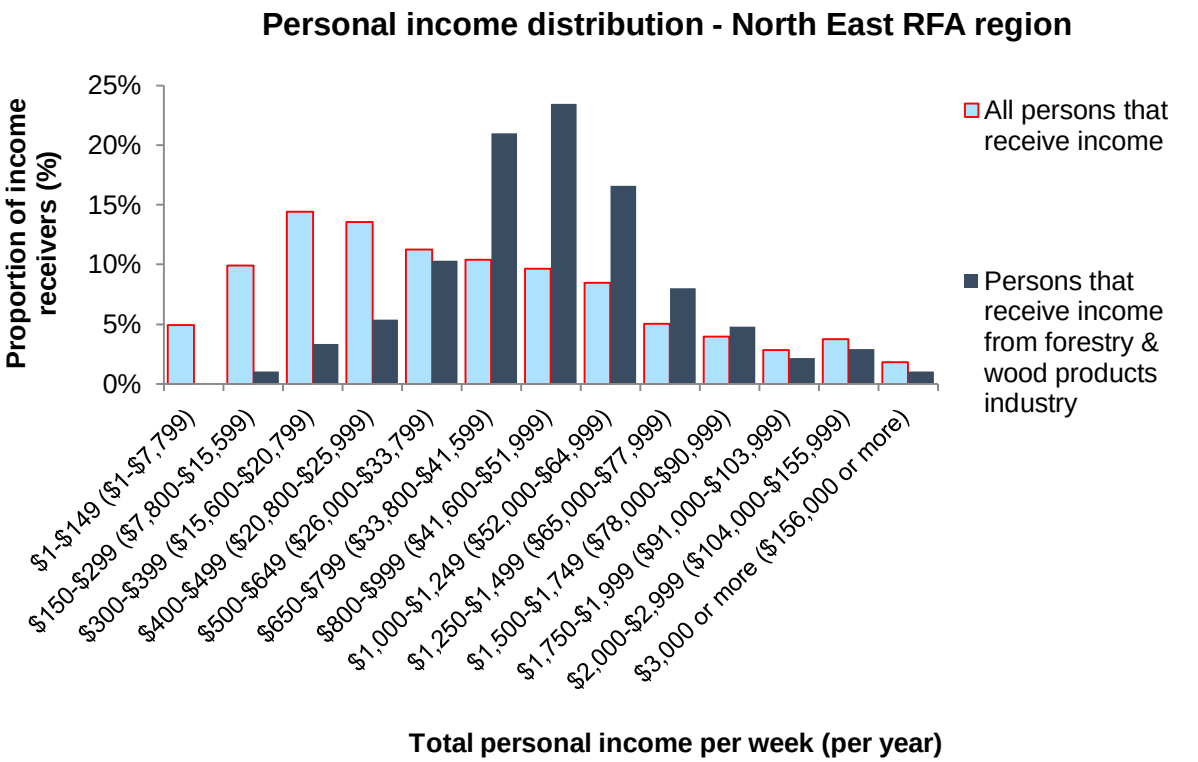

Figure 4.19 – Personal income distribution in the North East RFA region for persons in the forestry and wood products industry and for all persons that receive income.

In summary, the forestry and wood products industry is comparable to other NSW industries in terms of personal income distribution with a slightly greater concentration of wages in the middle income brackets ($650 to $1,249 per week or $33,800 to $65,000 per year). When it comes to regional employment, the industry is far more highly valued with much higher average wages paid by the industry than in other sectors.

Injury rates

Work-related injuries have a wide-ranging impact at both an individual and macro-economic level. NSW workers compensation injury statistics allow employers, workers, regulators and insurance and service providers to better understand and manage workplace health and safety risks.

In NSW, over 30,000 people incur major work-related injuries each year costing $547 million[85] (State Insurance Regulatory Authority, 2015). Around 400 of these injuries (1.3%) are attributed to the forestry and wood products industry.

There are 20 recognised industry categories that are used to report injury statistics in NSW. The forestry and wood products industry is split between two categories – Agriculture, Forestry and Fishing, and Manufacturing. Within Agriculture, Forestry and Fishing, the

[85] Gross incurred cost comprising $391 million in compensation payments and $126 million in estimated liability

subcategory relevant to the industry is forestry and logging. Within Manufacturing, the relevant subcategory is wood and paper product manufacturing[86].

The rate at which workplace injury incidents occur (no. of injuries per 1,000 employees) is a recognised way of comparing the performance of different industries and their sectors. Figure 4.20 shows how injury incident rates have changed between 1999 and 2015 for forestry and logging, wood and paper product manufacturing, in comparison to the agricultural industry, mining industry and all NSW industry.

Figure 4.2 shows that there has been a clear downward trend in injury incident rates for mining, agricultural, and all NSW industry. This same trend has not been achieved in the forestry and logging sector where injury incident rates have fluctuated quite markedly. In particular, forestry and logging injury incident rates have spiked in recent years. This trend should be treated with caution, however, as it is based on limited data that has a high relative standard error (between 25% and 50%).

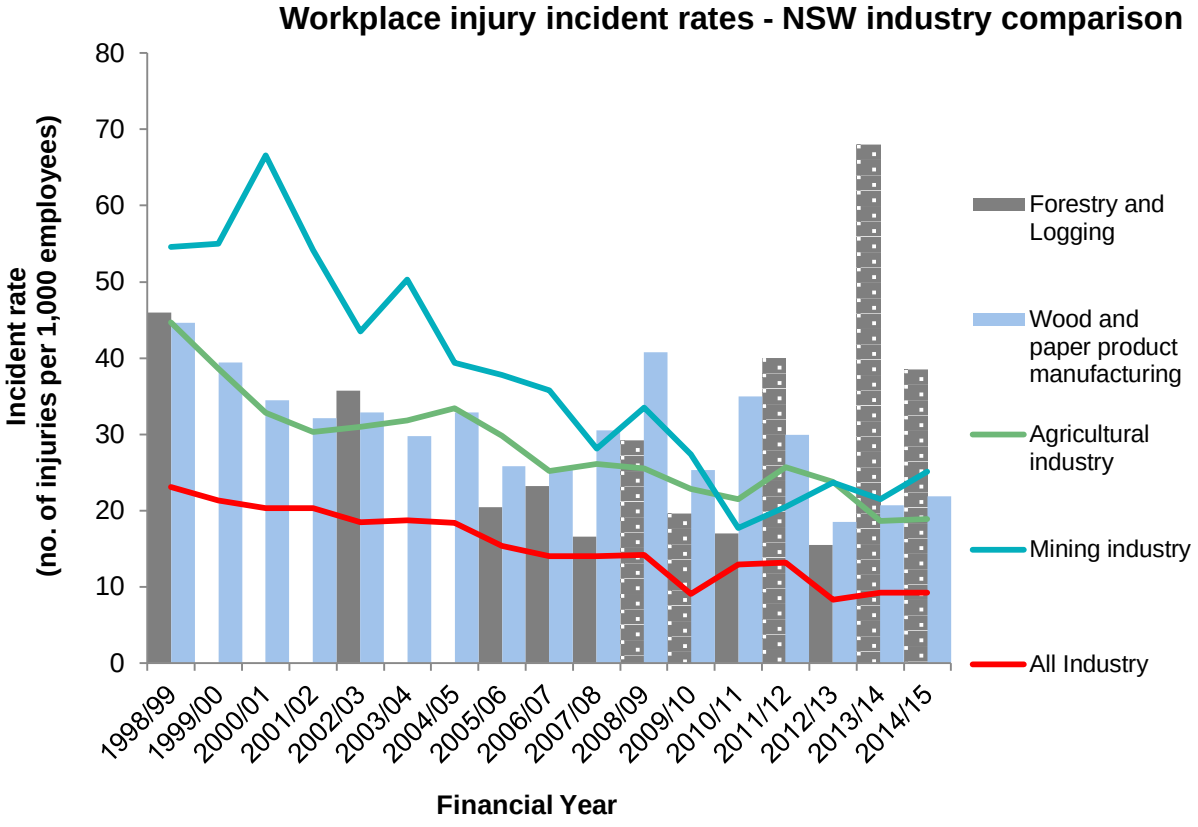

Figure 4.20 – Workplace injury incident rates between FY1999 and FY2015 for forestry and logging; wood and paper product manufacturing; agricultural industry; mining industry; and all NSW industry. Note, columns coloured dark grey with white dots have a relative standard error of between 25% and 50%.

[86] More recently wood and paper product manufacturing injury statistics have been split into wood product manufacturing and pulp, paper and converted paper product manufacturing.

Injury incident rates for wood and paper product manufacturing has been trending downward since 1999 in a similar fashion to agriculture however (unlike agriculture) there has been some notable exception years where injury incident rates have spiked (i.e. 2009, 2011 and 2012).

Analysis of the number and severity of workplace injuries in the forestry and wood products industry reveals a more positive trend with fewer injuries and a declining proportion of serious injuries (ones that result in death or permanent disability) (Figure 4.21).

Figure 4.21 – No. and severity of workplace injuries in the NSW forestry and wood products industry.

The average cost of a workplace injury is another key performance indicator. For the forestry and wood products industry, average costs have declined in real terms over a seventeen year period (Figure 4.22). Within the industry, wood and paper manufacturing has performed better that forestry and logging with respective average costs of $26,959[87] and $33,022[88] per injury. Since 2012, wood product manufacturing, and pulp, paper and converted paper products manufacturing have been reported separately. Over a four year period, the average cost of injury was $16,334[89] for wood product manufacturing and $19,562[7] for pulp, paper and converted paper products manufacturing.

[87] Average over 13 years, data indexed to $2015s using all groups all cities CPI
[88] Average over 17 years, data indexed to $2015s using all groups all cities CPI
[89] Average over 4 years, data indexed to $2015s using all groups all cities CPI

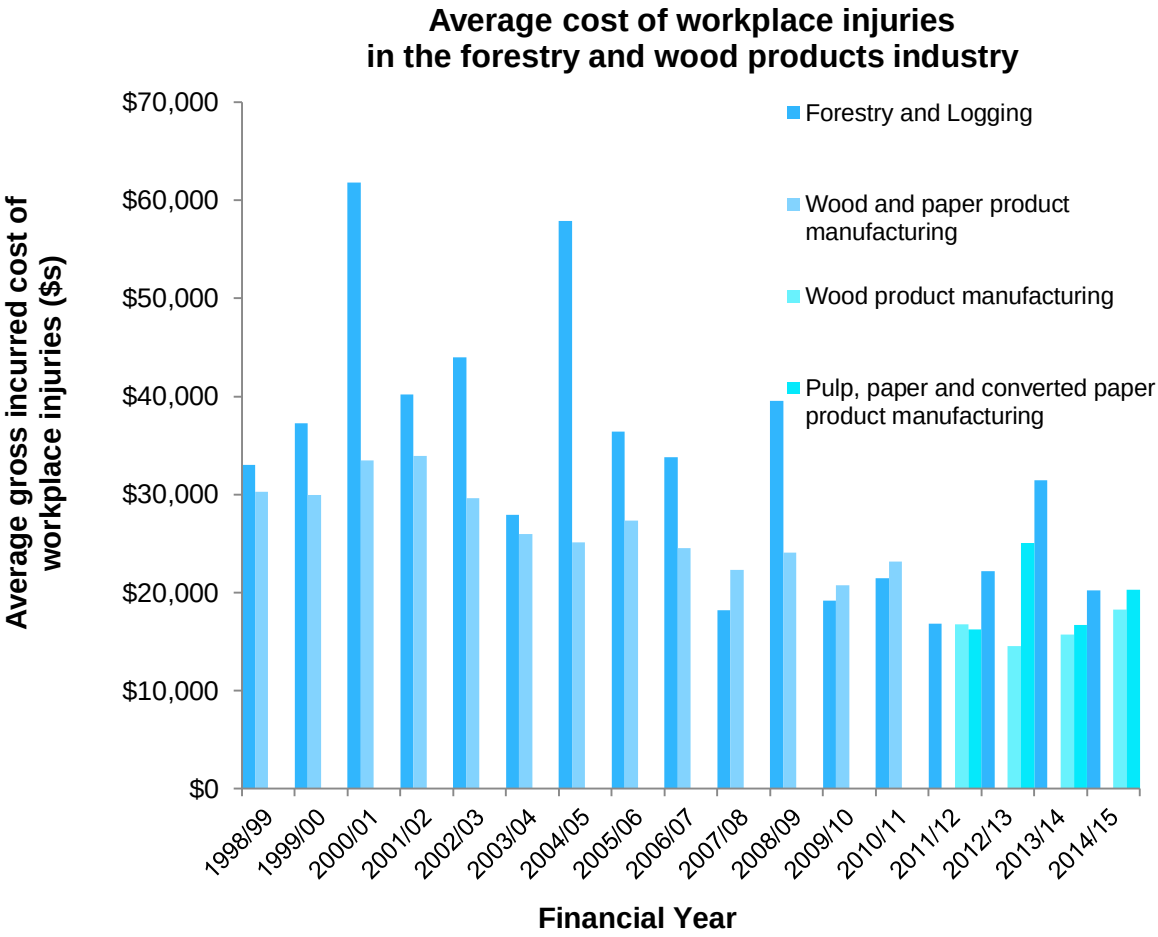

Figure 4.22 – Average incurred cost of workplace injuries by sector in the forestry and wood products industry. Note all values are in $2015s.

In summary, over the duration of the NSW RFAs the performance of the forestry and wood products industry has improved with workplace injuries reducing in number, severity and average cost. Workplace incident rates have, however, remained high, particularly when benchmarked against other NSW industry. This trend suggests that there is scope for improvement, particularly in the forestry and logging sector.

References

Australian Bureau of Statistics (2016) 2016 Census of Population and Housing. Online Table data builder. https://guest.censusdata.abs.gov.au/webapi/jsf/dataCatalogueExplorer.xhtml

State Insurance Regulatory Authority (1998/99 to 2014/15 inclusive) Statistical Bulletins.

NSW Public Service Commission (2017) Workforce Profile Report 2017.

Fairwork Ombudsman (2017) Website https://www.fairwork.gov.au/how-we-will-help/templates-and-guides/fact-sheets/minimum-workplace-entitlements/minimum-wages

Indicator 6.5c Resilience of forest dependent communities to changing social and economic conditions

This indicator provides a measure of the extent to which forest dependent communities are able to respond and adapt to change successfully. Resilient forest dependent communities will adapt to changing social and economic conditions, ensuring they remain viable into the future.

This indicator considers only the dependence of communities on the forest and wood products industries, and not on other forest activities or services such as tourism or grazing.

In 2016, the NSW Forestry Industry Roadmap committed the NSW Government to ensuring regional economies are stronger and more diverse, for the overall wellbeing and resilience of communities. The roadmap states that forestry jobs are crucial in ensuring communities' economic diversity and sustainability, with over 42% of forestry and wood products jobs in 2016 in NSW being based in regional areas[90].

This indicator was not reported on in the first five-yearly NSW RFAs review, in both the draft implementation report and independent assessors report[91].

In the combined second and third RFA Review Progress with Implementation [92]Report[93], the information for this indicator was sourced from SOFR 2013 (ABARES 2013), which is again presented in this section. Information for this indicator is currently being updated by ABARES for SOFR 2018.

There is currently no clear measure of the resilience of communities in adapting to change. To inform the understanding of community resilience, information about the characteristics

[90] NSW Government, 2016, NSW Forestry Industry Roadmap, available at at www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/711851/nsw-forestry-industry-roadmap.pdf (accessed on 14 May 2018)

[91] State of NSW and Commonwealth of Australia, 2009, A draft report on progress with implementation of the New South Wales Regional Forest Agreements,Research and Conservation Unit, NSW Department of Environment and Climate Change NSW, Sydney, available at at www.environment.nsw.gov.au/resources/forestagreements/09200draftrfa.pdf (accessed on 16 May 2018)

[92] NSW EPA 2017, A report on progress with implementation of the New South Wales Regional Forest Agreements: Second and third five-yearly reviews, July 2004 to June 2014, NSW Environment Protection Authority, Sydney. Accessed on 16 May 2018 at www.epa.nsw.gov.au/your-environment/native-forestry/about-public-native-forestry/regional-forest-agreements-assessments/review-regional-forest-agreements

[93] NSW EPA 2017, A report on progress with implementation of the New South Wales Regional Forest Agreements: Second and third five-yearly reviews, July 2004 to June 2014, NSW Environment Protection Authority, Sydney, Accessed on 16 May 2018 available at www.epa.nsw.gov.au/your-environment/native-forestry/about-public-native-forestry/regional-forest-agreements-assessments/review-regional-forest-agreements (accessed on 16 May 2018)

of communities and workers in the forests and wood products industries that may affect their capacity to adapt is presented.

The proportion of people directly employed in an industry can indicate the level of a community's economic dependence on that industry. Beyond those directly employed in the forest and wood products industries, it is difficult to determine the economic dependence on forests of forest users such as apiarists, graziers, ecotourism operators, training providers and transport contractors, and potentially some personnel involved in forest management. Since these categories are not included in this assessment of forest dependence, forest-related employment is potentially underestimated by the available figures.

Communities are considered to show medium-to-high relative community dependence on the forest and wood products industries when employment in the sector is at least 4% of total community employment. In NSW there are seven Statistical Local Areas (SLAs) that satisfy this condition (**Table 4.6**).

Table 4.6 also assigns these seven SLAs with an Adaptive Capacity Ranking from 2006 ABS data (the latest data available for SOFR 2013. This ranking indicates the community's ability to accommodate change, which is influenced by their economic dependence on the forests and wood products industries and the level of resources they can draw on to assist their response to change. This Adaptive Capacity Ranking incorporates human and social capital, and economic diversity. Though this is a simplified measure as the adaptive capacity of communities is a complex concept that a single metric cannot capture, particularly when specific communities undergo rapid change.

A 'lower' Adaptive Capacity Ranking indicates that a community, in this case SLA, has a low capacity to respond to changes. The adaptive capacity of a community and its dependence on the forest and wood products industries can help indicate where assistance may be required for communities adapting to change.

Six of these NSW SLAs that show medium-to-high relative community dependence on the forest and wood products industries are in NSW RFA regions: Bombala (lower adaptive capacity ranking) is in the Eden RFA region; Tumut LGA (middle) and Tumbarumba (lower) are in the Southern RFA region; and Clarence Valley – Balance (lower), Clarence Valley - Grafton (middle) and Kyogle (lower) are all in the North East RFA region. Oberon is not in an RFA region.

Table 4.6 Characteristics of NSW Statistical Local Areas with more than 4% employment dependence on, and more than 20 workers employed in, the forest and wood products industries

Statistical Local Area [1]	Employed in forest and wood products industries				All industries	Adaptive capacity ranking[4] 2006
	Number of people 2011	Proportion of workforce 2011 (%)	Change in employment 2001–06[2] (%)	Change in employment 2006–11[3] (%)	Change in total employment 2006–11 (%)	
Oberon	394	17.45	8.65	–7.73	–0.66	Middle
Bombala	163	15.22	–0.64*	4.49*	–1.47	Lower
Tumut Shire	717	15.22	1.65	–3.24	4.06	Middle
Tumbarumba	185	13.08	2.56*	–7.50	–5.35	Lower
Clarence Valley-Balance	113	5.30	7.19*	–24.16	5.33	Lower
Clarence Valley-Grafton	412	4.81	27.83	–6.58	4.92	Middle
Kyogle	135	4.03	–46.85	14.41	0.72	Lower
Australia [5]	73,267	0.75	7.2	–14.1	9.7	–

Source: ABS (2011a) *Census of Population and Housing,* ABS, Canberra.

Table notes: SLA = Statistical Local Area

(1) 2001 and 2006 comparative data are based on 2006 SLA boundaries, and 2011 data are based on 2011 SLA boundaries. There are no significant boundary differences for the SLAs listed.

(2) & (3) Per centage change calculated from change in absolute employment numbers between census years. Changes of 10 or fewer individuals are indicated by *.

(4) Adaptive capacity ranking is only currently available from 2006 census data. 'Lower', 'middle' and 'higher' refer to the adaptive capacity index relative to all SLAs with 20 or more forest-sector workers. The adaptive capacity index combines sub-indices for human and social capital, and economic diversity.

(5) Data based on total aggregated SLAs across Australia.

* Indicates changes of 10 or fewer individuals.

Independent Reviewers report:

The Independent Reviewer of the combined second and third five-yearly review mentioned that most of the areas which had a high dependence on the forest and wood products industry experienced a decline in employment over the period of 2004-2014. As this was less than the decline in the overall employment, the Independent Reviewer assessed that this indicated that the forest and wood products industry improved community resilience (Waller, 2018).

Community resilience in the Southern and Eden RFA regions

The NSW Government commissioned a 2017 study on the *Socio-economic impacts of the softwood plantation industry in the South West Slopes and Bombala region, NSW*[94] (Schirmer et al, 2017) which provides insight into the resilience of communities in parts of the Southern and Eden RFA regions.

The softwood industry is a significant component of the South West Slopes and Bombala region's economy, with its contribution to the Gross Regional Production (GRP) being $1,014 million in 2015-16, including $580 million from flow-on effects. As of February 2017, the industry directly employed 1917 people in the region, with 66 per cent of these in the wood and paper processing sector. When adding flow on jobs, the softwood industry of the South West Slopes and Bombala region employs 5375 people in the region and 6026 across NSW. The softwood industry directly injected $115 million into the region through household incomes in 2015-16[95].

The study found that in the Snowy Monaro Regional Council LGA and Snowy Valley Council LGA, the softwood plantation industry is a significant employer, with 22% and 18% of jobs are directly dependent on the softwood plantation industry respectively.

The study found that from 2011 to 2017 there was approximately a 5% decline in the amount of jobs directly dependent on the softwood plantation industry in this region. The study states this is "not surprising" as a large amount of the jobs are dependent on the manufacturing sector which reduces jobs as a result of new technology and companies introducing efficiencies to maintain competitiveness by reducing employment while increasing production.

NSW RFAs renewal consultation

During the public consultation as part of the NSW RFA renewals many stakeholders were worried about the future of local communities if there was a downturn in the forestry industry or there were more reserves created from the existing native forest production estate. This was raised specifically as a concern in most of the sites where stakeholder meetings and drop-in sessions were facilitated including Bellingen, Batemans Bay and Lismore regions.

[94] Jacki Schirmer, Diana Gibbs, Mel Mylek, Anders Magnusson and Julian Morison, 2017. Socio-economic impacts of the softwood plantation industry in the South West Slopes and Bombala region, NSW. Published by NSW Department of Industry, Lands & Forestry Division. Accessed on 14 May 2018 at www.dpi.nsw.gov.au/__data/assets/pdf_file/0005/721724/socio-economic-impacts-of-the-softwood-plantation-industry.pdf

[95] Ibid

Summary and future management of social values

NSW forests contribute to local and state economies, benefit personal and community wellbeing, and support cultural values for local communities, including Indigenous communities.

During the initial social and economic reports for the CRAs of NSW RFA regions, stakeholders expressed a growing interest in tourism and recreation activities in forests in the Eden, North East and Southern RFAs. As reported in the first five-yearly Draft Report on Progress with Implementation of the New South Wales Regional Forest Agreements (2009), the overwhelming majority of both multiple-use public forest and nature conservation reserves in NSW were available for recreation and tourism at the time of the first five-yearly independent review. Ninety-six per cent of the State forest estate was considered available for forest-related recreational activities, with visitation rates high across the four NSW RFA regions.

Visitation to tourist destinations in NSW forests has generally increased over time, largely centred on the nature conservation reserve estate. There has been significant investment in, and recognition of, a number of tourism ventures across NSW forests with several national parks having won tourism awards. This is also reflected in a recent 26.4 per cent increase in number of visitors on land managed by NPWS from 2011-12 to 2015-16.

In 2016, over 17,500 people were directly employed in the New South Wales forestry and wood products industry (ABS 2016 Census). Employment in this industry is widely distributed with jobs in 83% of all NSW LGAs. Dependence on the industry for jobs is much greater in regional areas than it is in metropolitan areas with 19 of the top 20 most forestry and wood products industry dependent LGAs located within regional NSW.

There has been a decline in direct employment in the forest and wood products industry across all three NSW RFA regions in both primary and secondary wood processing. The fall in wood manufacturing jobs between 2011 and 2016 occurred mainly in secondary processing which is more exposed to international competition. Job losses in primary processing jobs were smaller and may be attributed to reductions in available supply. When compared with the rest of NSW however, the NSW RFA regions performed better – with regions not covered by an RFA losing a higher number and higher proportion of jobs.

The indirect employment impact of the NSW RFAs varies considerably between regions and between employment fields. In one study, prior to the RFAs being entered into, it was found that between 0.47 and 0.74 indirect jobs were created for every direct job in the coastal native forest regions. Following the signing of the NSW RFAs (1999-2000), there was considerable investment in value-adding of native forest timbers and this is known to have a positive effect on indirect employment. Further work is needed, however, to understand the magnitude of the downstream impacts.

Personal incomes in the forestry and wood products industry are higher than those in the agriculture and fishing industries. Over the last ten years, personal incomes in the forestry and wood products industry have grown, capturing the benefits of Australia's growing economy.

Submissions to the public consultation on both the renewal and combined second and third five yearly review to the NSW RFAs reflect the broad range of views the community holds

about forests values and uses. Local communities, especially Aboriginal communities, have strong social, spiritual and cultural attachments to forests, whether for traditional needs, provision of wood and non-wood forest products, a source of income and job security, or for tourism and recreation.

People also value forests for broad environmental reasons, including for biodiversity, clean air and water, carbon storage and sequestration, and as a source of renewable resources. Community consultation for the renewal of the NSW RFAs has revealed further potential alternative uses of forests in the state. There was significant interest in using creating additional national parks for ecotourism in areas including Lismore and Bateman's Bay. This could, however, also limit the range of social benefits as the recreational activities able to be undertaken in areas set aside for low impact ecotourism, may be limited when compared to State forests.

Future RFA five-yearly reviews will be focussed on outcomes and the objectives of the NSW RFAs. Monitoring and reporting arrangements will also be strengthened and streamlined, and where possible indicate the impact of management arrangements.

The varied NSW RFAs will continue to ensure New South Wales' forests remain accessible for a range of uses, and support and deliver social benefits. The renewed NSW RFAs will continue to provide an adaptive framework that can incorporate new information and changes in community attitudes and circumstances, which will maintain and enhance social values into the future. This demonstrates that the renewed 20 year RFAs with five year rolling extensions will maintain and enhance social values of forests in NSW.

5.Principles of Ecologically Sustainable Management

As a party to the National Forest Policy Statement, NSW is committed to the principles of ecologically sustainable development. The NSW RFAs define Ecologically Sustainable Forest Management (ESFM) as 'forest management and use in accordance with the specific objectives and policies for ecologically sustainable development as detailed in the National Forest Policy Statement'.

The three NSW RFAs include the following five ESFM principles[96]:

1. Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate
2. Ensure public participation, access to information, accountability and transparency in the delivery of ESFM
3. Ensure legislation, policies, institutional framework, codes, standards and practices related to forest management require and provide incentives for ecologically sustainable management of the native forest estate
4. Apply precautionary principles for prevention of environmental degradation
5. Apply best available knowledge and adaptive management processes.

This section includes analysis of the following Montréal Process indicators:

- Indicator 7.1a – Extent to which the legal framework supports the conservation and sustainable management of forests
- Indicator 7.1b – Extent to which the institutional framework supports the conservation and sustainable management of forests
- Indicator 7.1c – Extent to which the economic framework supports the conservation and sustainable management of forests
- Indicator 7.1d – Capacity to measure and monitor changes in the conservation and sustainable management of forests
- Indicator 7.1e – Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services
- Indicator 3.1.a: – Scale and impact of agents and processes affecting forest health and vitality
- Indicator 5.1a – Contribution of forest ecosystems and forest industries to the global greenhouse gas balance

Management of the formal reserve system

The NPW Act sets out the framework for managing protected areas, including forest ecosystems, in NSW. The objects of the NPW Act are: the conservation of nature, the conservation of objects, places and features of cultural value in the landscape, fostering

[96] See appendix 5 for full definitions of the ESFM principles found in the NSW RFAs

public appreciation of nature and cultural heritage, and providing for the management of land preserved under the NPW Act.

The NPW Act includes several categories of protected area, which allow different levels of sustainable visitor use. Reserve categories include national parks, historic sites, state conservation areas, regional parks, karst conservation reserves, nature reserves and Aboriginal areas. Permissible activities in these reserves are determined by a set of management principles for each reserve category and by plans of management which must be prepared for each reserve.

The NPW Act outlines the functions of the Chief Executive of the NPWS relating to reservation of land including proposals for adding land to the reserve system. In considering proposed additions, the Chief Executive must have regard to whether the proposal is consistent with the establishment of a comprehensive, adequate and representative reserve system.

Management of State forests: IFOAs

The Forestry Act provides that the Minister for Forestry and Lands and the Minister for the Environment may jointly make an IFOA. An IFOA integrates the regulatory regimes for environmental planning and assessment, for the protection of the environment and for threatened species conservation. It describes the forestry operations covered by the approval, and sets out conditions subject to which those operations are to be carried out. The IFOAs include licences issued under the POEO Act, the TSC Act and the FM Act.

The EPA's compliance program

The EPA monitors FCNSW's native forestry operations to ensure they comply with the conditions in the IFOAs. The EPA's reports annually on the compliance results. The EPA also undertakes regular proactive audits which aim to identify good and poor forestry practices. In addition, the EPA conducts investigations when non-compliances are identified. The EPA regularly responds to questions and concerns raised by the community, which sometimes result in detailed investigations. The EPA's regulatory program includes:

- Monitoring, assessing and reporting on compliance with the conditions in IFOAs, including targeted audits and investigations
- Periodic reviews of compliance strategies
- Development of guidelines and procedures for forestry operators
- Responding to incidents reported by the community.

EPA staff have expertise in environment protection, threatened species, soil, water, policy and regulation. They work closely with specialists in science and ecology, and legal services to audit compliance with IFOAs.

FCNSW's management of forests

FCNSW's management of State forests is certified to the Australian Standard for Sustainable Forest Management (AS4708–2013)[97]. This standard has been recognised through the international Programme for the Endorsement of Forest Certification (PEFC), which states that: 'PEFC promotes this independent certification and provides assurance mechanisms to demonstrate to consumers that the wood used in their products comes from sustainably managed forests'[98].

FCNSW's Environmental Management System (EMS) sets the framework for achieving and continually improving its environmental performance by systematically measuring and monitoring performance. The EMS is currently certified to ISO 14001:2004 (Environmental management systems).

FCNSW's Forest Management Plans[99] (FMPs) include ESFM commitments and ESFM management outcomes.

The Plantations and Reafforestation (Code) Regulation 2001[100] (NSW) (PR Code) contains standards for plantation establishment and management and for harvesting operations on authorised plantations.

In addition, FCNSW prepares an annual Sustainability Supplement to its annual report, which reports on many indicators which demonstrate ESFM.

Private forests

In NSW, PNF is currently regulated under the Forestry Act, the *Local Land Services Act 2013* (NSW) (LLS Act) and the BC Act. PNF operations require an approved private native forestry plan under the Forestry Act and must comply with the PNF Code.

The PNF Code is an important component of the regulatory framework for the ecologically sustainable management of PNF operations. The PNF Code sets minimum operating standards for harvesting in private native forests.

The PR Code contains standards for plantation establishment and management and for harvesting operations on authorised plantations.

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[97] Standards Australia 2013, *Home*, accessed July 2017 www.forestrystandard.org.au/

[98] PEFC 2017, *Requirements & Criteria*, accessed July 2017, www.pefc.org/standards/sustainableforest- management/requirements-criteria

[99] FCNSW 2016h, *Forest Management Plans*, accessed 9 November 2016, www.forestrycorporation.com.au/management/sustainable-forest-management/esfm

[100] DPI n.d., Plantation forestry, accessed 30 July 2018, https://www.dpi.nsw.gov.au/forestry/forestry-operations/plantation-forestry

Indicator 7.1a Extent to which the legal framework supports the conservation and sustainable management of forests

This indicator outlines the support that the legal system gives to the sustainable management of forests. A legal system that ensures transparency and public participation in policy and decision-making processes supports the continuous improvements in sustainable forest management.

Forest management in NSW is subject to both Commonwealth and state laws which have evolved as a result of ongoing work to improve the balance between environmental and economic demands, and in response to other factors affecting resource availability, and economic and social needs.

The NFPS, signed by the Commonwealth, and state and territory governments, has underpinned Australian forest policy. This Statement outlines agreed objectives and policies for the future of Australia's public and private forests. It aims to coordinate forest management while maintaining the tradition of managing public and private native forests for multiple uses.

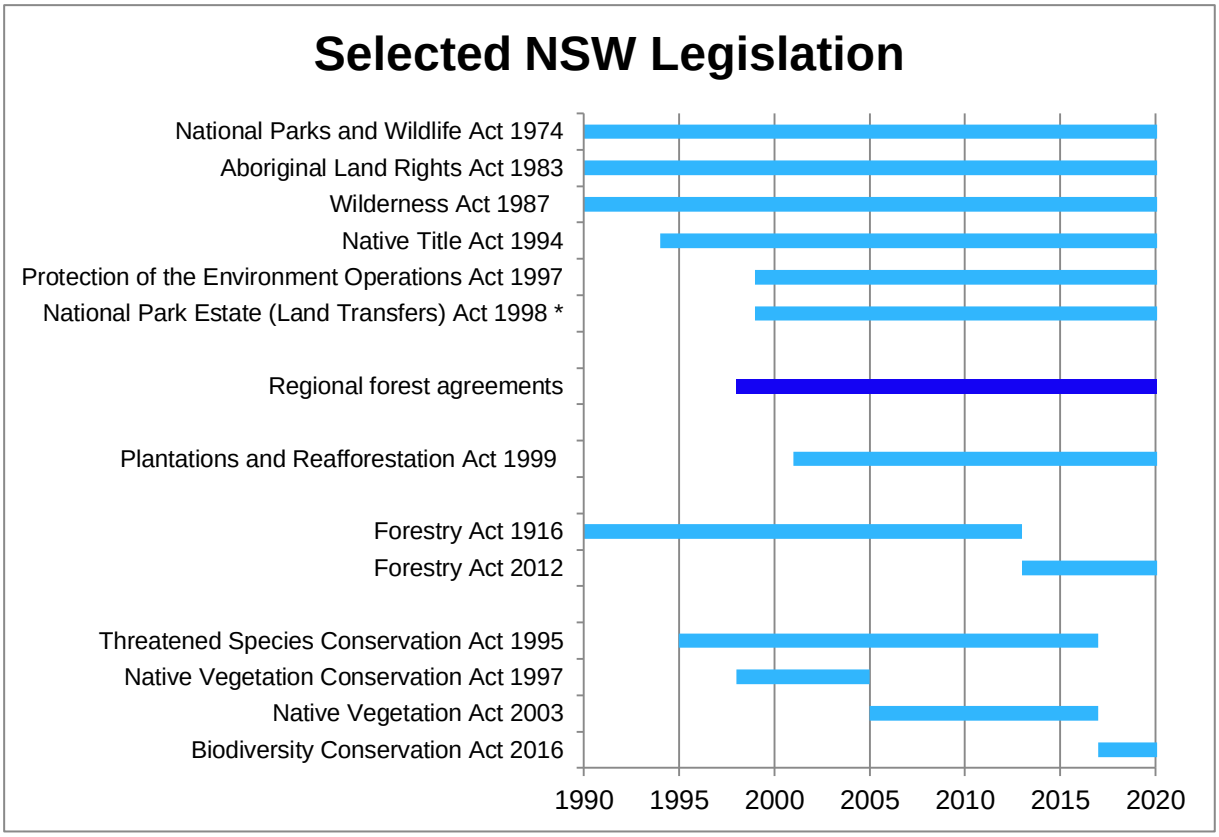
Commonwealth Legislation

Commonwealth legislation that supports the conservation and sustainable management of forests includes:

- The EPBC Act – encapsulating and promoting the principles of ecologically sustainable development, and providing for assessment of likely significant impacts to nationally protected matters by the Commonwealth Minister for the Environment.
- The *Export Control Act 1982 (Cth)* – which establishes a broad framework under which goods for export are regulated, recognises RFAs in allowing unprocessed wood and woodchip export when sourced from native forestry operations in an RFA region. This is also permitted from plantations which have an approved Code of Practice to satisfactorily protect environmental and heritage values.
- The RFA Act – which legislates for the creation and operation of RFAs. These agreements provide a streamlined approach to satisfying Commonwealth environmental legislative requirements for conducting sustainable productive forest management.

NSW Legislation

NSW legislation relating to the conservation and sustainable management of forests on public and private lands in NSW has evolved and continues to evolve including the NPW Act, PR Act, Forestry Act, BC Act, *Wilderness Act 1987* (NSW) and the LLS Act. Some of these acts have remained in force (with amendment) over the life of the current NSW RFAs, while others have been the product of major reform to provide contemporary settings. This evolution is shown in **Figure 5.1**.



* Formerly known as the Forestry and National Park Estate Act 1998

Figure 5.1 Evolution of key legislation affecting sustainable forest management in NSW

National Parks and Wildlife Act 1974

The *NPW Act* regulates forest management within national parks, nature reserves and other conservation reserves, which constitute the majority of the NSW NPWS estate. The NPW Act also provides for management of Aboriginal land and objects.

Wilderness Act 1987

The *Wilderness Act 1987* (NSW) creates a management overlay for land that is generally in pristine condition. Wilderness in NSW is declared over existing nature conservation reserves, although it can be applied to any form of land tenure.

Protection of the Environment Operations Act 1997

The POEO Act commenced operation in 1999, repealing the *Clean Air Act 1961* (NSW), the *Clean Waters Act 1970* (NSW), the *Environmental Offences and Penalties Act 1989* (NSW), the *Noise Control Act 1975* (NSW), and the *Pollution Control Act 1970* (NSW). The POEO Act covers environmental protection policies, licensing, regulation, investigation and enforcement activities.

Plantations and Reafforestation Act 1999

In 2001, the PR Act commenced. The PR Act promotes and facilitates the development of timber plantations on essentially cleared land. It provides a streamlined and integrated

scheme, for the establishment, management and harvesting of timber and other forest plantations, consistent with the principles of ecologically sustainable development. The PR Act was amended later to clarify and improve the process for authorising plantations, and the enforcement and compliance provisions within it. The PR Act regulates both softwood and hardwood plantations on all tenures to support the sustainable development of plantation forestry throughout NSW.

Biodiversity Conservation Act 2016 *and* Local Land Services Act 2013

In 2005, the former *Native Vegetation Act 2003* (NSW) (NV Act) replaced the *Native Vegetation Conservation Act 1995* (NSW), introducing changes to end broad scale land clearing and aiming to give greater certainty to farmers and industry.

In June 2014, the Independent Biodiversity Legislation Review Panel was commissioned to conduct a comprehensive review of the NV Act, TSC Act, *Nature Conservation Trust Act 2001* (NSW) and those parts of the NPW Act that relate to native plants and animals and private land conservation.

The NSW Government accepted all 43 recommendations of the Independent Biodiversity Legislation Review Panel and implemented an integrated package of reforms to deliver on commitments to cut red tape, facilitate sustainable development and conserve biodiversity.

As a part of these reforms, the NV Act and the TSC Act were repealed. Provisions regulating clearing of native vegetation in rural areas are now contained in a new part 5A of the LLS Act, and provisions in relation to the private native forestry are contained in a new part 5B of the LLS Act.

Consequently, a BC Act now supports sustainable development and productive farming that responds to environmental risk through a more balanced approach to land management and biodiversity conservation in NSW. This affects sustainable forest management in the areas of private native forestry and plantations

The LLS Act provides a new regulatory framework for the management of native vegetation in NSW to streamline the process for providing private native forestry advice, approvals and extension services for landholders.

Forestry Act 2012

The Forestry Act regulates forest management on Crown-timber land, including State forests and provides for dedication, management and use of State forests and other Crown-timber land for forestry and other purposes. With the repeal on the NV Act, a new Part 5C was inserted to accommodate provisions relating to private native forestry that were previously contained in that Act, which has since been transferred to Part 5B of the LLS Act.

Commencing in 2013, the Forestry Act strengthened the governance arrangements and commercial viability of the then Forests NSW by establishing it as a State-owned corporation—the *Forestry Corporation of New South Wales*. It modernised the former *Forestry Act 1916* (NSW), made consequential amendments to a number of associated Acts, and repealed the *Timber Marketing Act 1977* (NSW) and part of the former *Forestry and National Park Estate Act 1998* (NSW).

The Forestry Act provides for an IFOA for forestry operations on Crown-timber land, including State forests. An IFOA provides the formal approval for and conditions that apply to the undertaking of native forest harvesting activities on Crown-timber land. An IFOA integrates the regulatory regimes for environmental planning and assessment, protection of the environment and threatened species conservation. The IFOAs allow FCNSW to conduct compliant forestry operations consistent with the conditions of relevant licences issued under these other Acts. The IFOAs also include non-licence conditions relating to forestry and logging operations, ongoing forest management, ancillary road construction and other activities.

The NSW Government is currently implementing further changes under its planned biodiversity reforms.

A number of other acts and legal instruments such as Regulations supporting the Acts, codes such as the PNF Code, and NSW planning policies such as the NSW State Environment Planning (Vegetation) Policy 2017, forest agreements and integrated forest operations approvals, also form part of the NSW forestry legal framework.

Other NSW statutes may also impact upon specific forest management activities such as those related to protection of the environment, fisheries management, control of feral animals or work health and safety management.

Indicator 7.1b Extent to which the institutional framework supports the conservation and sustainable management of forests

This indicator examines the institutional frameworks that support sustainable forest management. Institutional frameworks provide mechanisms for engagement of the wider community in the process of continuous improvement and sustainable forest management.

This includes institutional and administrative arrangements that have been put in place for enforcement and compliance with the legal regulatory framework, decision-making in relation to forestry resource management, and community engagement in the broader process of sustainable forest management.

The information outlines NSW Government's overarching vision and strategic plan for sustainable forest management, the roles and responsibilities of relevant NSW agencies and their respective policy mechanisms that contribute towards achieving this vision.

NSW Forestry Industry Roadmap

The 2016 NSW Forestry Industry Roadmap is the NSW Government's strategic action plan to support its vision of a stronger, ecologically sustainable and more competitive forestry industry. The Roadmap outlines a triple bottom line approach to achieving social, ecological (environmental) and economic sustainability through four priority pillars. Under each of these pillars, there are clear actions the NSW Government will implement.

1. Regulatory modernisation and environmental sustainability

The NSW Government is committed to a modern regulatory framework that ensures ecological (environmental) sustainability of NSW forests and balances economic benefits with community expectations through best practice regulation.

The NSW Government has committed to reviews of a range of institutional arrangements over the short, medium and long term to achieve best practice regulation. This includes NSW Government's commitment to ensure no erosion of environmental values and no net change to wood supply in remaking of the four current IFOAs covering the RFA regions into one coastal IFOA. IFOAs are being renewed to improve clarity and enforceability of environment protection conditions, and deliver a contemporary regulatory framework that is fit for purpose. A review of the PNF Codes is also being undertaken, which is a key instrument for guiding PNF operations in NSW that sets the minimum operating standards for wood harvesting in private native forests.

2. Balancing supply and demand

The NSW Government aims to ensure that decisions on balancing resource supply and demand are based on evidence and robust planning, and also provide greater certainty of resource supply for industry to plan investment, recruit and retain employees, and build their business with renewed confidence.

3. Community understanding and confidence

The NSW Government seeks to further build on community engagement though consultation to deliver and enforce a credible, effective and transparent forestry regulation and framework, and to increase community confidence that the forestry industry is sustainable,

complies with requirements of the regulatory framework, and is a supplier of wood and non-wood forest products from legal and ecologically sustainable sources.

4. Industry innovation and new markets

The carbon economy presents challenges and opportunities for NSW. The forestry industry can play an important role in storing carbon and displacing use of higher carbon materials. This may be aided by the development of innovative biomass and bioenergy products, and the establishment of methods for carbon crediting. The Roadmap will ensure the forestry industry is well placed in the global market to capitalise on these opportunities and contribute to Australia's low carbon economy.

The NSW Forest Industries Taskforce was established in 2012 to provide members of the softwood and hardwood timber industries with an opportunity to consider issues affecting those industries and provide advice to the Minister responsible for forestry. The NSW Forest IndsutriesTaskforce meets four times a year, is currently chaired by the Parliamentary Secretary for Natural Resources, and consists of 15 other members.

Relevant NSW Agencies – roles and policy mechanisms

The following NSW agencies work towards providing a seamless institutional framework that supports the conservation and sustainable management NSW forested estate.

Roles and responsibilities of each of these agencies, including their respective regulatory, decision-making and other policy mechanisms, are broadly outlined below.

Office of Environment and Heritage (OEH)

OEH is responsible for managing the nature conservation reserve estate, including the native forests which lie within it. It advises the NSW Minister for the Environment and administers programs to protect threatened species and communities.

The NSW OEH has adopted an EMS to ensure a consistent approach to the many measures it implements to minimise environmental impacts of managing the nature conservation reserve estate.

The EMS is comprised of the Park Management Framework (PMF) and the Park Management Program (PMP) as well as management elements such as guidelines and legislation. The PMF and the PMP are complementary. Together, they form an EMS that is consistent with the Australian Standard for Environmental Management Systems (ISO 14001:2004).

The PMF provides a holistic and strategic approach to OEH's environmental policy, plans and actions. In developing the PMF, OEH used the ISO 14001: 2004 Self-Assessment Checklist and adapted the IUCN's Management Effectiveness Framework.

This model supports continual improvement in the management of NSW's nature conservation reserve estate. The PMF ensures that all key elements required in a management cycle are considered. The PMF is delivered by the PMP, which coordinates the major park management programs.

Department of Primary Industries (DPI)

DPI (Forestry) advises the NSW Minister for Lands and Forestry and the NSW Minister for Primary Industries on forest policy, undertakes forest science research, and is responsible for the development and application of plantations policy and regulation.

DPI (Fisheries) advises the NSW Minister for Primary Industries on matters related to the FM Act including those related to threatened species licences, which form part of the IFOAs.

Plantation operations on both Crown land (including State forests) and freehold land are regulated and supported by DPI. Plantation forestry involves planting trees which may be managed for commercial timber production or environmental purposes.

DPI NSW forest research group carries out the majority of its forest research projects through a service level agreement with FCNSW. Improved information derived from research results drives the adaptive management and continuous improvement process that is critical to ecologically sustainable forestry management. These projects are reported through the publication of the FCNSW's Annual Report.

Regulation occurs through the PR Act, and the PR Code. Plantations officers provide support and advice to the industry, both through the authorisation process and at other times. The authorisation process for individual plantations or plantation estates involve a single application, replacing the need for multiple licences and permits, and includes a streamlined assessment process with pre-application inspections undertaken to resolve issues in advance of formal application.

NSW Environment Protection Authority (EPA)

EPA is the primary environmental regulator in NSW. It is an independent statutory body, responsible for regulating native forestry operations on both public (Crown) land and private land in NSW. The EPA monitors the operations of FCNSW to ensure that native forest operations on public land are undertaken in accordance with the IFOAs and their licences. It also monitors compliance[101] of private landholders with the requirements of their PNF Plans[102].

National Parks and Wildlife Service

The NPW Act undertakes functions of the Chief Executive of the NPWS relating to reservation of land and the powers and functions of the NPWS. One of the functions of the Chief Executive, under section 7 of the NPW Act, is to consider proposals for the addition of land to the nature conservation reserve estate. In considering any proposals, the Chief Executive is to have regard to criteria including whether the proposal is consistent with the establishment of a CAR reserve system.

Under the NPW Act, the Chief Executive of NPWS is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves in NSW. State conservation areas, karst conservation reserves and regional parks are also administered under the NPW Act.

Functions and duties of the National Parks and Wildlife Advisory Council and the Aboriginal Cultural Heritage Advisory Committee are also outlined in the NPW Act. Advisory groups provide stakeholder advice to the Minister and Chief Executive on achieving the objects of the NPW Act.

[101] Monitoring and compliance is in the process of being transferred to NSW Local Land services
[102] Under the BC Act, private native forestry plans replace Private vegetation plans

Forestry Corporation of NSW

FCNSW is a SOC established by the Forestry Act, with the principal objective of being a successful business operating in compliance with the principles of ecologically sustainable development.

Functions of FCNSW include carrying out forestry operations on Crown-timber land, selling, supplying or processing wood, establishing and maintaining plantations, and managing forestry areas. This allows forestry operations to be undertaken by an entity that has neither a regulatory role nor responsibility for policy development and implementation. As noted above, DPI (Forestry) is responsible for forestry industry policy advice.

FCNSW produces a corporate Annual Report which is tabled in the NSW Parliament. In addition, FCNSW publicly reports its performance against a suite of sustainability indicators consistent with reporting commitments under the Montréal Process, the FAs and IFOAs. FCNSW also provides information on annual sustainability indicators within its Annual Report.

Independent Pricing and Regulatory Tribunal

The Premier may request advice on issues related to forest management from the Independent Pricing and Regulatory Tribunal (IPART) or the Natural Resources Commission (NRC).

IPART is an independent statutory authority which advises the NSW Government on issues relating to the level and structure of prices, industry structures and competition, particularly with regard to NSW Government services. The NSW Government may ask IPART to undertake investigations. IPART also undertakes a range of regulatory and licensing functions.

Natural Resources Commission

The NRC is an independent statutory authority. Section 12 of the *Natural Resources Commission Act 2003* (NSW) provides that the NRC is to provide the NSW Government with independent advice on natural resource management. For example, in 2009, the Premier asked the NRC to recommend sustainable land use and water requirements in the Riverina red gum and south west cypress forests.

Local Land Services

The NV Act was repealed in August 2017 and the provisions regulating the clearing of native vegetation in rural areas are now contained in a new Part 5A of the LLS Act.

Part 5A of the LLS Act is administered by NSW Local Land Services. However, the OEH has responsibility for native vegetation mapping and compliance under that Part of the LLS Act.

Administration of PNF authorisations is currently being transferred from EPA to LLS as part of legislative reforms in forestry.

Indicator 7.1c Extent to which the economic framework supports the conservation and sustainable management of forests[103]

This indicator examines the extent to which government policies support the conservation and sustainable management of forests. Government policies on investment, taxation and trade influence the level of investment in forest conservation, forest establishment and timber processing.

Many of the factors that affect the economic framework in relation to sustainable management of forests occur at the state or national level. These factors have been actively reported on over the life of NSW RFAs in five yearly SOFRs, as well as in NSW reporting such as FA annual reporting.

Investment

Australia has stringent controls over land use changes and industrial development that aim to protect environmental cultural and amenity values. These controls generally apply equally to all land use change and developments. Provided those values are protected, private investment in the forest and forest products industries in Australia is generally free from industry-specific legal and regulatory constraints. Australia's foreign investment policy aims to encourage foreign investment that is consistent with community and economic interests. Foreign investment in Australia is regulated primarily through a regime established under the *Foreign Acquisitions and Takeovers Act 1975* (Cth).

Competition

Australia's National Competition Policy has led to several reforms that affect the competitive climate for Australian forest-based industries, including that commercial state-owned forest entities be competitively neutral with the private sector. FCNSW, a SOC, was established in 2012 and functions as a commercial entity in the competitive market place.

Taxation

Prior to 2002, the tax treatment of forestry activities as primary production created unintended inequities for small scale private investments in forestry due to the seasonal and long-term nature of forestry, and its associated irregular cash flows. Key issues were:

- Inability to offset upfront establishment payments in managed schemes in the payment year
- Immediate tax liability created by forward contracts for timber harvesting rights
- Tax bracket creep with no mechanism to average large harvest incomes over the plantation lifecycle.

[103] Prior to 2005 effects of the economic framework on sustainable forest management was reported under indicators which were then enumerated as 7.3a and 7.3b.

In 2002, a 12-month prepayment rule was introduced to address the offset issue for investors in prospectus based forestry schemes. This was the only significant tax treatment for forestry investments in managed schemes that was different to investment in other sectors at that time.

Managed Investment Schemes

In July 2007, new taxation arrangements for investment in forestry managed investment schemes came into effect as a result of Plantations for Australia: the 2020 Vision, a strategic partnership between the Australian, state and territory governments and the timber industry. The aim was to enhance regional wealth creation and international competitiveness by increasing Australia's plantation resources by trebling the 1997 area of commercial tree crops by 2020.

Following the Global Financial Crisis and collapse of several large managed investment schemes in 2009 and 2010, these schemes have become a less important financial mechanism for plantation expansion.

Adjustment programs

A joint NSW – Commonwealth adjustment package was made available to assist forest industry businesses and workers in the transition to new arrangements under the NSW RFAs. This comprised $160 million for those directly affected by the outcomes of the RFAs. This included businesses and workers:

- directly involved in the native forest based industry sector
- directly dependent on the native forest industry, (> 50% of their income from direct supply of goods or services to the forest industry), and rendered financially unviable as a result of RFA decisions.

The adjustment package included:

- Rescheduling Assistance
- Labour Adjustment Package
- Restructuring Assistance
- Business Exit Assistance

Trade policies

Throughout the RFA period, Australian trade policy has continued to support trade liberalisation to improve access for Australian exports in global markets, as well as Australian access to imports. Improved market access has been facilitated through global and multilateral efforts and through the use of free trade agreements (FTAs). Australia is a member of the World Trade Organization, which facilitates multilateral trade negotiations and ensures that the rules of international trade are correctly applied and enforced. FTAs are increasingly important to the forest-based industries.

Investment in environmental services

The Australian Government's Emissions Reduction Fund (ERF), established under the *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth), allows businesses to earn carbon credits for

storing carbon or reducing greenhouse gas emissions. ERF project participants have an opportunity to sell their emissions reductions to the Government through competitive reverse auctions.

Effectiveness of the economic framework

The effectiveness of the economic framework was not explicitly assessed on a holistic basis prior to SOFR 2011. The inclusion of these metrics with data from 2006 provided a baseline for future analysis of the effectiveness of the economic framework in relation to production forests, management of conservation reserves, bushfires and Indigenous managed lands.

The majority of measures remained consistent between 2006 and 2016 with the exception of understanding and processes relating to indigenous managed land, and conservation reserve processes which showed decline. Notably no items were ranked below partially effective, and no items showed significant improvement in ranking over the period.

Table 5.1 Assessment of understanding, planning, inputs, processes, outputs and outcomes associated with conservation and sustainable management of forests 2001-2016

Category	**Production forests**		
Year	**2001-2006**	**2006-2011**	**2011-2016**
	Assessment grade and recent trend		
Understanding	N/A	Very effective ↑	Very effective –
Planning	N/A	Very effective –	Very effective –
Inputs	N/A	Effective –	Effective ↓
Processes	N/A	Effective –	Effective –
Outputs and outcomes	N/A	Effective ↑	Effective –
Source		Australian State of the Environment (SOE) report 2011 p359	Australian SOE report 2016

Category	**Bushfire**		
Year	**2001-2006**	**2006-2011**	**2011-2016**
	Assessment grade and recent trend		
Understanding	N/A	Effective ↑	Effective ↑
Planning	N/A	Effective ↑	Effective ↑
Inputs	N/A	Partially effective ↑	Partially Effective –

Processes	N/A	Very effective –	Very effective –
Outputs and outcomes	N/A	Effective –	Effective ↑
		Australian SOE report 2011 p359	Australian SOE report 2016

Category	**Management of conservation reserves**		
Year	**2001-2006**	**2006-2011**	**2011-2016**
	Assessment grade and recent trend		
Understanding	N/A	Very effective –	Very effective –
Planning	N/A	Effective ↑	Effective ↑
Inputs	N/A	Effective ↓	Effective ↓
Processes	N/A	Very effective –	Effective –
Outputs and outcomes	N/A	Effective ↓	Effective –
		Australian SOE report 2011 p359	Australian SOE report 2016

Category	**Indigenous managed lands**		
Year	**2001-2006**	**2006-2011**	**2011-2016**
	Assessment grade and recent trend		
Understanding	N/A	Effective ↑	Partially effective –

Planning	N/A	Partially effective –	Partially effective –
Inputs	N/A	Partially effective ↓	Partially effective –
Processes	N/A	Effective –	Partially effective –
Outputs and outcomes	N/A	Partially effective ↑	Partially effective ↑
		Australian SOE report 2011 p359	Australian SOE report 2016

Notes:

1. Recent trend refers to the direction of change at the time of assessment (End of Period):

↑ improving;

↓ deteriorating;

– stable.

Indicator 7.1d Capacity to measure and monitor changes in the conservation and sustainable management of forests

This indicator examines the capacity of forest owners and agencies to measure and monitor changes in the forest and the impact of forest activities. A comprehensive measurement and monitoring programme provides the basis for forest planning to support sustainable management.

Biodiversity is measured in terms of genetics, species and ecosystems. FCNSW manages its softwood plantation estate primarily for wood production. There are often important opportunities for biodiversity conservation within plantations.

Forestry Corporation of NSW

FCNSW is the SOC that carries out forestry operations in NSW State forests and other Crown-timber lands. It has a Forest Management Policy , which outlines its commitments to conserving and advancing a range of forest values such as biodiversity, forest productivity and carbon sequestration in keeping with the principles of sustainable forest management. The policy is delivered through the Forestry Management System (FMS) that is available on FCNSW website.

The FMS includes processes and procedures that guide day-to-day operations by outlining how FCNSW will plan operations, implement procedures, audit and report operations and review performance to achieve sustainable forest management.

The FMS is tailored to the distinct requirements of each of the organisation's key activities that are undertaken by the operational divisions include wood harvesting, plantation establishment and tending, weed and pest control, prescribed use of fire, road maintenance and construction. These activities are undertaken with specific controls that aim to minimise risks. The FMS ensures FCNSW has controls in place to minimise impact of its key activities on the environment and to continuously improve its operations through regular audits and reviews of its performance management systems and processes.

Australian and International Standards

Both FCNSW's Softwood Plantations Division and Hardwood Forests Division are independently certified to the AS4708:2013. This Australian Standard® provides forest managers with economic, social, environmental and cultural criteria and requirements that support management of forests for products and services.
The certification provides objective assurance to FCNSW customers and stakeholders that it is a sustainable and effective forest manager. Certification to AS 4708:2013 also allows end users to identify certified timber at the time of purchase, providing customers with a guarantee that the timber they are buying has been grown and harvested legally from a sustainable forest.

Both divisions are also certified under ISO 14001:2004 for the EMS that they have in place to minimise environmental impacts of their management of native forest and plantations.

Data Collection

FCNSW assesses existing data when planning forestry activities to identify whether further information needs to be collected to assess site-specific impacts of the proposed activity and develop any amelioration measures. FCNSW maintains large and complex databases including an extensive geographic information system (GIS) and a stand record system. These are used to collect, process, store, analyse and report forest information required for planning. Its GIS libraries contain a suite of information on cadastre, mapping context, topography, the environment, forest disturbances and forest management. Other databases linked to the GIS, and which can be represented spatially, include timber inventory, flora and fauna surveys and species location, Aboriginal cultural heritage sites and non-Aboriginal cultural heritage items.

Where existing information is inadequate, additional surveys may be required. Additional information may relate to inventory estimates, flora and fauna, cultural heritage, aquatic habitat, soil and water. All additional data collected is regularly incorporated into FCNSW's databases to ensure strategic and operational planning are based on the most up-to-date information.

New technologies to capture and record data

With the advent of new technologies, particularly mobile devices such as tablets and smart phones, the ability to capture and record information is changing. FCNSW aims to embrace and develop this technology to improve management and business outcomes. To this end, FCNSW has developed a mobile app (application) for staff that is used to capture environmental, planning and incident related information in the field via mobile devices. The app improves data capture through its ease of use, accuracy and the ability to automatically provide a spatial reference which is linked to the GIS. FCNSW will continue to investigate opportunities to improve planning through the use of technology.

Stand Record System

FCNSW maintains a stand record system, which is a spatially-linked record of all plantation areas, site treatments, wood harvesting events and yield monitoring. It provides a snapshot of the current state of the forest and is the starting point for all modelling of future yield predictions.

Estate Modelling

FCNSW calculates the amount of wood available now and into the future using a predictive tool that allows it to evaluate multiple objectives and to explore management options to meet a number of different constraints. Long-term yield predictions based on this modelling are critical for efficient management of plantation forests, policy formulation, strategic planning, and operations management.

FCNSW uses estate modelling tools to determine the areas that can be scheduled for wood harvesting while maintaining a sustainable supply level. Among other things, modelling considers supply commitments, market and product demand, the estimated capacity of the forest, the ability of the forest to support harvesting operations during periods of wet weather and logistical issues.

Estate modelling allows FCNSW to optimise the value of the resource within supply commitment constraints over a timeframe of approximately 70 years, optimise volume of the resource to meet commercial objectives, and identify opportunities for further sales and timber industry growth.

The predictive nature of estate modelling is balanced by real world checks, including on-going review of whether silvicultural strategies met their objectives and comparison of predicted and actual harvest yields. FCNSW implements plot measurement programs that span strategic through to operational (pre-harvest) inventory and also completes assessments for operational control and biometric analysis.

For this to work, growth models and other forest information systems must be compatible and linked efficiently and this is done through a GIS, inventory databases, growth models and yield scheduling and optimising software. FCNSW runs strategic models as required, reviews stratification of planted forest areas to assist future sampling and modelling, refines harvestable area predictions, measures inventory plots in accordance with the inventory framework, maintains the permanent growth plot data system, maintains yield tables and growth models with additional field data, improves growth and mortality models, and

monitors and incorporates progressive yield data between five yearly review periods. FCNSW also has an ongoing program to improve estate modelling.

NSW Office of Environment and Heritage

The OEH, works with the community in protecting NSW's environment and heritage, which includes the natural environment, Aboriginal country, culture and heritage, and built heritage. OEH supports the community, business and government in protecting, strengthening and making the most of a healthy environment and economy in NSW.

New South Wales is home to an amazing diversity of plants, animals and ecosystems – collectively known as biological diversity or biodiversity. There is a need to manage and protect this biodiversity to support the health of the environment and of our communities. Progress on the implementation of the four State-based FAs and IFOAs is reported annually. The reports provide a snapshot of the results of monitoring ecologically sustainable forest management criteria and indicators, wood supply, compliance with IFOAs for each region, and achievement of milestones defined in the four NSW FAs and the IFOAs.

Biodiversity Act 2016

The NSW Government has introduced new legislation for biodiversity conservation and native vegetation management, including the BC Act. One of the main goals of the BC Act is to conserve biodiversity. To help assess the performance of the new legislation, a monitoring program will be established by OEH to assess the status of biodiversity in NSW at the beginning of the BC Act – the baseline – and then at recommended intervals, including contributing to the five-year review of the BC Act.

Biodiversity Baseline Assessment

Biodiversity is the variety of living animal and plant life from all sources, and includes diversity within and between species, and diversity of ecosystems. The Biodiversity Baseline Assessment is a method and program for assessing and reporting on the status and trends in biodiversity and ecological integrity in NSW, as required by the BC Act. It includes all plants, animals, insects, fungi and micro-organisms.

The idea of ecological integrity is central to the maintenance of biodiversity. Ecological integrity is the ability and capacity of natural areas to maintain biodiversity now and in the future. Indicators of biodiversity are statistical measures which help scientists, managers and policy-makers understand the current status of biodiversity and how likely it is to change in the future.

OEH uses scientifically sound and cost-effective methods to gather the necessary information to create a snapshot of the status of all plants and animals across NSW. This includes the analysis of satellite images to assess the size and condition of natural areas in NSW where different types of plants and animals occur. In some cases, existing long-term data sets for particular areas or species can be used to understand how the numbers of species or their habitats have been changing over time.

The method identifies key indicators for biodiversity in NSW. These indicators measure different aspects of biodiversity, including how well our efforts at protecting and restoring threatened species are working, how many species are expected to survive in the future, how

previous loss of habitat has affected biodiversity, the condition of existing natural areas, how well-connected these are to each other, and the level of pressures and threats to biodiversity. These state-wide assessments will be complemented by case studies using data from on-ground monitoring programs in important areas for biodiversity or for important species or ecosystems.

OEH partnered with CSIRO and other experts from the Australian Museum and Macquarie University in developing the peer-reviewed methodology and identifying the best indicators. OEH will publish the results of the biodiversity baseline assessments in a NSW Biodiversity Outlook Report, which will be subject to peer-review.

Access to NSW Environmental Data

The NSW Government's portal for Sharing and Enabling Environmental Data (SEED) has been developed with and for the community of NSW, is a central place where anyone can access, contribute and visualise NSW environmental data. All data that was published via this open data portal is now available in SEED.

NSW government is seeking to simplify access to environmental data, establishing SEED as the primary discovery point as SEED provides a superior map viewing experience.

Department of Primary Industries

NSW Government has funded a $1.5 million feasibility study project for the DPI to develop a proposal for an ongoing Forest Monitoring program for cross tenure forest monitoring in NSW. The project would generate robust scientific data required to support and benchmark sustainable forest management practice and performance in preparation for a state wide monitoring program.

Within NSW there are 22.2 million hectares of native forest, 40 per cent privately owned, 25 per cent on leasehold land, 25 per cent in national parks and other conservation reserves and 9 per cent State forests. A new multi-value, cross tenure Forest Monitoring program would be of great value in providing a common standard for tracking the condition, productivity and resilience of forests across both private and public tenures over time.

The feasibility project would involve scoping out and developing the technical, operational, financial and resourcing aspects of a new long-term forest monitoring proposal:

- Technical – identification and prioritising of forest monitoring and measurement needs for a cross tenure Forest Monitoring program in NSW, and limitations and challenges around current data.
- Operational – clarity around data management, processing and modelling incorporating ground, LiDAR and satellite data, and production output metrics of sustainable forest management
- Financial - an important element of the feasibility project that would largely depend on the scope of a FM program, its outputs and accuracy. The feasibility project aims to quantify costs and benefits, where possible, of an ongoing Forest Monitoring program
- Resources - the feasibility project would evaluate resources required for the management and administration of a NSW-wide, cross-tenure, long-term Forest Monitoring

program, taking into account research needs and data collection capacity of relevant NSW agencies.

The project will develop a proposal for an ongoing program to measure and monitor changes in the conservation and sustainable management of forests. The new program, once developed and approved, will further enhance NSW's capacity to measure and monitor changes in conservation and sustainable management of forests in NSW.

Indicator 7.1e Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services

This indicator reports on the scientific understanding of Australian forest ecosystem characteristics and functions needed to underpin sustainable forest management. Research, inventory and the development of assessment methodologies provide the basis for sustainable forest management.

For this indicator, forestry research and development (R&D) covers research in relation to commercial management and protection of forests, including environmental and ecological considerations. It also includes forest products R&D such as production runs in mills, but not work on final product development (e.g. furniture production). This indicator is closely aligned to 6.2b which monitors the investment in, and the adoption of, new or improved technologies in forest management and in forest-based industries.

National capacity for Australian forestry R&D

While research is fundamental to supporting development and improvement in all aspects of forest management, production and sustainability, several recent publications have highlighted the significant decline in national forestry R&D capacity and capability (Kile *et al.* 2014; Turner & Lambert 2015 & 2016). Reasons for the reduction in funding for R&D associated with commercial forestry include the declining relative contribution of the forest industry to the national economy, reduced government involvement in the forestry industry, corporate restructuring, and increased international ownership.

Resource allocation for research priorities in nature conservation reserves is generally funded by state-based agencies or through universities that have received project grants, with specific and targeted interests focused on biodiversity and conservation issues. State conservation agencies are frequently being restructured and forced to having a greater reliance on securing competitive external funding.

Forest products research is broadly considered in terms of utilisation of products from forests (i.e. primary processing, pulp and paper, engineered wood products, bioenergy). National R&D capacity in this area has also declined, notably with the demise of CSIRO's contribution to wood products research. While there has been a decline in forestry R&D by government agencies, a small number of new university-based forestry and/or forest products research centres have recently been established, e.g. the Forest Industries Research Centre at the University of Sunshine Coast, or by the National Centre for Future Forest Industries at the University of Tasmania established under the National Institute for Forest Products Innovation.

Nationally, the number of staff (scientists, technicians, support staff and graduate students) involved in forestry and products research was about 276 in 2013 compared with 794 in the mid-1980s (Turner & Lambert 2016).

NSW capacity for forestry R&D associated with State Forests

Since the commencement of the NSW RFAs, the State forestry agency (previously State Forests NSW, Forests NSW, and now FCNSW) has undergone several significant changes, with subsequent consequences for the R&D program that it supported.

In 2005, the R&D capacity within the Forests NSW was transferred across to DPI. The associated full-time-equivalent (FTE) positions in forest-related R&D decreased from 36 in 2006-07 to 25 in 2010-11. This resulted in a reduction in the areas of research, for example, the loss of expertise in forest soils and nutrition and hydrology. In particular for the NSW RFAs, the restructure resulted in the reduction of scientists within the Forest Ecology team from 8 FTEs to 2 FTEs. This team focuses predominantly on research in native forests. In 2013, the number of FTEs in the Forest Ecology team increased to 3.5 FTEs, supported in part by casual employees funded through external grants.

While numbers in most forest research disciplines have diminished, some disciplines have increased, for example, forest biomass & carbon, and remote sensing. Also most of the remaining forest researchers work opportunistically in both native forests and plantations. In 2015-2016, there were 16 FTEs within the NSW DPI Forest Science team which increased to 18 FTEs with receipt of a two year grant from NSW DPI for three projects based in the UNE and LNE RFA regions. The same amount of funding for a further two years was provided in order to investigate the feasibility of a strategic, cross-tenure, multi-value forest monitoring program. The objective of a long-term forest monitoring program would be to provide robust scientific data suitable for evaluating the effectiveness and performance of forest managers in delivering sustainable forests practices, across forests included within the NSW RFAs. This addresses the NSW RFA research priority of developing appropriate mechanisms to monitor and continually improve the sustainability of forest management practices.

Under a Service Level Agreement (SLA) with DPI, FCNSW invested $1.7 million in R&D during 2017-18. This was increased to $1.8 million in a revised SLA for the period 1 July 2017 to 30 June 2019. The NSW DPI Forest Science team currently has scientific and technical expertise in forest ecology and sustainability, forest health and biosecurity, forest resource assessment and spatial modelling, carbon in forests, wood products and bioenergy, biometric and cost-benefit analysis services.

Many of the research projects recently undertaken by the NSW DPI Forest Science team are supported by external funds and conducted in collaboration with other organisations, including other State departments, Commonwealth agencies, the CSIRO and various Universities. Therefore, their projects tend not to focus on specific NSW RFAs but have multi-regional or state-level objectives.

The declines in expenditure and staffing for NSW forestry research are only part of the changes that have occurred. There has also been a reduction or loss of facilities such as regional research centres. FCNSW, for example, have closed their small research centres located in Coffs Harbour, Eden and Tumut.

NSW capacity for forestry R&D associated with National Parks and reserves

As a result of several restructures within the state agency managing NSW national parks and other conservation reserves, it has proven difficult to quantify research work that specifically focused on forests. However, research programs have included studies on biodiversity

conservation, invasive weeds and pests, and fire within native forests. All of these had implications for sustainable forest management but were not necessarily focused just on forests. More recently, the OEH established a R&D program on climate change impacts and adoption. As with the forestry R&D, many of these projects are collaborative and supported by external funding.

Forestry R&D Capacity within NSW Universities

In NSW and the ACT, there are three Universities that reported activities in forest science in 2015: the Australian National University (ANU), Southern Cross University and the University of Western Sydney.

The Fenner School of Environment and Society at the ANU undertakes research on issues related to the management, conservation and sustainability of forest ecosystems while researcher's in the Southern Cross University's Forest Research Centre investigate the ecology of native forests, as well as studying how native forests and plantations can sustainably produce wood products, environmental services and carbon. The Western Sydney University Hawkesbury Institute for the Environment operates the world's only 'free air carbon dioxide enrichment' experiment in native forest.

Review of the NSW RFA Implementation Reports for Indicator 7.1e

During the 20 year period of NSW RFAs, R&D priorities and capacity has undergone significant change. The CRAs of the forest values of the UNE and LNE RFA regions identified a number of areas requiring further research and recommended the establishment of a Research Liaison Committee to identify research priorities relating to forest management. However, the Research Liaison Committee was disbanded in 2002. Subsequently, the parties agreed to consult each other in the development of joint research projects that may affect the NSW RFAs. Unfortunately research projects undertaken were not conducted via this mechanism (NSW EPA 2017) even though an initial principle of the RFA process was that there would be coordinated research by NPWS, the then State Forests NSW and research organisations on threatened species conservation and pest and forest management. Throughout the annual Implementation Reports, there has been a dichotomy in the presentation of the narrative for Indicator 7.1e, with the two relevant agencies presenting their own information.

A chronology of the changes in this R&D environment is summarised in Appendix L of the NSW RFAs Implementation Report 2004-2014 (NSW EPA 2017). It is also noted that the length of the narrative for Indicator 7.1e decreases over time, with reference to Annual Reports or web sites produced by the two forest management agencies and provides minimal commentary on their capacity to conduct and apply R&D.

Although the annual RFA Implementation reports provide limited information on research projects, sufficient information is provided to locate lists of references published by NSW forest researchers. **Table 5.2** summarises a number of peer-review research papers or reports on NSW native forests published by forest science funded by the FCNSW. Identifying research papers related to national parks is more difficult. However, in the 2000-2001 annual implementation report, NPWS published 52 research papers relevant to forest management, and during 2001-2002 NPWS staff produced 78 research papers relevant to the conservation of native forests.

Table 5.2 Numbers of peer-reviewed papers published by researchers with study areas within NSW State forest for the periods 1998-2002, 2003-2007, 2008-2012 and 2013-2014*

	1998-2002	2003-2007	2008-2012	2013-2017
Number of peer-reviewed papers published by researchers within NSW State forest	42	62	65	35

*Source: NSW DPI Forest Science Literature Database (NSW DPI CM9 V17/2112)

References

FCNSW Annual Report 2016-2017.

Kile, G.A., Nambier, E.K.S. & Brown, A.G. (2014) The rise and fall of research and development for the forest industry in Australia. Australian Forestry 77: 142-152.

NSW EPA (2017) A report on progress with implementation of the New South Wales Regional Forest Agreements: Second and third five-yearly reviews, July 2004 to June 2014. NSW Environmental Protection Authority, Sydney.

Turner, J., & Lambert, M. (2015) Forestry and Forest Products Research Summary of Changes in Capacity 1985 - 2013. FWPA PRE338-1415

Turner, J. & Lambert, M. (2016) Changes in Australian forestry and forest products research for 1985-2013. Australian Forestry 79: 53-58.

Indicator 3.1.a: Scale and impact of agents and processes affecting forest health and vitality

This indicator identifies the scale and impact on forest health of a variety of processes and agents, both natural and human-induced. Through the regular collection of this information, significant changes to the health and vitality of forest ecosystems can be monitored and measured.

Operational aspects of this indicator involve maintaining NSW' forest ecosystem health and vitality through pest and weed monitoring and control, including insect pests, invertebrate pests, and fungal diseases. It follows the principles of ESFM, which requires that forests are managed in an environmentally appropriate, socially beneficial, and economically viable manner, and meet the needs of the present without compromising the needs of future generations[104,105].

Native forest programs

- FCNSW instigated a forest health surveillance program in 1996 that conducts annual surveys of its hardwood and softwood plantations.
- Both FCNSW and NPWS monitor and test for *Phytopthtora cinnamomi* (and associated dieback) in their native forest estates.
- Targeted aerial and ground surveys for bell miner associated dieback (BMAD) have occurred in Eden in 2002[106], northern NSW in 2004[107] and a more extensive campaign from the Manning River to Queensland border in 2015-2017[108].

None of these programs are structured to systematically assess the scale and impact of agents or processes, which would require repeated wide scale and consistent measures over the same defined sample areas.

To date there have been no such systematic surveys of the health of native forests across any forested tenure. Existing data collected by various land managers for ESFM monitoring is not suitable as it has not been coordinated for this purpose. Thus there is currently no accurate measure of the extent of negative agents across the forest estate.

The most readily available sources of data for native forest are expenditure on control efforts, and area over which these efforts were undertaken. However, this data has not been

[104] Holvert B, Muys B. 2004. Sustainable forest management worldwide: a comparative assessment of standards. International Forestry Review 6: 99–122
[105] Washburn MP, Miller KJ. 2003. FSC: Forest Stewardship Council certification. Journal of Forestry 101: 8, 10–13
[106] Jurskis V, Walmsley T. 2012. Eucalypt ecosystems predisposed to chronic decline: estimated distribution in coastal New South Wales. Bushfire Cooperative Research Centre.
[107] Carnegie AJ, Price G. 2004. Mapping BMAD in northern NSW. State Forests of NSW unpublished.
[108] Silver MJ, Carnegie AJ. 2017. An independent review of bell miner associated dieback. Final report prepared for the Project Steering Committee: systematic review of bell miner associated dieback.

reported consistently in the annual FA Implementation Reports and little quantitative or qualitative data has been included in these reports from 2010-2011 onwards.

In contrast, more comprehensive data is collected for plantation health, and there is accurate and consistent data on the area affected by damaging agents over the period of the NSW RFAs.

Monitoring of the scale and impact of agents affecting ecosystem health and vitality

From the data gathered over the RFA period, pest and disease monitoring can be seen to be more diligent on State forests than on other tenures[109]. Furthermore, monitoring on State forests was mainly concentrated on the plantation estate. Systematic forest health surveillance was conducted annually over the majority of their softwood and hardwood plantations in NSW.

In contrast, general surveillance was the main method of monitoring pests and diseases in native forest estate.

Several programs targeted monitoring and assessment of damage by specific agents, such as BMAD[5,6,7], *Phytophthora* species[e.g.110,111], and myrtle rust[112]. For *Phytophthora,* OEH developed a "Statement of intent[113]" to help manage this invasive pathogen, and in some years, had conducted surveys for *Phytophthora* of native plants listed under the TSC Act, and has developed management protocols including monitoring, wash-down facilities, and education for bush walkers and other forest users.

A range of programs targeted monitoring and control of weeds and feral animals on State forests, national parks, and other reserves.

Monitoring and control programs for feral animals in both State forests and national parks targeted pigs (*Sus scrofa*), wild dogs, feral cats, foxes (*Vulpes vulpes*), deer (*Axis axis, Cervus elaphus, Cervus timorensis, Cervus unicolor* and *Dama dama*), goats (*Capra hircus*)and rabbits (*Oryctolagus cuniculus*).

Monitoring and control programs for weeds in both State forests and national parks has targeted blackberry(*Rubus fruticosus* agg.), bitou bush (*Chrysanthemoides monilifera subsp. rotundata*), crofton weed (*Ageratina adenophora*), serrated tussock (*Nassella trichotoma*), lantana (*Lantana camara*), willow (*Salix* spp.), giant Parramatta grass (*Sporobolus fertilis*) and groundsel bush (*Baccharis halimifolia*). Expenditure on such programs is available for State forests in the RFA Annual Reports, with annual expenditure ranging from $400,000 to $1.9

[109] Protecting our national parks from Pests and Weeds, available at http://www.environment.nsw.gov.au/resources/parks/SoPPestManagement.pdf (accessed on 31 May 2018).

[110] Burgess TI et al. (2017). Distribution and diversity of *Phytophthora* across Australia. *Pacific Conservation Biology* 23:1–13.

[111] Scarlett K et al. 2015. *Phytophthora* in the Gondwana Rainforests of Australia World Heritage Area. *Australasian Plant Pathology* 44:335-348.

[112] Carnegie AJ et al. (2016). Impact of the invasive rust *Puccinia psidii* (myrtle rust) on native Myrtaceae in natural ecosystems in Australia. *Biological Invasions* 18:127–144.

[113] http://www.environment.nsw.gov.au/resources/threatenedspecies/08119soipc.pdf

million. Information for expenditure in national parks is supplied mostly as a narrative in the RFA Annual Reports, but with a figure of $34 million in 2014-2015.

Management of agents affecting ecosystem health and vitality

There was good evidence of active management — following ESFM principles — of a range of agents that affect ecosystem health and vitality over the period of the RFA. This includes active on-ground management (e.g. mapping, monitoring, and chemical control of invasive weeds), development of management plans and strategies, and involvement in research to improve management of invasive species. A selection of these activities, as reported in the NSW RFAs Implementation Reports and elsewhere, includes:

- NSW Threat Abatement Plan: predation by the red fox (2010) (http://www.environment.nsw.gov.au/resources/pestsweeds/110791FoxTAP2010.pdf)
- FCNSW ESFM Plans for State forest in all regions (http://www.forestrycorporation.com.au/management/esfm)
- Bell miner associated dieback strategy (2004); developed with input from a broad range of land managers (http://www.environment.nsw.gov.au/resources/nature/BMADStrategy.pdf)
- Protecting our National Parks from pests and weeds (2006) (http://www.environment.nsw.gov.au/pestsweeds/SoPPestManagement.htm)
- Regional Pest Management Strategies (http://www.environment.nsw.gov.au/pestsweeds/RegionPestManagement.htm)
- NSW Invasive Species Plan (2008-2015) (https://www.pestsmart.org.au/wp-content/uploads/2014/12/nsw-invasive-species-plan.pdf)
- Biological control of pests in native forest and plantations, including sirex wood wasp and Monterey pine aphid in softwood plantations, and involvement by land managers in the ongoing biological control program for blackberry (e.g. testing new strains of blackberry rust in NSW).
- A range of research projects were conducted on agents that affect ecosystem health and vitality, including BMAD, myrtle rust, and *Phytophthora* species.

Change in the scale and impact of agents affecting ecosystem health and vitality

Table 5.3: provides a summary of changes over time for Indicator 3.1a agents within NSW forests. The only consistent data is for State forest softwood and hardwood plantations, where data is supplied on the area affected by key damaging agents in softwood plantations (dothistroma needle blight, Monterey pine aphid, sirex wood wasp, diplodia canker/drought) and hardwood plantations (herbivorous and sap-sucking insects, leaf and shoot fungi, stem borers). The area affected by these key damaging agents varied across the reporting period.

For softwood plantations, much of this variation was related to climate, with increases in sirex wood wasp, diplodia canker/drought and Monterey pine aphid in years of below-average rainfall, and increases in dothistroma needle blight in years of above-average rainfall.

For hardwood plantations, the variation was associated with the maturity of the plantations estate, with more herbivorous insects and leaf fungi in younger plantations and more stem borers in older plantations.

Monitoring for *Phytophthora cinnamomi* was not conducted in a systemative or consistent manner to identify a trend or change in area affected. Surveys have revealed that *P. cinnamomi* is widespread in native forests in eastern NSW but rarely damaging. Dieback associated with *P. cinnamomi* has been observed in the following Catchment Management Authority (CMA) areas: Hawkesbury–Nepean, Hunter–Central Rivers, Northern Rivers, Southern Rivers and Sydney Metropolitan.

Myrtle rust was detected in 2010 on the NSW central coast and is now widespread along the east coast from Batemans Bay to the Queensland border[114]. It has been recorded in over 230 species of the Myrtaceae family under natural conditions (native ecosystems or gardens) in Australia, with a further 115 species know to be susceptible under artificial conditions.

In 2014, assessments were made of the impact of myrtle rust on two key rainforest species in NSW, *Rhodamnia rubescens* and *Rhodomyrtus psidioides*. Native populations of these two species were identified across the extent of their native range and assessed for crown health and tree survival. Severe impact as a result of repeated defoliation and dieback from myrtle rust was observed across all populations. Fifty-seven per cent (57%) of *Rhodomyrtus psidioides* trees surveyed had been killed by myrtle rust, and 12% of *Rhodamnia rubescens* trees had been killed. Prior to the arrival of myrtle rust, both species had been listed as Least Concern under the then TSC Act. The NSW Scientific Committee has made a Preliminary Determination to support a proposal to list both *Rhodomyrtus psidioides* and *Rhodamnia rubescens* as Critically Endangered Species as a result of impact from myrtle rust[115].

Bell miner associated dieback has been known from NSW for many decades, including early surveys assessing factors associated with BMAD in NSW State forests in the 1990s which identified 2000 hectares affected by BMAD[116]. BMAD is considered to be expanding in native forests in NSW[117], and although likely, there is little quantitative data to support this due to a lack of systematic surveillance. Several projects have conducted aerial surveys of BMAD. Jurskis and Wamsley reported 10,000 hectares of "declining forest" in three coastal regions in southern NSW based on 6 hours of aerial surveillance in 2002. Carnegie and Price conducted aerial surveillance over approx. 100,000 hectares of native forest (all tenures) in northern NSW mapping 20,000 hectares of BMAD. Aerial surveillance from 2015 to 2017 over 1.25 million hectares of native forest (all tenures) from the Manning River to the Queensland border identified 44,770 hectares of BMAD affected forests[118]. Analysis of the change in area affected from 2004 to 2017 is currently underway.

Whilst there is no indication of a significant overall increase or decrease in scale or impact of the majority of agents affecting forest health and vitality in NSW over the past 20 years,

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[114] Berthon K et al. 2018. Assessment and prioritisation of plant species at risk from myrtle rust (*Austropuccinia psidii*) under current and future climates in Australia. *Biological Conservation* 218:154-162

[115] http://www.environment.nsw.gov.au/committee/preliminarydeterminationsbydate.htm

[116] Stone C et al. 1995. Survey of crown dieback in moist hardwood forests in the central and northern regions of New South Wales (psyllid/bell miner research programme). Research Paper No. 28. Research Division, State Forests of New South Wales, Sydney, NSW.

[117] Wardell-Johnson G et al. 2006. Bell miner associated dieback (BMAD) independent scientific literature review: a review of eucalypt dieback associated with bell miner habitat in north-eastern New South Wales, Australia. Occasional Paper No. DEC2006/116.

[118] Carnegie AJ et al. 2018. Change detection and risk mapping of bell miner associated dieback (BMAD). North Coast Forest Project. NSW Department of Primary Industries, Parramatta, NSW.

systematic and consistent monitoring would be required for meaningful conclusions to be drawn.

Changes in area affected by key pests and diseases in softwood and hardwood plantations are consistent with normal variation due to climate (e.g. drought) and silvicultural attributes (e.g. age class-related susceptibility). The increase in area and scale of impact by myrtle rust is consistent with an invasive species expanding its geographic range and encountering native hosts following establishment in a new country, irrespective on any forest management processes.

The reported increase in BMAD from the 1990s in forests across all tenures is likely to have occurred but analysis of systematic surveillance has not been completed to verify or quantify this change. The scale and impact of *Phytophthora cinnamomi* does not appear to have increased significantly in the past 20 years, although several localised areas have been impacted.

The evidence shows that key land managers (FCNSW and OEH) have been using ESFM principles to manage their respective forest estates over the past 20 years. This includes identifying key damaging agents and developing management strategies to limit their spread and reduce their impact. Both agencies, and especially OEH, have worked with private land owners to ensure ESFM principles are utilised in managing forest across all tenures in NSW.

Key criteria relevant to Environmentally Sustainable Forest Management

As an aid to future management of NSW forests, several key criteria from the Forest Stewardship Council[119] and the Australian Forestry Standard[120] are relevant for ESFM under the current RFA process:

- FSC Criterion 6.6: Management systems shall promote the development and adoption of environmentally friendly non-chemical methods of pest management and strive to avoid the use of chemical pesticides.
- FSC Criterion 10.7: Measures shall be taken to prevent and minimise outbreaks of pests, diseases, fire and invasive plant productions. Integrated Pest Management (IPM) shall form an essential part of the management plan, with primary reliance on prevention and biological control methods rather than chemical pesticides and fertilisers.
- AFS Criterion 5.1: Identify damage agents: Ensure that forest managers are cognisant of the relevant and potential damage agents, are able to identify such agents in the field and are able to assess and prioritise the impact in relation to prevention/control measures.
- AFS Criterion 5.2 Maintain health: Ensure that forest managers take appropriate measures to lessen the impact of damage agents.

[119] Forest Stewardship Council. 2018. https://au.fsc.org/en-au/standards/forest-management
[120] Australian Forestry Standard. 2018. Sustainable Forest Management – Guidance for the certification of forest management (Guidance Note 01 to AS4708–2013). https://www.responsiblewood.org.au/

Table 5.3: Data on scale and impact of agents affecting ecosystem health and vitality in NSW

Agent	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Phytophthora cinnamomi in national parks	Present (+)	Present (+)	Present (↔)	Present (↔)	Present (↑)											
Armillaria leutobubalina in national parks					Present (+)											
Phellinus noxious in national parks					Present (+)											
BMAD - all tenures	Present (+)	Present (+)	Present (+)	10,000 ha		20,000 ha	Present (+)	Present (+)	Present (+)	Present (+)	Present (+)	Present (+)	Present (+)	Present (+)	Present (+)	44,770 ha
Weed/pest animal management in National parks	narra-tive	narra-tive	narra-tive	narra-tive	narra-tive	narra-tive	narra-tive		narra-tive	narra-tive	narra-tive			$34 M		
Weed/pest animal control expenditure in State forest	narra-tive	$824,344	$400,000	$910,000	$1.34M	$1.16M	$873,000	$886,831	$700,000	$605,000	$1.7 M					$1.9 M

Agent	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Herbivorous and sapsucking insects in hardwood plantations	25.8%	2.80%	5.80%	7.50%	2.50%	2.00%	2.00%	3.00%	6.00%	2.50%	1.50%	2.50%	1.95%	3.4%	1.50%	4.50%
Leaf and shoot fungi in hardwood plantations	Present (-)	Present (-)	2.40%	1.00%	0.50%	0.50%	2.00%	2.00%	2.00%	0.00%	0.00%	0.10%	0.05%	0.09%	0.00%	0.01%
Phytophthora cinnamomi in plantations	Absent	Absent	Present (-)								Present (-)			Present (+)		
Stem borers in hardwood plantations	0.50%	0.30%	0.14%	0.14%	0.14%	0.25%	0.00%	3.00%	5.00%	11.0%	11.0%	11.0%	11.0%	10.0%	12.0%	
Phytophthora cinnamomi in State forest		Present (-)														
Dothistroma needle blight in softwood plantations	2.30%	2.00%	1.30%	0.9%	0.50%	0.25%	0.25%	0.50%	1.00%	1.00%	0.80%	1.00%	2.00%	4.10%	0.75%	1.60%

Agent	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
Sirex wood wasp in softwood plantations	0	0.02%	0.01%	0.01%	0.01%	0.01%	0.01%	1.20%	1.50%	0.80%	0.13%	0.20%	0.25%	0.30%	0.20%	0.36%
Diplodia/ Drought/ Ips in softwood plantations	0.10%	0.50%	0.13%	0.01%	0.01%	0.01%	0.01%	6%	15%	4%	4.03%	1.30%	0.01%	1%	5%	3.82%
Essigella pine aphid in softwood plantations						15%	25%	40%	47%	32%	21.5%	9%	1.50%	7.10%	6%	8.63%
Myrtle rust in native environments (all tenures)												Present (↑)	Present (↑)	Present (↑)	Present (↑)	Present (↑)

Source: DPI

Notes:

Present (+) = present and damaging;

Present (-) = present and not damaging;

Present (↑) = present, increasing;

Present (↔) = present, stable

Indicator 5.1a Contribution of forest ecosystems and forest industries to the global greenhouse gas balance

Forest ecosystems and forest industries contribute in a number of positive ways to the global greenhouse balance. When forests are managed sustainably, they generate harvested wood products (HWPs) which also play a significant role in the global greenhouse balance, primarily via carbon storage in long-lived products and in landfills; and also by displacing the use of more greenhouse-intensive materials.

However, these interactions between forest ecosystems and/or forest industries and the global greenhouse balance were not as apparent twenty years ago when the RFA was signed. The original RFA document highlighted a number of areas of research to be targeted to improve knowledge. Since then a number of studies have addressed many of the gaps originally identified, including a strong focus on the life cycle of carbon in HWPs. The majority of the forest-based studies have been conducted in production forests (both native and plantations).

The estimation of forest biomass and carbon has improved with the development of species-specific and generic allometric relationships for a number of important tree species (e.g. Keith et al 2000; Paul et al 2013, 2014 and 2016; Montagu et al 2005; Ximenes et al 2005, 2005b, 2008, 2018). There is a better understanding also of the longevity of biomass in root systems following tree harvest (Ximenes et al 2006). Carbon dynamics in forest ecosystems are affected by the impacts of climate change. These may include more frequent and more severe bushfires, increased incidence of pests and diseases and also changes in growth dynamics due to increased CO_2 levels in the atmosphere. The impact of natural disturbances such as bushfires to the greenhouse balance of forest ecosystems in NSW may lead to large emission pulses for a particular year. However these emissions are typically offset over time by the carbon sequestered when the burnt forests regrow. In NSW, research from Western Sydney University is investigating the impact of increased CO_2 levels on the growth of native Eucalyptus species. Much of this research is conducted through the "Eucalyptus Free-Air CO_2 Enrichment (EucFACE)" experiment started in 2012, the only one of its kind in the world for native forests.

Plantations also contribute significantly to the global greenhouse balance via additional carbon sequestration, especially if planted in previously cleared lands. NSW had its own greenhouse gas abatement scheme (NSW GGAS), which rewarded carbon sequestration in new plantations with carbon credits. Much of the carbon abatement was achieved by the then Forests NSW, which in 2005 became the first body in the world to trade carbon credits from sequestration in forests in a registered greenhouse gas abatement scheme. By the time the NSW GGAS was stopped, FCNSW had sequestered approximately 3.8 million tonnes of CO_2-e in their hardwood plantations that were issued as certificates under the NSW GGAS (IPART 2012). Currently the national ERF presents an opportunity for plantations to obtain credits for carbon abatement

When forests are managed for production, a large proportion of the biomass is left in the forests as residues. There have been a number of studies to determine volumes of residue for a range of species of commercial importance in NSW (e.g. Ximenes et al 2005, 2005b, 2008, 2012a, 2016, 2017b). The carbon dynamics of HWPs in NSW has been the focus of a number

of studies that have significantly improved knowledge of the role wood products in NSW play in climate change mitigation efforts. These include research of carbon flows in sawmills (e.g. Ximenes et al 2005a, 2005b, 2016, 2017b), product substitution impacts due to the use of HWPs instead of more greenhouse-intensive options (Ximenes and Grant 2013, Ximenes et al 2016) and the fate of carbon in HWPs in landfills (Ximenes et al 2008b, 2015, 2017). These studies, which have been published in a variety of peer-reviewed journals and national reports, have highlighted the importance of understanding the carbon implications of the use of HWPs – addressing one of the key gaps identified in the original RFA. For example it is widely accepted now that HWPs in landfills represent a carbon reservoir, with minimal likely loss of carbon. This understanding has been reflected in the progressive change in the decay factor adopted in the national greenhouse gas inventory, from 50% in 2006 to 10% in 2016 (AGO 2006; Dept. of Environment and Climate Change 216).

Given the complex nature of the carbon dynamics in forests and HWPs, it is important to adopt a life cycle assessment approach in their assessment, taking into account what the atmosphere actually sees (i.e. actual flows and uptakes of greenhouse gases). This approach is typified by a life cycle assessment conducted for typical houses built in Sydney (Ximenes and Grant 2013), which analysed the greenhouse gas implications of an increase in the use of HWPs in the residential sector. It has also been adopted in studies of the greenhouse balance of native forest management in NSW (Ximenes et al 2012,2016). Ximenes et al (2016) quantified the greenhouse gas impact of a range of different alternative scenarios related to the management of native forests around Eden and also on the mid North Coast of NSW, with greenhouse gas benefits associated with most of the scenarios analysed.

There is insufficient, systematic data available that can be used to estimate the total contribution of forest ecosystems and forest industries in the RFA regions and NSW as a whole to the global greenhouse balance consistently since 1999. However, FCNSW has made publically available estimates of carbon sequestered both in native forests and plantations under their management for a number of recent years (e.g. FCNSW 2018). It is important to note that a significant proportion of forests under management for production are in fact not available for harvest, due to a range of factors (e.g. presence of threatened species, aboriginal values, proximity to riparian zones, rainforest areas). For example, in the latest FCNSW annual report (2016-17), of the 2 million hectares of forests managed by FCNSW, 946,150 hectares (or 47.3% of the total) was deemed as unavailable for harvest due to the reasons given above. This effect is quantified in Ximenes et al (2016) for the forest areas included in that study. There is no available data though that allows a summary of changes in the values over time, partly because of the substantial changes in tenure that have happened in the RFA period. In the period covered by the RFA, an additional 369,114 hectares of State forests were converted to national parks.

For 2016-17, FCNSW estimates that pine plantations sequestered 3.44 million tonnes of CO_2 equivalent per year (Mt CO_2-e/year) – this figure has kept reasonably constant since 1999-2000, as the size of the FCNSW softwood plantation estate has not changed significantly in that period (**Table 5.4**).

Hardwood and cypress forests sequestered 16 Mt CO_2-e in 2016-17. The earliest available figure dates back to 2006-07, when the annual sequestration was estimated at 12.4 Mt CO_2-e/year. Estimates of carbon sequestration in native forests are more variable over time, due to reductions in the total native forest area managed for production as outlined above and also due to changes in the estimation methods over time. The total current estimated standing

volume in hardwood and cypress forests is 1732 Mt CO_2e. This has increased from previous years, largely because of a change in the methodology and scope used for the estimation (**Table 5.4**).

Carbon balance figures related to emissions due to fire are available from 2006-07 and they fluctuate significantly, reflecting the relative variability in wildfire incidence from year to year. The figures presented do not include emissions for forests other than those managed by FCNSW. Emissions due to use of heavy machinery for harvest and haulage are minor compared to the other elements in **Table 5.4**.

The long-term carbon storage in HWPs is significant, with carbon in hardwood and softwood HWPs representing a cumulative figure of 12.8 Mt CO_2-e. This is comparable to the annual carbon sequestration in the large area of native forests managed by FCNSW (**Table 5.4**). The product substitution figure of 1.44 MtCO_2-e represents the avoided greenhouse emissions associated with the use of hardwood HWPs in lieu of more greenhouse-intensive products (e.g. aluminium, steel, concrete and fossil fuels). A similar figure is currently not available for softwood HWPs.

Table 5.4 Carbon balance trajectory – NSW production forests (whole estate)

	Year (Mt CO2-e)[1]				
	99/2000	2004/05	2008/09	2012/13	2016/17
Hardwoods and cypress - annual	NA	NA	12.5	11.5	16.0
Plantation softwoods – annual	2.98	2.97	3.18	2.69	3.44
Hardwoods and cypress – standing trees	NA	NA	977	803	1730[2]
Fire -[3]	NA	NA	0.53	9.51	2.44
Harvest and haulage emissions	NA	NA	NA	NA	0.02
HWPs – all hardwoods and cypress-cumulative4	0.17	0.28	0.4	0.5	0.56
HWPs softwoods-cumulative4	3.11	5.64	7.59	9.9	12.27

Product substitution[5]	NA[6]	NA[6]	NA[6]	NA[6]	1.44

[1] Methods used to calculate the values explained in detail in FC Power Bi (FCNSW 2018); [2] This figure includes cypress / hardwood plantations and unlike previous figures calculated based on net harvestable figures, hence much higher values; [3] Does not take into account emissions from bushfires outside the FCNSW estate; [4] Long-term carbon storage takes into account carbon stored in HWPs in landfills; [5] No substitution impact factors available for softwood products in NSW; [6] No substitution impact factors available previously for hardwood HWPs in NSW. NA – not available.

Although the trajectory of carbon stocks in NSW forest ecosystems has not been systematically quantified, studies such as Ximenes et al (2012) highlight the fact that over time, the contribution of managed forests to climate mitigation when carbon dynamics in both the forests and in HWPs are taken into account gradually increases when compared to the carbon dynamics of forests managed for conservation purposes alone. This trend is consistent with many studies internationally that have adopted a similar holistic approach in their assessments (for a detailed discussion see Ximenes et al 2016). There are also other studies which have come to different conclusions to those from the NSW DPI studies when analysing the greenhouse gas balance of native forests (e.g. Mackey et al 2008; Keith et al 2015). Ultimately the scope and system boundaries of such studies and robustness of data used to assess the life cycle implications of carbon cycles in forests and HWPs can have a large impact on results obtained.

Snapshots of relevant work

1) Carbon cycles in HWPs in landfills

Since 2000 there has been considerable research undertaken to understand the long-term dynamics of HWPs in landfills in NSW. This is important, as each year approximately 3.0 Mt of wood and wood products (including paper) are disposed of in landfills in Australia (Ximenes et al 2015 and 2017). The Intergovernmental Panel on Climate Change (IPCC) adopts a generic default value of decomposition in landfills of 50%, with approximately half of that loss in the form of methane gas, which is 25 times more potent than carbon dioxide. However the IPCC also states that it is good practice for countries to use decay values specific to waste types rather than generic factors when waste composition data are available (IPCC 2006). The research conducted by NSW DPI has demonstrated that the IPCC generic factor greatly overestimates decay of wood in landfills in Australia (Ximenes et al 2008b, 2015) – for example the most recent research suggests that the maximum carbon loss from wood in landfills for Australia is 1.4% (Ximenes et al in press). The implications of this work are that disposal of wood in landfills in Australia results in long-term storage of carbon, with only minimal conversion of carbon to gaseous end products.

2) ERF - Plantations

The ERF (Australian Government 2018) is one of the Australian Government's key mechanisms to achieve its greenhouse gas emission abatement targets. The ERF rewards abatement in a number of industry sectors using specific methods, and in 2017 a new method was approved to reward carbon abatement in new plantation establishment (under certain conditions) and also in conversion from short to long-rotation plantations.

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Summary of future management of the Principles of Ecologically Sustainable Forest Management

The Australian and NSW governments (the Parties) had regard to CRAs and the Principles of Ecologically Sustainable Management of forests in the development of the NSW RFAs. In the NSW RFAs the Parties have agreed that ESFM is an objective which requires a long term commitment to continuous improvement and that the key elements for achieving it are: the establishment of a CAR reserve system; the development of internationally competitive forest products industries; and integrated, complementary and strategic forest management systems capable of responding to new information. These three elements have been delivered and are being maintained and enhanced where possible in the renewed NSW RFAs.

This chapter has provided a further assessment of the ecologically sustainable management of forests in the NSW RFA regions. Assessment of the ecological sustainability of NSW Forest Management Framework requires evaluation against the five agreed Principles of Ecologically Sustainable Management of forests[1]:

1) *Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate*

NSW FMF is implemented by a strategic institutional and regulatory system that is adaptable and responsive to new information and changing circumstances. This ensures the full suite of forest values is balanced, maintained and where possible enhanced for the benefit of present and future generations. The NSW RFAs implement an extensive CAR reserve system for the conservation of forest and non-forest vegetation communities in perpetuity. They also ensure that ESFM on the public and private forest estate is practiced to provide for wood and non-wood products for industry development, as well as ecosystem services and other societal benefits.

2) *Ensure public participation, access to information, accountability and transparency in the delivery of ESFM*

The NSW RFAs themselves and many of the regulatory instruments within the NSW FMF have requirements for public participation in reviews and implementation with clear lines of responsibility and accountability for decision making. The EPA in particular regularly responds to questions and concerns raised by the community, which sometimes result in detailed investigations into specific forestry operations.

3) *Ensure legislation, policies, institutional framework, codes, standards and practices related to forest management require and provide incentives for ecologically sustainable management of the native forest estate*

A robust NSW legal and institutional framework is currently in place that is supported by a range of Acts, Regulations, and policy mechanisms of relevant NSW agencies. NSW FMF is consistent with the requirements of the NFPS and ensures there is a strong regulatory and institutional approach. The EPA monitors FCNSW's native forestry operations to ensure they

[1] See appendix 5 for full definitions of the ESFM principles found in the NSW RFAs

comply with the conditions in the IFOAs. The EPA reports annually on the compliance results and undertakes regular proactive audits which aim to identify good and poor forestry practices. In addition, the EPA conducts investigations when non-compliances are identified.

4) Apply precautionary principles for prevention of environmental degradation

The precautionary principle and management of risk and uncertainty was applied during the accreditation of the NSW Forest Management Framework, as well as through the development of environmental management systems and the priority placed on Recovery Plans. The Precautionary Principle is an important criterion in the assessment of ecologically sustainable forest management systems and processes.

5) Apply best available knowledge and adaptive management processes.

Research and development is vital for building on the current scientific understanding of NSW forest system characteristics and functions in order for the industry, governments and the community to support sustainable forest management. However, a reduction in R&D has been highlighted in recent publications. This decline in R&D is attributed to declining relative contribution of the forest industry to national economy, reduced government involvement in the industry, corporate restructuring, and increased international ownership.

However, the NSW Budget 2018 delivers a forestry package of $71.8 million over four years to support the industry. A proportion of this will be dedicated to research, collecting new data and developing and enhancing the NSW Forest Management Framework for the delivery of sustainable management. This will ensure the NSW FMF will continue to be adaptable and responsive to new information and changing circumstances.

The renewed NSW RFAs will provide for the long-term stability of forests and forest industries, a CAR reserve system and the ongoing ecologically sustainable management and use of forested areas in NSW. The NSW Government is committed to the principles of ecologically sustainable development and management that form the basis of the NFPS and the RFAs.

Measuring biodiversity in terms of genetics, species and ecosystems is an important aspect of forest planning for achieving sustainable forest management, and also for identifying opportunities for biodiversity conservations within plantations. FCNSW and NSW agencies continue to maintain and build on their current capacity to measure and monitor changes in forest through collection and evaluation of comprehensive biodiversity data. This includes adopting new technologies to enhance their capacity to capture and record information.

With regard to greenhouse gas reduction, NSW forest ecosystems and forest industry continues to contribute towards national and global efforts towards greenhouse gas abatement. The draft NSW RFA renewal documents include new clauses relating to climate change. Through these variations the Australian and NSW governments recognise the need to manage forests to maintain or enhance the contribution of all elements of the forest estate to the effective management of carbon within the carbon cycle. The governments also acknowledge that climate change adaptation needs to be integrated into forest management to build resilience and manage climate risks, and meet the objectives of ESFM.

ESFM is an objective which requires a long term commitment to continuous improvement. The renewed 20 year RFAs with five year rolling extensions will continue to provide for the ecologically sustainable management and use of forests in NSW RFA regions. They will commit the Parties to the key elements of ESFM, including the maintenance of the CAR

reserve system and an integrated, complementary and strategic Forest Management Framework capable of responding to new information.

Conclusion

The three New South Wales Regional Forest Agreements (RFAs) for the Eden, North East and Southern regions provide an efficient and effective long-term solution for access and use of NSW's forests.

The NSW RFAs establish a framework for forest management, which:

- identifies a comprehensive, adequate and representative (CAR) reserve system and provides for the conservation of those areas
- provides for the ecologically sustainable management and use of forests
- provides long-term stability of forests and forest-based industries.

In August 1999, the Eden RFA was entered into having regard to assessments of the matters now listed in para (a) of the definition of an 'RFA' in the RFA Act being: environmental values, including old growth, wilderness, endangered species, national estate values and world heritage values; indigenous heritage values; economic values of forested areas and forest industries; social values (including community needs); and the principles of ecologically sustainable management.

Assessments of these matters were undertaken through the CRA process that preceded the signing of the Eden RFA. The same assessment process was undertaken when the subsequent North East and Southern RFAs were entered into in March 2000 and April 2001 respectively.

This report has provided a further and updated assessment of the matters listed in para (a) of the definition of 'RFA' in the RFA Act, for all three NSW RFA regions, the outcomes of which are summarised under the relevant headings.

Forest management in NSW is subject to both Australian and NSW laws which have evolved as a result of ongoing work to improve the balance between environmental and economic demands, and in response to other factors affecting resource availability, and economic and social needs. The NSW Forest Management Framework includes legislation, regulations, bilateral agreements, and regulatory instruments subject to NSW law.

Environmental Values

Since NSW's CRA processes in 1998, the area of protected old-growth forest has increased by 851,000 hectares or 76 per cent, with the CAR reserve system and the ecologically sustainable management of State forests providing for the ongoing protection of old-growth forests. Wilderness values are now almost entirely protected within the conservation reserve estate, with the area of delineated wilderness reaching 92 per cent; surpassing the target of 90 per cent reservation (Commonwealth of Australia 1997).

The NSW RFAs address the conservation of endangered species through providing a system of conservation reserves and the management of habitat in areas outside the reserve system. Threatened species are protected through Australian and NSW environmental legislation and the NSW Forest Management Framework. The NSW Forest Management Framework

document has a case study demonstrating how forest management has responded to new information and threats. The NSW Forest Management Framework will be continually reviewed and updated in response to new information.

The register of the National Estate has been phased out, however the values of those places continue to be managed through a range of new management structures including the National Heritage List, the Commonwealth Heritage List, and the NSW Heritage Register. These values include components of the natural or cultural environment in Australia that have been assessed and recognised for their aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community by the Australian or NSW governments.

World Heritage values are catered for by the Australian and NSW governments in accordance with the Australian World Heritage Intergovernmental Agreement. World Heritage sites have Statements of Outstanding Universal Value that describe the listed World Heritage values of each site. They also have comprehensive management or strategic plans that provide broad management principles for the area, and establish the framework for the integrated management, protection, interpretation and monitoring of the sites. World Heritage sites are managed separately from processes put in place by the NSW RFAs, and continue to be protected by Part 3 of the EPBC Act. The Australian and NSW governments will continue to participate in the assessment and protection of any future World Heritage places consistent with the Australian World Heritage Intergovernmental Agreement.

The 20 year NSW RFAs with five year rolling extensions provide for the continued protection of biodiversity, old growth forests and wilderness values through the CAR reserve system and the ecologically sustainable management of forests as described in NSW Forest Management Framework document. The conservation reserve estate is interconnected, healthy, and capable of supporting genetic and species diversity.

The NSW Forest Management Framework protects the ecological character of Ramsar Wetlands, in accordance with the Ramsar Convention. Any potential indirect or offsite impacts to Ramsar wetlands are managed through the soil and water provisions of the IFOA.

Aboriginal Cultural Heritage

The NSW Forest Management Framework provides for the protection of Aboriginal heritage values that aligns with the NSW legislative framework for Aboriginal cultural heritage management, including in relation to consultation and ongoing involvement with Aboriginal people and managing the impacts of forestry operations on Aboriginal cultural heritage values. In NSW, the principal laws that deal with Aboriginal cultural heritage are the *Heritage Act 1977* (NSW), the NPW Act, and the *Environmental Planning and Assessment Act 1979* (NSW).

Under the NPW Act, it is an offence to harm (destroy, deface, or damage) or desecrate an Aboriginal object or Aboriginal place or move the object from the land on which is has been situated. The NPW Act also protects places of special significance to Aboriginal culture where objects may not be present. Places of importance to Aboriginal individuals and communities can be given legal protection by:

- declaration of new Aboriginal Places

- reservation and management as Aboriginal Areas and national parks
- formal agreements on the joint management of national parks
- formal agreements with land owners (Voluntary Conservation Agreements).

Since the signing of the NSW RFAs, the NSW Forest Management Framework has improved its ability to respond to matters of significance to the Aboriginal community. In consultation with Aboriginal Affairs NSW, the Aboriginal community was consulted on Aboriginal heritage values and the renewal of the NSW RFAs. As the NSW Forest Management Framework under the NSW RFAs is adaptive and responsive to new information and changing circumstances, the NSW RFAs will continue to provide the framework for the protection of Aboriginal heritage values throughout the life of the RFAs. The RFAs commit the Australian and NSW governments to meaningful consultation on forest management with the Aboriginal community.

Economic Values

The forests within the NSW RFA regions are managed to produce a range of forest products, services and environmental benefits. Since the signing of the NSW RFAs there has been significant change in the structure and management of the production forest estate. The area available for harvesting within NSW RFA regions reduced dramatically following the signing of the three RFAs between 1999 and 2001, by 836,000 hectares. The removal of significant areas of production forests has not diminished the responsibility of the governments to ensure that the productive capacity of remaining production forests, and certainty of resource access, is maintained. An independent review of sustainable yield from public forests, confirms that harvesting from public land has remained at or below the sustainable yield of public forests managed for wood production.

Plantations are also able to support economic development objectives of the RFAs. At the time of the CRAs, there was 234,600 hectares of softwood plantation (primarily radiata pine), and 25,540 hectares of hardwood plantation (primarily Eucalypt species) growing in the NSW RFA regions. In 2016-17, the plantation area in NSW in was 394,000 hectares, of which 307,000 hectares were softwoods and 87,000 hectares were hardwoods (Downham and Gavran 2017). Between July 2004 and June 2014, nearly 50,000 hectares of softwood plantation and 63,000 hectares of hardwood plantation were established.

Over the 1999-2000 to 2015-16 period, the gross value of production for NSW forests increased from around $200 million to more than $400 million by the end of the period. Overall, the industry has increased in value by 63 per cent from 1999-2000 to 2015-16.

In recognition of the contribution of timber and forest-based industries to the New South Wales' economy, the NSW RFAs will continue to support future growth and development of New South Wales' industries associated with forests and timber products specifically through:

- certainty of resource access for the timber and forest-based industries;
- encouraging increased production of plantation-grown timber to supplement wood supply from native forests;
- facilitating timber and forest-based industry growth and development, in areas such as:

  - skills retention and workforce development;
  - research, innovation and extension;
  - strategic marketing, communications and education;
  - essential and strategic infrastructure;
  - resource management and access; and
  - regulatory modernisation;

- providing for other forest based industries, including:
  - security of access to the Mining industry by continuing to recognise defined land tenures which allow for Mineral Exploration and Mining subject to the requirements of NSW and Australian legislation; and
  - facilitating economic opportunities for other non-wood forest product industries, tourism and recreation.

The native forest timber industry in NSW is an important economic component of many rural towns. However, since the transfer of land to the conservation reserve system, parts of the industry have had difficulty adjusting to the change in resource supply necessary to maintain the balance between environmental, economic and social values and uses of NSW RFA forests.

The renewed NSW RFAs will cover the period in which new, innovative wood products and processing technologies develop. Improved forest management and harvesting strategies will also be implemented in the renewed NSW RFAs as a result of ongoing investment in research and development. The renewed NSW RFAs will aim to support an internationally competitive wood production and wood products industry.

The proposed 20 year NSW RFAs with five year rolling extensions intend to support the NSW forest industry so that it has a strong and sustainable future and to provide additional certainty to industry and the community into the future. The variations seek to maintain a stable regulatory and investment environment, which will assist in providing for socio-economic stability and opportunities for market growth.

The renewed NSW RFAs will continue to support ongoing access by the forest industry to public native forests and plantations. Further, the variations will continue to periodically review the sustainable yield of high quality sawlogs to reflect changes in forest inventory and management initiatives. The renewed NSW RFAs will also continue to ensure forests in NSW's RFA areas remain accessible for a range of recreational and tourism related pursuits, as well as other uses such as apiary and the harvesting of non-wood forest products. This demonstrates that the 20 year NSW RFAs with five year rolling extensions will maintain and enhance economic values.

Social Values

The people of NSW hold a variety of views in relation to the use and management of NSW's forest resources. NSW communities have strong social, historical and cultural connections to forests, including for provision of wood and non-wood forest products leading to direct and indirect employment opportunities and nature-based recreation. Strong and differing views

from the community about the role of forests emphasises their ongoing importance to people, whether it be for environmental objectives, income, or recreation.

Local communities have strong cultural and spiritual connections to forests and value them for a range of reasons. Communities are aware of the environmentally friendly nature of wood and the role of forests in carbon storage. Recent investment in forest tourism ventures has increased the number of visitors on NPWS managed land.

Direct employment in the forest and wood products industry is declining across all three NSW RFA regions, and has had a considerable impact on regional communities in NSW. When compared with the rest of NSW however, the NSW RFA regions performed better, with regions not covered by an RFA losing a higher number and higher proportion of jobs.

The varied NSW RFAs will support the NSW forest industry to provide certainty to industry and the community. They seek to maintain a stable regulatory environment which will assist in producing socio-economic stability. The RFAs will also continue to ensure that forests in NSW RFA regions remain accessible for a range of uses and continue to deliver a range of social benefits.

Principles of Ecologically Sustainable Management

In the NSW RFAs the Parties have agreed that ESFM is an objective which requires a long term commitment to continuous improvement and that the key elements for achieving it are: the establishment of a CAR reserve system; the development of internationally competitive forest products industries; and integrated, complementary and strategic forest management systems capable of responding to new information. These three elements have been delivered and are being maintained and enhanced, where possible, in the renewed RFAs.

NSW Forest Management Framework is implemented by a strategic institutional and regulatory system that is adaptable and responsive to new information and changing circumstances. This ensures the full suite of forest values is maintained for the benefit of present and future generations and provides for wood and non-wood products for industry development, as well as ecosystem services and other societal benefits. The Precautionary Principle is an important criterion in the assessment of ESFM systems and processes.

Summary

The NSW RFAs have established an agreed framework for the ecologically sustainable management and use of forests. They provide for regionally specific ecologically sustainable management through the maintenance of the CAR reseserve system; complementary off-reserve management; an integrated, complementary and strategic NSW Forest Management Framework capable of responding to new information; internationally competitive forest product industries which are economically sustainable and provide social and economic benefits; and monitoring through internationally-agreed performance indicators.

Over the past 20 years forest management in NSW has adapted and improved incorporating new information and data. NSW has developed a Forest Management Framework which is a comprehensive system for delivering ESFM. The NSW Forest Management Framework includes overarching policy and legislation, institutional and administrative arrangements, and associated planning and operational systems. It is complemented by an adaptive management and continual improvement process incorporating research findings and feedback processes associated with compliance and enforcement systems, stakeholder engagement and monitoring and review mechanisms.

Improvements to NSW forest management over the past 20 years, that are also described in the NSW Forest Management Framework include:

- NSW OEH Environmental Management System (EMS): NSW OEH has adopted an EMS to ensure a consistent approach to the many measures it implements to minimise environmental impacts of managing the national park estate.

- FCNSW Forest Management System (FMS): FCNSW maintains a Hardwood FMS, which covers public native forestry and hardwood plantation management. The FMS is certified under the Australian Standard for Sustainable Forest Management, AS 4708:2013 and ISO 14001:2004 Environmental management systems - Requirements with guidance for use, which sets the framework for achieving and continually improving environmental performance. The Hardwood FMS is currently transitioning to ISO 14001:2015. FNCSW' softwood plantation management system is also certified to both of these standards, being AS 4708:2013 and ISO 14001:2004.

- New technologies to better deliver ESFM: FCNSW has made a number of significant investments to provide better forest management outcomes, reduce costs and increase the quality of information available for planning, these include:

    - Remote Sensing: The development of LiDAR technology, as a means of remote sensing, has been of significant benefit in delivery of ESFM outcomes. LiDAR has enabled development of a range of products that assist in planning forest management activities including:

        - Accurate digital elevation models that more closely identify landform elements like steep slopes to assist in the application of soil erosion mitigation measures

        - Development of wood volume models that assist with operational, tactical and strategic planning. Canopy height has a strong correlation with the productive capacity of a site. LiDAR, which can produce an accurate ground profile and thus more accurately determine the height of trees, combined with algorithms, can be used to predict areas likely to contain taller trees and provide an indication of the relative density of those trees. This type of information across a landscape provides data that has greatly improved the

ability to optimise wood supply for the long term, more effectively target tactical resource planning and more efficiently undertake wood harvesting.

- Mapping application: During 2012, FCNSW commenced investigation of a map application (referred to as the FCMapApp) for use on mobile electronic devices such as smart phones and tablets. The aim was to develop an App that would complement operational planning processes and allow real-time capture of spatial data that can be stored in a central database and be made available to other FCNSW staff and contractors. Version 1 of the App become operational in December 2013 and has revolutionised the capture and transfer of data used in the planning and implementation of forest management activities.

The application of sustainable yield and the conservation and sustainable use of forest resources for current and future generations has ensured that the health, diversity and productivity of the environment has been maintained for the benefit of future generations. Ecologically sustainable management under the NSW RFAs has provided the framework within which the Australian and NSW governments have systematically provided sustainable outcomes for forests and people in a responsive, adaptable and continually improving manner.

Independent five-yearly reviews of the NSW RFAs report on the matters listed in para (a) of the definition of 'RFA' in the RFA Act. Independent reviewers consider environmental values, indigenous heritage values, economic values of forested areas and forest industries, social values and the principles of ecologically sustainable management within the NSW RFA regions. Review reports are tabled in the Australian Parliament and the Australian and NSW governments respond to any recommendations through joint government responses. Should the NSW RFAs be varied, subsequent five-yearly extensions would be contingent on successful completion of these independent five-yearly reviews.

This report has demonstrated that the Australian and NSW governments have, through a comprehensive and diverse range of processes, formally had ongoing regard to the matters listed in para (a) of the definition of 'RFA' in the RFA Act relevant to the NSW RFA regions. Given the commitments of both governments to continue implementing the ongoing obligations and commitments of the NSW RFAs, while allowing for the forest management framework and implementation mechanisms to be responsive to new information consistent with adaptive management and continual improvement principles, it could be expected that the management of NSW forests in RFA regions would continue within this framework.

6.Appendices

Appendix 1

Alignment of the international Montréal Process indicators with Australia's national indicators used in SOFR since 2005

Source: ABARES State of the Forests Report 2013

Criterion 1 Conservation of biological diversity

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
1.1	Ecosystem diversity	—	—
1.1.a	Area and per cent of forest by forest ecosystem type, successional stage, age class, and forest ownership or tenure	1.1a	1.1b
1.1.b	Area and per cent of forest in protected areas by forest ecosystem type, and by age class or successional stage	1.1c	1.1b
1.1.c	Fragmentation of forests	1.1d	—
1.2	Species diversity	—	—
1.2.a	Number of native forest associated species	—	1.2a
1.2.b	Number and status of native forest associated species at risk, as determined by legislation or scientific assessment	1.2b	—
1.2.c	Status of on site and off site efforts focused on conservation of species diversity	—	—

1.3	Genetic diversity	—	—
1.3.a	Number and geographic distribution of forest associated species at risk of losing genetic variation and locally adapted genotypes	1.3a	—
1.3.b	Population levels of selected representative forest associated species to describe genetic diversity	—	1.2c
1.3c	Status of on site and off site efforts focused on conservation of genetic	—	1.3a 1.3b

Australia's criteria and indicators Indicator number	**Australia's criteria and indicators Indicator name**	**Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment**	**Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment**
1.1	Ecosystem diversity	—	—
1.1a	Area of forest by forest type and tenure	1.1.a	—
1.1b	Area of forest by growth stage	—	1.1.a 1.1.b
1.1c	Area of forest in protected area categories	1.1.b	—
1.1d	Fragmentation of forest cover	1.1.c	—
1.2	Species diversity	—	—
1.2a	Forest dwelling species for which ecological information is available	—	1.2.a
1.2b	The status of forest dwelling species at risk of not maintaining viable breeding populations, as determined by legislation or scientific assessment	1.2.b	—

1.2c	Representative species from a range of habitats monitored at scales relevant to regional forest management	—	1.3.b
1.3	Genetic diversity	—	—
1.3a	Forest associated species at risk from isolation and the loss of genetic variation, and conservation efforts for those species	1.3.a	1.3.c
1.3b	Native forest and plantations of indigenous timber species which have genetic resource conservation mechanisms in place	—	1.3.c

Criterion 2 Maintenance of productive capacity of forest ecosystems

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
2.a	Area and per cent of forest land and net areas of forest land available for wood production	2.1a	—
2.b	Total growing stock and annual increment of both merchantable and non-merchantable tree species in forests available for wood production	2.1a	—
2.c	Area, per cent, and growing stock of plantations of native and exotic species	2.1b	—
2.d	Annual harvest of wood products by volume and as a per centage of net growth or sustained yield	2.1c	—
2.e	Annual harvest of non-wood forest products	2.1d	—

Australia's criteria and indicators Indicator number	Australia's criteria and indicators Indicator name	Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment	Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment
2.1a	Native forest available for wood production, area harvested, and growing stock of merchantable and non-merchantable tree species	2.a 2.b	—
2.1b	Age class and growing stock of plantations	2.c	—
2.1c	Annual removal of wood products compared to the volume determined to be sustainable for native forests and future yields for plantations	2.d	—
2.1d	Annual removal of non-wood forest products compared to the level determined to be sustainable	2.e	—
2.1e	The area of native forest harvested and the proportion of that effectively regenerated, and the area of plantation harvested and the proportion of that effectively re-established	—	—

Criterion 3 Maintenance of ecosystem health and vitality

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
3.a	Area and per cent of forest affected by biotic processes and agents (e.g. disease, insects, invasive species) beyond reference conditions	3.1a	—
3.b	Area and per cent of forest affected by abiotic agents (e.g. fire, storm, land clearance) beyond reference conditions	3.1a 3.1b	—

Australia's criteria and indicators Indicator number	Australia's criteria and indicators Indicator name	Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment	Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment
3.1a	Scale and impact of agents and processes affecting forest health and vitality	3.a 3.b	—
3.1b	Area of forest burnt by planned and unplanned fire	3.b	—

Criterion 4 Conservation and maintenance of soil and water resources

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
4.1	**Protective function**	—	—
4.1.a	Area and per cent of forest whose designation or land management focus is the protection of soil or water resources	4.1a	—
4.2	**Soil**	—	—
4.2.a	Proportion of forest management activities that meet best management practices or other relevant legislation to protect soil resources	4.1b 4.1c	—
4.2.b	Area and per cent of forest land with significant soil degradation	—	—
4.3	**Water**	—	—
4.3.a	Proportion of forest management activities that	4.1d	—

	meet best management practices, or other relevant legislation, to protect water related resources	4.1e	
4.3.b	Area and per cent of water bodies, or stream length, in forest areas with significant change in physical, chemical or biological properties from reference conditions	—	—

Australia's criteria and indicators Indicator number	**Australia's criteria and indicators Indicator name**	**Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment**	**Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment**
4.1a	Area of forest land managed primarily for protective functions	4.1.a	—
4.1b	Management of the risk of soil erosion in forests	4.2.a	—
4.1c	Management of the risks to soil physical properties in forests	4.2.a	—
4.1d	Management of the risks to water quantity from forests	4.3.a	—
4.1e	Management of the risks to water quality in forests	4.3.a	—

Criterion 5 Maintenance of forest contribution to global carbon cycles

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
5.a	Total forest ecosystem carbon pools and fluxes	5.1a	—
5.b	Total forest product carbon pools and fluxes	5.1a	—
5.c	Avoided fossil fuel carbon emissions	—	5.1a

Australia's criteria and indicators Indicator number	Australia's criteria and indicators Indicator name	Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment	Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment
5.1a	Contribution of forest ecosystems and forest industries to the global greenhouse gas balance	5.a 5.b	5.c

Criterion 6 Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
6.1	**Production and consumption**	—	—
6.1.a	Value and volume of wood and wood products production, including primary and secondary processing	6.1a	—
6.1.b	Value of non-wood forest products produced or collected	6.1b	—
6.1.c	Revenue from forest based environmental services	6.1c	—
6.1.d	Total and per capita consumption of wood and wood products in round wood equivalents	6.1d	—
6.1.e	Total and per capita consumption of non-wood products	6.1d	—
6.1.f	Value and volume in round wood equivalents of exports and imports of wood products	6.1d	—
6.1.g	Value of exports and imports of non-wood products	6.1d	—
6.1.h	Exports as a share of wood and wood products production and imports as a share of wood and wood products consumption	—	6.1d
6.1.i	Recovery or recycling of forest products as a per cent of total forest products consumption	6.1e	—
6.2	**Investment in the forest sector**	—	—
6.2.a	Value of capital investment and annual expenditure in forest management, wood and non-wood product industries, forest-based environmental services, recreation and tourism	6.2a	—

6.2.b	Annual investment and expenditure in forest-related research, extension and development, and education	6.2b	—
6.3	**Employment and community needs**	—	—
6.3.a	Employment in the forest sector	6.5a	—
6.3.b	Average wage rates, annual average income and annual injury rates in major forest employment categories	6.5b	—
6.3.c	Resilience of forest-dependent communities	6.5c	—
6.3.d	Area and per cent of forests used for subsistence purposes	—	6.5d
6.3.e	Distribution of revenues derived from forest management	—	—
6.4	**Recreation and tourism**	—	—
6.4.a	Area and per cent of forests available and/or managed for public recreation and tourism	6.3a	—
6.4.b	Number, type, and geographic distribution of visits attributed to	6.3b	—
6.5	**Cultural, social and spiritual needs and values**	—	—
6.5.a	Area and per cent of forests managed primarily to protect the range of cultural, social and spiritual needs and values	6.4a 6.4b 6.4c	—
6.5.b	The importance of forests to people	6.4d	—

Australia's criteria and indicators Indicator number	Australia's criteria and indicators Indicator name	Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment	Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment
6.1	**Production and consumption**	—	—
6.1a	Value and volume of wood and wood products	6.1.a	—
6.1b	Values, quantities and use of non-wood forest products	6.1.b	—
6.1c	Value of forest based services	6.1.c	—
6.1d	Production and consumption and import/export of wood, wood products and non-wood products	6.1.d 6.1.e 6.1.f 6.1.g	6.1.h
6.1e	Degree of recycling of forest products	6.1.i	—
6.2	**Investment in the forest sector**	—	—
6.2a	Investment and expenditure in forest management	6.2.a	—
6.2 b	Investment in research, development, extension and use of new and improved technologies	6.2.b	—
6.5	**Employment and community needs**	—	—
6.5a	Direct and indirect employment in the forest sector	6.3.a	—
6.5 b	Wage rates and injury rates within the forest sector	6.3.b	—
6.5c	Resilience of forest dependent communities to changing social and economic conditions	6.3.c	—
6.5d	Resilience of forest dependent Indigenous communities to changing social and economic conditions	—	6.3.d
6.3	**Recreation and tourism**	—	—

6.3a	Area of forest available for public recreation/ tourism	6.4.a	—
6.3b	Range and use of recreation/ tourism activities available	6.4.b	—
6.4	**Cultural, social and spiritual needs and values**	—	—
6.4a	Area of forest to which Indigenous people have use and rights that protect their special values and are recognised through formal and informal management regimes	6.5.a	—
6.4b	Registered places of non-Indigenous cultural value in forests that are formally managed to protect those values	6.5.a	—
6.4c	The extent to which Indigenous values are protected, maintained and enhanced through Indigenous participation in forest management	6.5.a	—
6.4d	The importance of forests to people	6.5.b	—

Criterion 7 Legal, institutional and economic framework for forest conservation and sustainable management

International Montréal Process criteria and indicators Indicator number	International Montréal Process criteria and indicators Indicator name	Australian indicator(s) with which each Montréal Process indicator aligns Strong alignment	Australian indicator(s) with which each Montréal Process indicator aligns Partial alignment
7.1.a	Legislation and policies supporting the sustainable management of forests	7.1a	7.1b
7.1.b	Cross-sectoral policy and programme coordination	—	7.1a 7.1b
7.2.a	Taxation and other economic strategies that affect the sustainable management of forests	7.1c	—
7.3.a	Clarity and security of land and resource tenure and property rights	—	7.1a
7.3b	Enforcement of laws related to forests	—	7.1a
7.4.a	Programmes, services and other resources supporting the sustainable management of forests	—	7.1b
7.4.b	Development and application of research and technologies for the sustainable management of forests	7.1e	—
7.5.a	Partnerships to support the sustainable management of forests	—	—
7.5.b	Public participation and conflict resolution in forest-related decision making	—	7.1b
7.5.c	Monitoring, assessment and reporting on progress towards sustainable management of forests	7.1d	—

Australia's criteria and indicators Indicator number	Australia's criteria and indicators Indicator name	Montréal Process indicator(s) with which each Australian indicator aligns Strong alignment	Montréal Process indicator(s) with which each Australian indicator aligns Partial alignment
7.1a	Extent to which the legal framework supports the conservation and sustainable management of forests	7.1.a	7.3.a 7.3.b
7.1b	Extent to which the institutional framework supports the conservation and sustainable management of forests	—	7.1.a 7.4.a 7.5.b
7.1c	Extent to which the economic framework supports the conservation and sustainable management of forests	7.2.a	—
7.1d	Capacity to measure and monitor changes in the conservation and sustainable management of forests	7.5.c	—
7.1e	Capacity to conduct and apply research and development aimed at improving forest management and delivery of forest goods and services	7.4.b	—

— = no such alignment

Appendix 2

EPBC listed species and ecological communities known or likely to occur in NSW RFA regions

Flora

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Acacia bynoeana	Bynoe's Wattle, Tiny Wattle	Plant	NE, S	V	16/07/2000	CA approved, RP required
Acacia constablei	Narrabarba Wattle	Plant	E	V	16/07/2000	CA approved, RP not required
Acacia courtii	Northern Brother Wattle	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Acacia georgensis	Bega Wattle	Plant	E, S	V	16/07/2000	CA approved, RP not required
Acacia gordonii		Plant	NE	E	16/07/2000	CA approved, RP not required
Acacia macnuttiana	McNutt's Wattle	Plant	NE	V	16/07/2000	CA approved, RP not required
Acacia phasmoides	Phantom Wattle	Plant	S	V	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Acacia pubescens	Downy Wattle, Hairy Stemmed Wattle	Plant	NE, S	V	16/07/2000	CA approved, RP approved, RP required
Acacia pubifolia	Velvet Wattle	Plant	NE	V	16/07/2000	CA approved, RP not required
Acacia pycnostachya	Bolivia Wattle	Plant	NE	V	16/07/2000	CA approved, RP not required
Acacia ruppii	Rupp's Wattle	Plant	NE	E	16/07/2000	RP approved, RP required
Acronychia littoralis	Scented Acronychia	Plant	NE	E	16/07/2000	CA approved, RP not required
Allocasuarina defungens	Dwarf Heath Casuarina	Plant	NE	E	16/07/2000	CA approved, RP not required
Allocasuarina glareicola		Plant	NE, S	E	16/07/2000	CA approved, RP not required
Allocasuarina simulans	Nabiac Casuarina	Plant	NE	V	16/07/2000	CA approved, RP not required
Allocasuarina thalassoscopica		Plant	NE	E	16/07/2000	CA approved, RP not required
Almaleea cambagei	Torrington Pea	Plant	NE	V	16/07/2000	CA approved, RP not required
Ammobium craspedioides	Yass Daisy	Plant	S	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Amphibromus fluitans	River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	Plant	E, S	V	16/07/2000	CA approved, RP not required
Amyema plicatula		Plant	NE	E	16/07/2000	CA approved, RP not required
Androcalva procumbens		Plant	NE	V	16/07/2000	CA approved, RP not required
Androcalva rosea	Sandy Hollow Commersonia	Plant	NE	E	8/01/2008	CA approved, RP not required
Angophora inopina	Charmhaven Apple	Plant	NE	V	16/07/2000	CA approved, RP not required
Angophora robur	Sandstone Rough-barked Apple	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Argyrotegium nitidulum	Shining Cudweed	Plant	S	V	16/07/2000	CA approved, RP approved, RP required
Arthraxon hispidus	Hairy-joint Grass	Plant	NE	V	16/07/2000	CA approved, RP not required
Asperula asthenes	Trailing Woodruff	Plant	NE	V	16/07/2000	CA approved, RP not required
Asterolasia elegans		Plant	NE, S	E	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Astrotricha crassifolia	Thick-leaf Star-hair	Plant	NE, E, S	V	16/07/2000	CA approved, RP not required
Astrotricha roddii		Plant	NE	E	16/07/2000	CA approved, RP not required
Baloghia marmorata	Marbled Balogia, Jointed Baloghia	Plant	NE	V	16/07/2000	CA approved, RP not required
Baloskion longipes	Dense Cord-rush	Plant	NE, S	V	16/07/2000	CA approved, RP not required
Banksia vincentia		Plant	S	CE	15/02/2018	CA approved, RP not required
Bertya ernestiana	a shrub	Plant	NE	V	16/07/2000	CA approved, RP not required
Bertya opponens		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Boronia deanei	Deane's Boronia	Plant	S	V	16/07/2000	CA approved, RP not required
Boronia granitica	Granite Boronia	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Boronia repanda	Repand Boronia, Border Boronia	Plant	NE	E	16/07/2000	CA approved, RP not required
Boronia umbellata	Orara Boronia	Plant	NE	V	16/07/2000	CA approved, RP approved, RP

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
						required
Bosistoa transversa	Three-leaved Bosistoa, Yellow Satinheart	Plant	NE	V	16/07/2000	CA approved, RP not required
Bossiaea oligosperma		Plant	S	V	16/07/2000	CA approved, RP not required
Budawangia gnidioides	Budawangs Cliff-heath	Plant	S	V	16/07/2000	CA approved, RP not required
Bulbophyllum globuliforme	Miniature Moss-orchid, Hoop Pine Orchid	Plant	NE	V	16/07/2000	CA approved, RP not required
Cadellia pentastylis	Ooline	Plant	NE	V	16/07/2000	CA approved, RP not required
Caladenia actensis	Canberra Spider Orchid	Plant	S	CE	6/06/2005	RP approved, RP required
Caladenia atroclavia	Black-clubbed Spider-orchid	Plant	NE	E	16/07/2000	CA approved, RP not required
Caladenia concolor	Crimson Spider-orchid, Maroon Spider-orchid	Plant	S	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Caladenia tensa	Greencomb Spider-orchid, Rigid Spider-orchid	Plant	S	E	16/07/2000	CA approved, RP approved, RP required
Caladenia tessellata	Thick-lipped Spider-orchid, Daddy Long-legs	Plant	NE, E, S	V	16/07/2000	RP approved, RP required
Callistemon forresterae	Forrester's Bottlebrush	Plant	E	V	16/07/2000	RP approved, RP required
Callistemon pungens		Plant	NE	V	16/07/2000	CA approved, RP not required
Callitris oblonga	Pygmy Cypress-pine, Pigmy Cypress-pine, Dwarf Cypress-pine	Plant	NE, S	V	16/07/2000	CA approved, RP approved, RP required
Calotis glandulosa	Mauve Burr-daisy	Plant	E, S	V	16/07/2000	CA approved, RP not required
Clematis fawcettii	Stream Clematis	Plant	NE	V	16/07/2000	CA approved, RP not required
Colobanthus curtisiae	Curtis' Colobanth	Plant	S	V	16/07/2000	CA approved, RP not required
Commersonia prostrata	Dwarf Kerrawang	Plant	NE, S	E	16/07/2000	RP approved, RP required
Coopernookia scabridiuscula		Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Corchorus cunninghamii	Native Jute	Plant	NE	E	16/07/2000	CA approved, RP approved, RP not required
Corokia whiteana		Plant	NE	V	16/07/2000	CA approved, RP not required
Correa baeuerlenii	Chef's Cap	Plant	E, S	V	16/07/2000	CA approved, RP not required
Correa lawrenceana var. genoensis	Genoa River Correa	Plant	E	E	16/07/2000	RP approved, RP required
Corunastylis ectopa	Brindabella Midge-orchid, Ectopic Midge-orchid	Plant	S	CE	6/06/2005	RP approved, RP required
Corunastylis insignis	Wyong Midge Orchid 1, Variable Midge Orchid 1	Plant	NE	CE	19/07/2014	CA approved, RP not required
Corunastylis littoralis	Tuncurry Midge Orchid	Plant	NE	CE	22/02/2011	CA approved, RP not required
Corunastylis sp. Charmhaven (NSW 896673)	Wyong Midge Orchid 2	Plant	NE	CE	19/07/2014	CA approved, RP not required
Corynocarpus rupestris subsp. rupestris	Glenugie Karaka	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Cryptocarya foetida	Stinking Cryptocarya, Stinking Laurel	Plant	NE	V	16/07/2000	CA approved, RP not required
Cryptostylis hunteriana	Leafless Tongue-orchid	Plant	NE, E, S	V	16/07/2000	CA approved, RP not required
Cynanchum elegans	White-flowered Wax Plant	Plant	NE, S	E	16/07/2000	CA approved, RP not required
Cyperus semifertilis		Plant	NE	V	16/07/2000	CA approved, RP not required
Daphnandra johnsonii	Illawarra Socketwood	Plant	S	E	16/07/2000	CA approved, RP required
Darwinia biflora		Plant	NE	V	16/07/2000	CA approved, RP not required
Davidsonia jerseyana	Davidson's Plum	Plant	NE	E	16/07/2000	CA approved, RP required
Davidsonia johnsonii	Smooth Davidsonia, Smooth Davidson's Plum, Small-leaved Davidson's Plum	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Desmodium acanthocladum	Thorny Pea	Plant	NE	V	16/07/2000	CA approved, RP not required
Deyeuxia pungens	Narrow-leaf Bent-grass	Plant	S	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Dichanthium setosum	bluegrass	Plant	NE	V	16/07/2000	CA approved, RP not required
Diospyros mabacea	Red-fruited Ebony, Silky Persimmon, Ebony	Plant	NE	E	16/07/2000	RP approved, RP required
Diploglottis campbellii	Small-leaved Tamarind	Plant	NE	E	16/07/2000	RP approved, RP required
Diuris aequalis	Buttercup Doubletail	Plant	S	V	16/07/2000	CA approved, RP not required
Diuris flavescens	Pale Yellow Doubletail, Wingham Doubletail	Plant	NE	CE	24/01/2014	CA approved, RP not required
Diuris ochroma	Pale Golden Moths	Plant	NE, E, S	V	16/07/2000	CA approved, RP approved, RP required
Diuris pedunculata	Small Snake Orchid, Two-leaved Golden Moths, Golden Moths, Cowslip Orchid, Snake Orchid	Plant	NE	E	16/07/2000	CA approved, RP not required
Diuris praecox	Newcastle Doubletail	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Diuris venosa	Veined Doubletail, Goat Orchid, Veined Donkey-orchid	Plant	NE	V	16/07/2000	CA approved, RP not required
Dodonaea procumbens	Trailing Hop-bush	Plant	E, S	V	16/07/2000	RP approved, RP required
Eidothea hardeniana	Nightcap Oak	Plant	NE	CE	23/07/2002	CA approved, RP required
Elaeocarpus sedentarius	Minyon Quandong	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Elaeocarpus williamsianus	Hairy Quandong	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Endiandra floydii	Floyd's Walnut	Plant	NE	E	16/07/2000	RP approved, RP required
Endiandra hayesii	Rusty Rose Walnut, Velvet Laurel	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Eriocaulon australasicum	Austral Pipewort, Southern Pipewort	Plant	S	E	16/07/2000	RP approved, RP required
Eucalyptus aggregata	Black Gum	Plant	NE, E, S	V	17/11/2015	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Eucalyptus aquatica	Mountain Swamp Gum, Broad-leaved Sallee, Broad-leaved Sally	Plant	S	V	16/07/2000	CA approved, RP not required
Eucalyptus benthamii	Camden White Gum, Nepean River Gum	Plant	S	V	16/07/2000	CA approved, RP required
Eucalyptus caleyi subsp. ovendenii	Ovenden's Ironbark	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus camfieldii	Camfield's Stringybark	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus glaucina	Slaty Red Gum	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus imlayensis	Imlay Mallee, Mount Imlay Mallee	Plant	E, S	E	16/07/2000	CA approved, RP not required
Eucalyptus kartzoffiana	Araluen Gum	Plant	S	V	16/07/2000	CA approved, RP not required
Eucalyptus langleyi	Albatross Mallee	Plant	S	V	16/07/2000	CA approved, RP not required
Eucalyptus macarthurii	Camden Woollybutt, Paddys River Box	Plant	S	E	5/05/2016	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Eucalyptus mckieana	McKie's Stringybark	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus nicholii	Narrow-leaved Peppermint, Narrow-leaved Black Peppermint	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus pachycalyx subsp. banyabba	Banyabba Shiny-barked Gum	Plant	NE	E	16/07/2000	RP approved, RP required
Eucalyptus parramattensis subsp. decadens	Earp's Gum, Earp's Dirty Gum	Plant	NE	V	16/07/2000	CA approved, RP required
Eucalyptus parvula	Small-leaved Gum	Plant	E, S	V	16/07/2000	CA approved, RP not required
Eucalyptus pulverulenta	Silver-leaved Mountain Gum, Silver-leaved Gum	Plant	E, S	V	16/07/2000	CA approved, RP not required
Eucalyptus pumila	Pokolbin Mallee	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus recurva	Mongarlowe Mallee	Plant	S	CE	9/04/2015	CA approved, RP approved, RP required
Eucalyptus rubida subsp. barbigerorum	Blackbutt Candlebark	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Eucalyptus scoparia	Wallangarra White Gum	Plant	NE	V	16/07/2000	CA approved, RP not required
Eucalyptus sp. Howes Swamp Creek (M.Doherty 26)		Plant	NE	E	16/07/2000	CA approved, RP not required
Eucalyptus tetrapleura	Square-fruited Ironbark	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Euphrasia arguta		Plant	NE	CE	19/03/2011	CA approved, RP not required
Euphrasia bella	Lamington Eyebright, Mt. Merino Eyebright	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Floydia praealta	Ball Nut, Possum Nut, Big Nut, Beefwood	Plant	NE	V	16/07/2000	CA approved, RP not required
Fontainea australis	Southern Fontainea	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Fontainea oraria	Coastal Fontainea	Plant	NE	E	16/07/2000	RP approved, RP required
Gaultheria viridicarpa J.B.Williams subsp. viridicarpa ms.	Green Waxberry	Plant	NE	V	01/10/2008	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Genoplesium baueri	Yellow Gnat-orchid	Plant	NE, S	E	25/01/2014	CA approved, RP required
Genoplesium plumosum	Plumed Midge-orchid, Tallong Midge Orchid	Plant	S	E	16/07/2000	CA approved, RP approved, RP required
Genoplesium rhyoliticum	Pambula Midge-orchid	Plant	E	E	16/07/2000	CA approved, RP not required
Genoplesium vernale	East Lynne Midge-orchid	Plant	S	V	4/10/2001	CA approved, RP approved, RP required
Gentiana baeuerlenii	Baeuerlen's Gentian	Plant	S	E	16/07/2000	CA approved, RP required
Gentiana bredboensis	Bredbo Gentian	Plant	S	V	16/07/2000	CA approved, RP not required
Gentiana wingecarribiensis	Wingecarribee Gentian	Plant	S	E	16/07/2000	CA approved, RP not required
Gentiana wissmannii	New England Gentian	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Gingidia rupicola	Mountain Angelica, Broad-leafed Carrot	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Glycine latrobeana	Clover Glycine, Purple Clover	Plant	E, S	V	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Gossia fragrantissima	Sweet Myrtle, Small-leaved Myrtle	Plant	NE	E	16/07/2000	RP approved, RP required
Grevillea acanthifolia subsp. paludosa	Bog Grevillea	Plant	E, S	E	16/07/2000	CA approved, RP not required
Grevillea banyabba		Plant	NE	V	16/07/2000	RP approved, RP required
Grevillea beadleana	Beadle's Grevillea	Plant	NE	E	16/07/2000	CA approved, RP required
Grevillea evansiana		Plant	NE	V	16/07/2000	CA approved, RP not required
Grevillea guthrieana		Plant	NE	E	16/07/2000	CA approved, RP not required
Grevillea iaspicula	Wee Jasper Grevillea	Plant	S	E	16/07/2000	CA approved, RP not required
Grevillea masonii		Plant	NE	E	16/07/2000	RP approved, RP required
Grevillea mollis		Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Grevillea molyneuxii		Plant	S	E	16/07/2000	CA approved, RP not required
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Plant	NE, S	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Grevillea quadricauda		Plant	NE	V	16/07/2000	CA approved, RP not required
Grevillea rhizomatosa		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Grevillea rivularis	Carrington Falls Grevillea	Plant	S	E	16/07/2000	CA approved, RP not required
Grevillea scortechinii subsp. scortechinii	Black Grevillea	Plant	NE	V	16/07/2000	CA approved, RP not required
Grevillea shiressii		Plant	NE	V	16/07/2000	CA approved, RP not required
Grevillea wilkinsonii	Tumut Grevillea	Plant	S	E	16/07/2000	CA approved, RP approved, RP required
Hakea archaeoides		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Hakea fraseri	Gnarled Corkbark, Fraser's Hakea	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Haloragis exalata subsp. exalata	Wingless Raspwort, Square Raspwort	Plant	NE, E, S	V	16/07/2000	CA approved, RP not required
Haloragis exalata subsp.	Tall Velvet Sea-berry	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
velutina						
Haloragodendron lucasii	Hal	Plant	NE	E	16/07/2000	CA approved, RP not required
Hibbertia marginata		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Hicksbeachia pinnatifolia	Monkey Nut, Bopple Nut, Red Bopple, Red Bopple Nut, Red Nut, Beef Nut, Red Apple Nut, Red Boppel Nut, Ivory Silky Oak	Plant	NE	V	16/07/2000	CA approved, RP not required
Homopholis belsonii	Belson's Panic	Plant	NE	V	16/07/2000	CA approved, RP not required
Homoranthus darwinioides		Plant	NE	V	16/07/2000	CA approved, RP not required
Homoranthus lunatus		Plant	NE	V	16/07/2000	CA approved, RP not required
Homoranthus montanus		Plant	NE	V	16/07/2000	CA approved, RP not required
Homoranthus prolixus		Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Irenepharsus trypherus	Delicate Cress, Illawarra Irene	Plant	S	E	16/07/2000	CA approved, RP required
Isoglossa eranthemoides	Isoglossa	Plant	NE	E	16/07/2000	RP approved, RP required
Isopogon fletcheri	Fletcher's Drumsticks	Plant	NE	V	16/07/2000	CA approved, RP not required
Kennedia retrorsa		Plant	NE	V	16/07/2000	CA approved, RP not required
Kunzea cambagei		Plant	S	V	16/07/2000	CA approved, RP not required
Kunzea rupestris		Plant	NE	V	16/07/2000	CA approved, RP not required
Lasiopetalum joyceae		Plant	NE	V	16/07/2000	CA approved, RP not required
Lasiopetalum longistamineum		Plant	NE	V	16/07/2000	CA approved, RP not required
Leionema lachnaeoides		Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Leionema ralstonii		Plant	E	V	16/07/2000	CA approved, RP not required
Leionema sympetalum	Rylstone Bell	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Lepidium ginninderrense	Ginninderra Peppercress	Plant	S	V	28/02/2005	CA approved, RP required
Lepidium hyssopifolium	Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed	Plant	S	E	16/07/2000	RP approved, RP required
Lepidium peregrinum	Wandering Pepper-cress	Plant	NE	E	1/05/2003	CA approved, RP not required
Leptospermum deanei	Deane's Tea-tree	Plant	NE	V	16/07/2000	CA approved, RP not required
Leptospermum thompsonii	Monga Tea-tree	Plant	S	V	16/07/2000	CA approved, RP not required
Leucochrysum albicans var. tricolor	Hoary Sunray, Grassland Paper-daisy	Plant	NE, E, S	E	1/11/2009	RP approved, RP required
Leucopogon confertus	Torrington Beard-heath	Plant	NE	E	16/07/2000	CA approved, RP not required
Leucopogon exolasius	Woronora Beard-heath	Plant	S	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Macadamia integrifolia	Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Macadamia tetraphylla	Rough-shelled Bush Nut, Macadamia Nut, Rough-shelled Macadamia, Rough-leaved Queensland Nut	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Macrozamia occidua		Plant	NE	V	16/07/2000	CA approved, RP not required
Marsdenia longiloba	Clear Milkvine	Plant	NE	V	16/07/2000	CA approved, RP not required
Melaleuca biconvexa	Biconvex Paperbark	Plant	NE, S	V	16/07/2000	CA approved, RP not required
Melaleuca deanei	Deane's Melaleuca	Plant	NE, S	V	4/04/2001	RP approved, RP required
Melichrus sp. Gibberagee (Benwell 97239)	Narrow-leaf Melichrus	Plant	NE	E	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Melichrus sp. Newfoundland State Forest (P.Gilmour 7852)	Hairy Melichrus	Plant	NE	E	16/07/2000	RP approved, RP required
Micromyrtus blakelyi		Plant	NE	V	16/07/2000	CA approved, RP not required
Microtis angusii	Angus's Onion Orchid	Plant	NE	E	16/07/2000	RP approved, RP required
Myrsine richmondensis	Purple-leaf Muttonwood, Lismore Muttonwood	Plant	NE	E	16/07/2000	CA approved, RP required
Nematolepis rhytidophylla		Plant	E	V	16/07/2000	CA approved, RP not required
Neoastelia spectabilis		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Ochrosia moorei	Southern Ochrosia	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Olax angulata	Minnie Waters Olax	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Olearia cordata		Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Olearia flocktoniae	Dorrigo Daisy-bush	Plant	NE	E	16/07/2000	RP approved, RP required
Owenia cepiodora	Onionwood, Bog Onion, Onion Cedar	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Ozothamnus tesselatus		Plant	NE	V	16/07/2000	CA approved, RP not required
Ozothamnus vagans	Wollumbin Dogwood	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Parsonsia dorrigoensis	Milky Silkpod	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Paspalidium grandispiculatum	a grass	Plant	NE	V	16/07/2000	CA approved, RP not required
Pelargonium sp. Striatellum (G.W.Carr 10345)	Omeo Stork's-bill	Plant	NE, E, S	E	21/12/2011	CA approved, RP not required
Persicaria elatior	Knotweed, Tall Knotweed	Plant	NE, E, S	V	16/07/2000	CA approved, RP not required
Persoonia acerosa	Needle Geebung	Plant	S	V	16/07/2000	CA approved, RP not required
Persoonia bargoensis	Bargo Geebung	Plant	S	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Persoonia glaucescens	Mittagong Geebung	Plant	S	V	16/07/2000	CA approved, RP not required
Persoonia hirsuta	Hairy Geebung, Hairy Persoonia	Plant	NE, S	E	16/07/2000	CA approved, RP not required
Persoonia mollis subsp. maxima		Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Persoonia pauciflora	North Rothbury Persoonia	Plant	NE	CE	8/07/2005	RP approved, RP required
Phaius australis	Lesser Swamp-orchid	Plant	NE	E	16/07/2000	CA approved, RP not required
Phebalium glandulosum subsp. eglandulosum	Rusty Desert Phebalium	Plant	NE	V	16/07/2000	CA approved, RP not required
Phebalium whitei		Plant	NE	V	16/07/2000	CA approved, RP not required
Philotheca ericifolia		Plant	NE	V	16/07/2000	CA approved, RP not required
Phyllota humifusa	Dwarf Phyllota	Plant	S	V	16/07/2000	CA approved, RP not required
Picris evae	Hawkweed	Plant	NE	V	16/07/2000	CA approved, RP not required
Pimelea curviflora var.		Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
curviflora						
Pimelea spicata	Spiked Rice-flower	Plant	S	E	16/07/2000	CA approved, RP approved, RP required
Pimelea venosa		Plant	NE	E	16/07/2000	CA approved, RP not required
Plectranthus nitidus	Nightcap Plectranthus, Silver Plectranthus	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Plinthanthesis rodwayi	Budawangs Wallaby-grass	Plant	S	V	16/07/2000	CA approved, RP not required
Pomaderris brunnea	Rufous Pomaderris	Plant	NE, E, S	V	16/07/2000	RP approved, RP required
Pomaderris cotoneaster	Cotoneaster Pomaderris	Plant	E, S	E	16/07/2000	RP approved, RP required
Pomaderris gilmourii var. cana	Grey Deua Pomaderris	Plant	S	V	16/07/2000	CA approved, RP not required
Pomaderris pallida	Pale Pomaderris	Plant	E, S	V	16/07/2000	CA approved, RP not required
Pomaderris parrisiae	Parris' Pomaderris	Plant	E, S	V	16/07/2000	CA approved, RP not required
Pomaderris reperta	Denman Pomaderris	Plant	NE	CE	8/01/2008	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Pomaderris sericea	Bent Pomaderris	Plant	NE, E, S	V	16/07/2000	RP approved, RP required
Prasophyllum affine	Jervis Bay Leek Orchid, Culburra Leek-orchid, Kinghorn Point Leek-orchid	Plant	E, S	E	16/07/2000	RP approved, RP required
Prasophyllum bagoense	Bago Leek-orchid	Plant	S	CE	3/05/2012	CA approved, RP not required
Prasophyllum fuscum	Tawny Leek-orchid, Slaty Leek-orchid	Plant	S	V	16/07/2000	CA approved, RP not required
Prasophyllum innubum	Brandy Marys Leek-orchid	Plant	S	CE	24/01/2014	CA approved, RP not required
Prasophyllum keltonii	Kelton's Leek-orchid	Plant	S	CE	24/01/2014	CA approved, RP not required
Prasophyllum morganii	Mignonette Leek-orchid, Cobungra Leek-orchid, Dense Leek-orchid	Plant	S	V	16/07/2000	CA approved, RP approved, RP required
Prasophyllum petilum	Tarengo Leek Orchid	Plant	E, S	E	16/07/2000	RP approved, RP required
Prasophyllum sp. Wybong (C.Phelps ORG 5269)	a leek-orchid	Plant	NE	CE	13/11/2009	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Prasophyllum validum	Sturdy Leek-orchid	Plant	S	V	16/07/2000	RP approved, RP required
Prostanthera askania	Tranquillity Mintbush, Tranquility Mintbush	Plant	NE	E	16/07/2000	RP approved, RP required
Prostanthera cineolifera		Plant	NE	V	16/07/2000	CA approved, RP not required
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	Plant	NE	V	8/06/2013	CA approved, RP not required
Prostanthera densa	Villous Mintbush	Plant	NE, S	V	16/07/2000	CA approved, RP not required
Prostanthera discolor		Plant	NE	V	16/07/2000	CA approved, RP not required
Prostanthera junonis	Somersby Mintbush	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Prostanthera palustris	Swamp Mint-bush	Plant	NE	V	16/07/2000	RP approved, RP required
Prostanthera staurophylla	a mint-bush	Plant	NE	V	16/07/2000	CA approved, RP not required
Prostanthera stricta	Mount Vincent Mintbush	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Pterostylis bicornis		Plant	NE	V	16/07/2000	CA approved, RP not required
Pterostylis chlorogramma	Green-striped Greenhood	Plant	E	V	16/07/2000	RP approved, RP required
Pterostylis gibbosa	Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood	Plant	NE, S	E	16/07/2000	CA approved, RP approved, RP required
Pterostylis oreophila	Blue-tongued Orchid, Kiandra Greenhood	Plant	E, S	CE	3/05/2012	CA approved, RP required
Pterostylis pulchella	Pretty Greenhood	Plant	NE, S	V	16/07/2000	CA approved, RP not required
Pterostylis saxicola	Sydney Plains Greenhood	Plant	NE, S	E	16/07/2000	CA approved, RP not required
Pterostylis vernalis	Halbury Rustyhood	Plant	S	CE	12/02/2010	CA approved, RP not required
Pultenaea aristata		Plant	S	V	16/07/2000	CA approved, RP not required
Pultenaea baeuerlenii	Budawangs Bush-pea	Plant	S	V	16/07/2000	CA approved, RP not required
Pultenaea elusa	Elusive Bush-pea	Plant	S	E	16/07/2000	CA approved, RP not required
Pultenaea glabra	Smooth Bush-pea, Swamp	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
	Bush-pea					
Pultenaea parrisiae		Plant	E, S	V	16/07/2000	CA approved, RP not required
Randia moorei	Spiny Gardenia	Plant	NE	E	16/07/2000	RP approved, RP required
Ranunculus anemoneus	Anemone Buttercup	Plant	S	V	16/07/2000	CA approved, RP approved, RP required
Rhizanthella slateri	Eastern Underground Orchid	Plant	NE, S	E	18/12/2007	CA approved, RP not required
Rutidosis heterogama	Heath Wrinklewort	Plant	NE	V	16/07/2000	CA approved, RP not required
Rutidosis leiolepis	Monaro Golden Daisy	Plant	E, S	V	16/07/2000	CA approved, RP not required
Rutidosis leptorrhynchoides	Button Wrinklewort	Plant	E, S	E	16/07/2000	RP approved, RP required
Rytidosperma pumilum	Feldmark Grass	Plant	S	V	16/07/2000	CA approved, RP approved, RP required
Samadera bidwillii	Quassia	Plant	NE	V	16/07/2000	CA approved, RP not required
Samadera sp. Moonee Creek (J.King s.n. Nov.		Plant	NE	E	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
1949)						
Sarcochilus fitzgeraldii	Ravine Orchid	Plant	NE	V	16/07/2000	CA approved, RP not required
Sarcochilus hartmannii	Waxy Sarcochilus, Blue Knob Orchid	Plant	NE	V	16/07/2000	CA approved, RP not required
Sarcochilus weinthalii	Blotched Sarcochilus, Weinthals Sarcanth	Plant	NE	V	16/07/2000	CA approved, RP required
Selaginella andrewsii	Tallebudgera spikemoss	Plant	NE	V	23/02/2013	CA approved, RP required
Senecio macrocarpus	Large-fruit Fireweed, Large-fruit Groundsel	Plant	S	V	16/07/2000	RP approved, RP required
Solanum sulphureum		Plant	NE	E	7/12/2016	CA approved, RP not required
Sophora fraseri		Plant	NE	V	16/07/2000	CA approved, RP not required
Styphelia perileuca		Plant	NE	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Swainsona recta	Small Purple-pea, Mountain Swainson-pea, Small Purple Pea	Plant	S	E	16/07/2000	RP approved, RP required
Symplocos baeuerlenii	Small-leaved Hazelwood, Shrubby Hazelwood	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Syzygium hodgkinsoniae	Smooth-bark Rose Apple, Red Lilly Pilly	Plant	NE	V	16/07/2000	CA approved, RP not required
Syzygium moorei	Rose Apple, Coolamon, Robby, Durobby, Watermelon Tree, Coolamon Rose Apple	Plant	NE	V	16/07/2000	CA approved, RP approved, RP required
Syzygium paniculatum	Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry	Plant	NE, S	V	16/07/2000	RP approved, RP required
Tasmannia glaucifolia	Fragrant Pepperbush	Plant	NE	V	16/07/2000	CA approved, RP not required
Tetratheca juncea	Black-eyed Susan	Plant	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Thelymitra adorata	Wyong Sun Orchid	Plant	NE	CE	19/07/2014	CA approved, RP not required
Thelymitra kangaloonica	Kangaloon Sun Orchid	Plant	NE, S	CE	8/01/2009	CA approved, RP not required
Thelymitra matthewsii	Spiral Sun-orchid	Plant	E	V	16/07/2000	RP approved, RP required
Thesium australe	Austral Toadflax, Toadflax	Plant	NE, E, S	V	16/07/2000	CA approved, RP required
Triplarina imbricata		Plant	NE, S	E	16/07/2000	CA approved, RP approved, RP required
Triplarina nowraensis	Nowra Heath-myrtle	Plant	S	E	16/07/2000	RP approved, RP required
Tylophora linearis		Plant	NE	E	16/07/2000	CA approved, RP not required
Tylophora woollsii		Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Uromyrtus australis	Peach Myrtle	Plant	NE	E	16/07/2000	RP approved, RP required
Velleia perfoliata		Plant	NE	V	16/07/2000	CA approved, RP not required
Westringia davidii		Plant	E	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Westringia kydrensis		Plant	E, S	E	16/07/2000	CA approved, RP not required
Westringia rupicola		Plant	NE	V	16/07/2000	CA approved, RP not required
Wollemia nobilis	Wollemi Pine	Plant	NE	E	16/07/2000	RP approved, RP required
Xerochrysum palustre	Swamp Everlasting, Swamp Paper Daisy	Plant	E, S	V	16/07/2000	RP approved, RP required
Zieria adenophora	Araluen Zieria	Plant	S	E	16/07/2000	CA approved, RP approved, RP required
Zieria baeuerlenii	Bomaderry Zieria, Bomaderry Creek Zieria	Plant	S	E	16/07/2000	RP approved, RP required
Zieria buxijugum	Box Range Zieria	Plant	E	E	16/07/2000	CA approved, RP approved, RP required
Zieria citriodora	Lemon-scented Zieria	Plant	E, S	V	16/07/2000	RP approved, RP required
Zieria floydii		Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Zieria formosa	Shapely Zieria	Plant	E	E	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Zieria granulata	Hill Zieria, Hilly Zieria, Illawarra Zieria	Plant	S	E	16/07/2000	CA approved, RP required
Zieria involucrata		Plant	NE	V	16/07/2000	RP approved, RP required
Zieria lasiocaulis	Willi Willi Zieria	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Zieria murphyi		Plant	S	V	16/07/2000	CA approved, RP not required
Zieria parrisiae	Parris's Zieria	Plant	E	E	16/07/2000	CA approved, RP approved, RP required
Zieria prostrata	Headland Zieria	Plant	NE	E	16/07/2000	CA approved, RP approved, RP required
Zieria tuberculata	Warty Zieria	Plant	E, S	V	16/07/2000	CA approved, RP not required

Notes:

(1) RFA regions: NE – North East; S – Southern; E – Eden
(2) EPBC Act listing as at 6 April 2018: CE – Critically Endangered; C – Critical; V- Vulnerable; M – Listed as migratory but not threatened
(3) CA – Conservation Advice; RP – Recovery Plan
(4) Hirundapus caudacutus was nominated for vulnerable and included on the 2017 FPAL. The nomination identified forestry as a potential threat (i.e. loss of roosting hollows).
* Listed threatened Migratory species

Source: Environmental Resources Information Network Species of National Environmental Significance Database

Fauna

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Anomalopus mackayi	Five-clawed Worm-skink, Long-legged Worm-skink	Reptile	NE	V	16/07/2000	CA approved, RP not required
Anthochaera phrygia	Regent Honeyeater	Bird	NE, E, S	CE	8/07/2015	CA approved, RP approved, RP required
Aprasia parapulchella	Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	Reptile	NE, E, S	V	16/07/2000	CA approved, RP required
Apus pacificus	Fork-tailed Swift	Bird	NE, E, S	M	NA	CA and RP not required
Argynnis hyperbius inconstans	Australian Fritillary	Insect	NE	CE	15/08/2017	CA approved, RP not required
Atrichornis rufescens	Rufous Scrub-bird	Bird	NE	E	6/11/2014	CA approved, RP not required
Bidyanus bidyanus	Silver Perch, Bidyan	Fish	S	CE	21/12/2013	CA approved, RP required
Botaurus poiciloptilus	Australasian Bittern	Bird	NE, E, S	E	3/03/2011	CA approved, RP required
Burramys parvus	Mountain Pygmy-possum	Mammal	S	E	16/07/2000	CA approved, RP approved, RP required
Calidris canutus	Red Knot, Knot	Bird *	NE, E, S	E	5/05/2016	CA approved, RP not required
Calidris ferruginea	Curlew Sandpiper	Bird *	NE, E, S	CE	26/05/2015	CA approved, RP not required
Calidris tenuirostris	Great Knot	Bird *	NE, S	CE	5/05/2016	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	Mammal	NE, E, S	V	4/04/2001	RP approved, RP required
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	Bird *	NE, S	V	5/05/2016	CA approved, RP not required
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	Bird *	NE, S	E	5/05/2016	CA approved, RP not required
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo	Bird	NE, E, S	M	NA	CA and RP not required
Cyclodomorphus praealtus	Alpine She-oak Skink	Reptile	S	E	24/12/2009	CA approved, RP required
Cyclopsitta diophthalma coxeni	Coxen's Fig-Parrot	Bird	NE	E	16/07/2000	CA approved, RP approved, RP required
Dasyornis brachypterus	Eastern Bristlebird	Bird	NE, E, S	E	16/07/2000	RP approved, RP required
Dasyurus maculatus maculatus (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Mammal	NE, E, S	E	14/05/2004	RP approved, RP required
Delma impar	Striped Legless Lizard	Reptile	NE, E, S	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Delma torquata	Adorned Delma, Collared Delma	Reptile	NE	V	16/07/2000	CA approved, RP not required
Diomedea antipodensis	Antipodean Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Diomedea antipodensis gibsoni	Gibson's Albatross	Bird	NE, E, S	V	16/07/2000	RP approved, RP required
Diomedea epomophora	Southern Royal Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Diomedea exulans	Wandering Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Diomedea sanfordi	Northern Royal Albatross	Bird *	NE, E, S	E	16/07/2000	RP approved, RP required
Erythrotriorchis radiatus	Red Goshawk	Bird	NE	V	16/07/2000	CA approved, RP approved, RP required
Euastacus dharawalus	Fitzroy Falls Spiny Crayfish	Crustacean	S	CE	7/12/2016	CA approved, RP not required
Fregetta grallaria grallaria	White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian)	Bird	NE, E, S	V	16/07/2000	RP approved, RP required
Furina dunmalli	Dunmall's Snake	Reptile	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Galaxias rostratus	Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow	Fish	NE, S	CE	5/05/2016	CA approved, RP not required
Geophaps scripta scripta	Squatter Pigeon (southern)	Bird	NE	V	16/07/2000	CA approved, RP not required
Grantiella picta	Painted Honeyeater	Bird	NE, E, S	V	8/07/2015	CA approved, RP required
Heleioporus australiacus	Giant Burrowing Frog	Frog	NE, E, S	V	16/07/2000	CA approved, RP required
Hirundapus caudacutus[4]	White-throated Needletail	Bird	NE, E, S	M	NA	CA and RP not required
Hoplocephalus bungaroides	Broad-headed Snake	Reptile	NE, S	V	16/07/2000	CA approved, RP required
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern)	Mammal	NE, E, S	E	4/04/2001	CA approved, RP required
Lathamus discolor	Swift Parrot	Bird	NE, E, S	CE	5/05/2016	CA approved, RP approved, RP required
Leipoa ocellata	Malleefowl	Bird	S	V	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Limosa lapponica baueri	Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit	Bird	NE, E, S	V	5/05/2016	CA approved, RP not required
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri)	Bird	NE, E, S	CE	5/05/2016	CA approved, RP not required
Liopholis guthega	Guthega Skink	Reptile	S	E	23/02/2011	CA approved, RP required
Litoria aurea	Green and Golden Bell Frog	Frog	NE, E, S	V	16/07/2000	CA approved, RP required
Litoria booroolongensis	Booroolong Frog	Frog	NE, E, S	E	18/12/2007	CA approved, RP approved, RP required
Litoria castanea	Yellow-spotted Tree Frog, Yellow-spotted Bell Frog	Frog	NE, E, S	E	16/07/2000	CA approved, RP approved, RP required
Litoria littlejohni	Littlejohn's Tree Frog, Heath Frog	Frog	NE, E, S	V	16/07/2000	CA approved, RP not required
Litoria olongburensis	Wallum Sedge Frog	Frog	NE	V	16/07/2000	RP approved, RP required
Litoria piperata	Peppered Tree Frog	Frog	NE	V	16/07/2000	CA approved, RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Litoria raniformis	Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog	Frog	E, S	V	16/07/2000	RP approved, RP required
Litoria spenceri	Spotted Tree Frog	Frog	S	E	16/07/2000	CA approved, RP approved, RP required
Litoria verreauxii alpina	Alpine Tree Frog, Verreaux's Alpine Tree Frog	Frog	E,S	V	16/07/2000	CA approved, RP required
Maccullochella ikei	Clarence River Cod, Eastern Freshwater Cod	Fish	NE	E	16/07/2000	CA approved, RP required
Maccullochella macquariensis	Trout Cod	Fish	S	E	16/07/2000	RP approved, RP required
Maccullochella peelii	Murray Cod	Fish	NE, E, S	V	3/07/2003	RP approved, RP required
Macquaria australasica	Macquarie Perch	Fish	NE, E, S	E	16/07/2000	CA approved, RP required
Macronectes giganteus	Southern Giant-Petrel, Southern Giant Petrel	Bird *	NE, E, S	E	4/04/2001	RP approved, RP required
Macronectes halli	Northern Giant Petrel	Bird *	NE, E, S	V	4/04/2001	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Mastacomys fuscus mordicus	Broad-toothed Rat (mainland), Tooarrana	Mammal	NE, E, S	V	10/05/2016	CA approved, RP not required
Mixophyes balbus	Stuttering Frog, Southern Barred Frog (in Victoria)	Frog	NE, E, S	V	16/07/2000	RP approved, RP required
Mixophyes fleayi	Fleay's Frog	Frog	NE	E	16/07/2000	CA approved, RP approved, RP required
Mixophyes iteratus	Giant Barred Frog, Southern Barred Frog	Frog	NE	E	16/07/2000	CA approved, RP approved, RP required
Monarcha melanopsis	Black-faced Monarch	Bird	NE, E, S	M	NA	CA and RP not required
Monarcha trivirgatus	Spectacled Monarch	Bird	NE, E, S	M	NA	CA and RP not required
Myiagra cyanoleuca	Satin Flycatcher	Bird	NE, E, S	M	NA	CA and RP not required
Nannoperca oxleyana	Oxleyan Pygmy Perch	Fish	NE	E	16/07/2000	CA approved, RP approved, RP required
Neophema chrysogaster	Orange-bellied Parrot	Bird	E, S	CE	13/09/2006	RP approved, RP required
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Bird *	NE, E, S	CE	26/05/2015	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	Mammal	NE, S	V	4/04/2001	CA approved, RP required
Pachyptila turtur subantarctica	Fairy Prion (southern)	Bird	NE, E, S	V	16/07/2000	CA approved, RP required
Pandion haliaetus	Osprey	Bird	NE, E, S	M	NA	CA and RP not required
Pedionomus torquatus	Plains-wanderer	Bird	S	CE	8/07/2015	CA approved, RP approved, RP required
Petauroides volans	Greater Glider	Mammal	NE, E, S	V	5/05/2016	CA approved, RP required
Petrogale penicillata	Brush-tailed Rock-wallaby	Mammal	NE, E, S	V	16/07/2000	RP approved, RP required
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	Mammal	NE, E, S	V	2/05/2012	CA approved, RP required
Phoebetria fusca	Sooty Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Phyllodes imperialis smithersi	Pink Underwing Moth	Insect	NE	E	3/12/2002	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Poephila cincta cincta	Southern Black-throated Finch	Bird	NE	E	14/02/2005	RP approved, RP required
Polytelis swainsonii	Superb Parrot	Bird	S	V	16/07/2000	CA approved, RP approved, RP required
Pommerhelix duralensis	Dural Land Snail	Snail	NE	E	9/04/2015	CA approved, RP not required
Potorous longipes	Long-footed Potoroo	Mammal	E	E	16/07/2000	CA approved, RP approved, RP required
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Mammal	NE, E, S	V	16/07/2000	RP required
Prototroctes maraena	Australian Grayling	Fish	NE, E, S	V	16/07/2000	RP approved, RP required
Pseudomys fumeus	Smoky Mouse, Konoom	Mammal	E, S	E	16/07/2000	RP approved, RP required
Pseudomys novaehollandiae	New Holland Mouse, Pookila	Mammal	NE, S	V	11/08/2010	CA approved, RP required
Pseudomys oralis	Hastings River Mouse, Koontoo	Mammal	NE	E	16/07/2000	RP approved, RP required
Pseudophryne corroboree	Southern Corroboree Frog	Frog	S	CE	6/04/2013	RP approved, RP required
Pseudophryne pengilleyi	Northern Corroboree Frog	Frog	S	CE	6/04/2013	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Pterodroma leucoptera leucoptera	Gould's Petrel, Australian Gould's Petrel	Bird	NE, E, S	E	16/07/2000	RP approved, RP required
Pterodroma neglecta neglecta	Kermadec Petrel (western)	Bird	NE, S	V	16/07/2000	RP approved, RP required
Pteropus poliocephalus	Grey-headed Flying-fox	Mammal	NE, E, S	V	6/12/2001	RP required
Rhipidura rufifrons	Rufous Fantail	Bird	NE, E, S	M	NA	CA and RP not required
Rostratula australis	Australian Painted Snipe	Bird	NE, E, S	E	15/05/2013	CA approved, RP required
Saiphos reticulatus	Three-toed Snake-tooth Skink	Reptile	NE	V	16/07/2000	CA approved, RP not required
Sternula nereis nereis	Australian Fairy Tern	Bird	NE, E, S	V	3/03/2011	CA approved, RP required
Synemon plana	Golden Sun Moth	Insect	S	CE	3/12/2002	CA approved, RP required
Thalassarche bulleri	Buller's Albatross, Pacific Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Thalassarche bulleri platei	Northern Buller's Albatross, Pacific Albatross	Bird	NE, E, S	V	16/07/2000	RP approved, RP required
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Thalassarche cauta steadi	White-capped Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Thalassarche eremita	Chatham Albatross	Bird *	NE, E, S	E	16/07/2000	RP approved, RP required
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Thalassarche melanophris	Black-browed Albatross	Bird *	NE, E, S	V	6/06/2005	RP approved, RP required
Thalassarche salvini	Salvin's Albatross	Bird *	NE, E, S	V	16/07/2000	RP approved, RP required
Thersites mitchellae	Mitchell's Rainforest Snail	Snail	NE	CE	23/07/2002	CA approved, RP approved, RP required
Thinornis rubricollis rubricollis	Hooded Plover (eastern)	Bird	E, S	V	6/11/2014	CA approved, RP not required
Turnix melanogaster	Black-breasted Button-quail	Bird	NE	V	16/07/2000	CA approved, RP approved, RP required
Tympanocryptis pinguicolla	Grassland Earless Dragon	Reptile	E, S	E	16/07/2000	RP approved, RP required
Uvidicolus sphyrurus	Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko	Reptile	NE	V	16/07/2000	CA approved, RP not required

Scientific Name	Common Name	Class	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Wollumbinia belli	Bell's Turtle, Western Sawshelled Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle	Reptile	NE	V	16/07/2000	CA approved, RP not required
Wollumbinia georgesi	Georges' Snapping Turtle, Bellinger River Snapping Turtle, Georges Helmeted Turtle	Reptile	NE	CE	7/12/2016	CA approved, RP not required
Xeromys myoides	Water Mouse, False Water Rat, Yirrkoo	Mammal	NE	V	16/07/2000	RP approved, RP required

Notes:

(1) RFA regions: NE – North East; S – Southern; E – Eden
(2) EPBC Act listing as at 6 April 2018: CE – Critically Endangered; C – Critical; V- Vulnerable
(3) CA – Conservation Advice; RP – Recovery Plan

Source: Environmental Resources Information Network Species of National Environmental Significance Database

Appendix 2 (Continued)

Communities

Community Name	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	NE, S, E	CE	10/10/2008	CA approved, RP required
Illawarra and south coast lowland forest and woodland ecological community	S, E	CE	16/09/2016	CA approved, RP not required
Central Hunter Valley eucalypt forest and woodland	NE	CE	7/05/2015	CA approved, RP not required
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	NE	CE	9/12/2009	CA approved, RP required
Hunter Valley Weeping Myall (Acacia pendula) Woodland	NE	CE	1/08/2005	CA approved, RP approved, RP required
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	NE, S	CE	16/12/2014	CA approved, RP required
Lowland Rainforest of Subtropical Australia	NE	CE	25/11/2011	CA approved, RP not required
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	NE	CE	7/01/2009	CA approved, RP required
New England Peppermint (Eucalyptus nova-anglica) Grassy Woodlands	NE	CE	1/03/2011	CA approved, RP required
Lowland Grassy Woodland in the South East Corner Bioregion	S, E	CE	16/02/2013	CA approved, RP not required
Natural Temperate Grassland of the South Eastern Highlands	S, E	CE	6/04/2016	CA approved, RP required
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	NE, S, E	CE	17/05/2006	No approved CA, RP approved, RP required
Turpentine-Ironbark Forest of the Sydney Basin Bioregion	NE	CE	26/08/2005	CA approved, RP required
Warkworth Sands Woodland of the Hunter Valley	NE	CE	5/05/2016	CA approved, RP not required
Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion	S	CE	28/08/2015	CA approved, RP not required
Western Sydney Dry Rainforest and Moist Woodland on Shale	NE	CE	27/02/2013	CA approved, RP required

Community Name	RFA region[1]	EPBC Act listing[2]	EPBC listing date effective	Status of conservation advice and recovery plans[3]
Alpine Sphagnum Bogs and Associated Fens	S, E	E	7/01/2009	CA approved, RP approved, RP required
Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion	S	E	17/03/2015	CA approved, RP required
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	NE, S, E	E	20/03/2018	CA approved, RP not required
Coastal Upland Swamps in the Sydney Basin Bioregion	NE, S	E	17/07/2014	CA approved, RP not required
Temperate Highland Peat Swamps on Sandstone	S, E	E	12/05/2005	CA approved, RP not required
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	NE	E	7/05/2015	CA approved, RP not required
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	NE, S	E	1/04/2010	CA approved, RP required
Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion	NE	E	7/05/2015	CA approved, RP not required
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion	NE, S	E	25/11/2011	CA approved, RP not required
Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion)	NE, S, E	E	17/11/2005	CA approved, RP not required
Weeping Myall Woodlands	NE, S	E	7/01/2009	CA approved, RP required
Subtropical and Temperate Coastal Saltmarsh	NE, S, E	V	10/08/2013	CA approved, RP required

Notes:

(1) RFA regions: NE – North East; S – Southern; E – Eden
(2) EPBC Act listing as at 6 April 2018: CE – Critically Endangered; C – Critical; V- Vulnerable
(3) CA – Conservation Advice; RP – Recovery Plan

Appendix 3

NSW Threatened Species List

As at 23 May 2018 (from Schedule 1 of the BC Act)[121]

Critically endangered species

Animals

Phylum	Class	Family	*Scientific Name*	Common name
Vertebrates	**Amphibians**	Hylidae	*Litoria castanea* (Steindachner, 1867)	Yellow-spotted Tree Frog
			Litoria spenceri Dubois, 1984	Spotted Tree Frog
			Litoria piperata Tyler & Davis, 1985	Peppered Tree Frog
			Pseudophryne corroboree Moore, 1953	Southern Corroboree Frog
		Myobatrachidae	*Pseudophryne pengilleyi* Wells and Wellington, 1985	
	Reptiles	Chelidae	*Myuchelys georgesi* (Cann, 1997)	Bellinger River Snapping Turtle
	Birds	Accipitridae	*Erythrotriorchis radiatus* (Latham, 1801)	Red Goshawk
		Turnicidae	*Turnix melanogaster* (Gould, 1837)	Black-breasted Button-quail

[121] Accessed 23 May 2018 at https://www.legislation.nsw.gov.au/~/view/act/2016/63/sch1

Phylum	**Class**	**Family**	***Scientific Name***	**Common name**
		Burhinidae	*Esacus magnirostris* Vieillot, 1818	Beach Stone-curlew
		Charadriidae	*Thinornis rubricollis* (Gmelin, 1789)	Hooded Plover
		Cacatuidae	*Calyptorhynchus banksii banksii* (Latham, 1790)	Red-tailed Black-Cockatoo (coastal subspecies)
		Columbidae	*Geophaps scripta scripta* (Temminck, 1821)	Squatter Pigeon (southern subspecies)
		Psittacidae	*Cyclopsitta diophthalma coxeni* Gould, 1867	Coxen's Fig-Parrot
			Neophema chrysogaster (Latham, 1790)	Orange-bellied Parrot
		Maluridae	*Amytornis modestus inexpectatus* (Mathews, 1912)	Thick-billed Grasswren (central NSW subspecies)
			Amytornis modestus obscurior (Mathews, 1923)	Thick-billed Grasswren (north-west NSW subspecies)
		Meliphagidae	*Anthochaera phrygia* (Shaw, 1794)	Regent Honeyeater
			Manorina melanotis (Wilson, 1911)	Black-eared Miner
		Pachycephalidae	*Pachycephala rufogularis* Gould, 1841	Red-lored Whistler
	Mammals	Muridae	*Pseudomys desertor* Troughton, 1932	Desert Mouse
			Pseudomys fumeus Brazenor, 1934	Smoky Mouse
		Potoroidae	*Potorous longipes* Seebeck and Johnston, 1980	Long-footed Potoroo
Invertebrates	**Mollusca**	Charopidae	*Mystivagor mastersi* (Brazier, 1872)	Masters Charopid Land Snail
			Pseudocharopa ledgbirdi (Etheridge, 1889)	Mount Lidgbird

Phylum	Class	Family	*Scientific Name*	Common name
				Charopid Land Snail
			Pseudocharopa whiteleggei (Etheridge, 1889)	Whitelegge's Land Snail
		Helicarionidae	*Gudeoconcha sophiae magnifica* Iredale, 1944	Magnificent Helicarionid Land Snail
Arthropoda				
Insecta	**Phasmatodea**	Phasmatidae	*Dryococelus australis* (Montrouzier, 1855)	Lord Howe Island Phasmid
	Lepidoptera	Lycaenidae	*Jalmenus eubulus* Miskin, 1876	

Plants

Family	*Scientific Name*	Common name
Araucariaceae	*Wollemia nobilis* W.G. Jones, K.D. Hill & J.M. Allen	Wollemi Pine
Arecaceae	*Lepidorrhachis mooreana* (F. Muell.) O.F. Cook	Little Mountain Palm
Convolvulaceae	*Calystegia affinis* Endl.	
Cucurbitaceae	*Cucumis althaeoides* (Ser.) P.Sebastian & I.Telford	
Dilleniaceae	*Hibbertia fumana* Sieber ex Toelken	
	Hibbertia sp. Bankstown (R.T. Miller & C.P. Gibson s.n. 18/10/2006)	
	Hibbertia spanantha Toelken & A.F. Rob.	
Euphorbiaceae	*Fontainea oraria* Jessup & Guymer	
Fabaceae	*Bossiaea fragrans* K.L. McDougall	
	Glycine latrobeana (Meisn.) Benth.	
	Pultenaea sp. Genowlan Point (Allen s.n., 29 Nov. 1997)	
	Pultenaea elusa (J.D. Briggs & Crisp) R.P.J. de Kok	
Gentianaceae	*Gentiana bredboensis* L.G. Adams	

Family	*Scientific Name*	Common name
	Gentiana wingecarribiensis L. Adams	Wingecarribee Gentian
Haloragaceae	*Myriophyllum implicatum* Orchard	
Lamiaceae	*Prostanthera gilesii* Althofer ex B.J.Conn & T.C.Wilson	
	Prostanthera marifolia R. Br.	
Malvaceae	*Lasiopetalum behrii* F. Muell.	
Myrtaceae	*Callistemon megalongensis* (Craven & S.M. Douglas) Udovicic & R.D. Spencer	Megalong Valley Bottlebrush
	Callistemon purpurascens S.M. Douglas & S. David	
	Eucalyptus imlayensis Crisp & Brooker	
	Eucalyptus sp. Cattai (Gregson s.n., 28 Aug 1954)	
Orchidaceae	*Caladenia attenuata* (Brinsley) D.L. Jones	
	Corunastylis sp. Charmhaven (NSW896673)	
	Diuris flavescens D.L. Jones	
	Genoplesium insigne D.L. Jones	
	Genoplesium littorale D.L. Jones	Tuncurry Midge Orchid
	Genoplesium plumosum (Rupp) D.L. Jones & M.A. Clem.	
	Prasophyllum bagoense D.L. Jones	
	Prasophyllum canaliculatum D.L. Jones	
	Prasophyllum fuscum R. Br. *sensu stricto*	
	Prasophyllum innubum D.L. Jones	
	Prasophyllum keltonii D.L. Jones	
	Prasophyllum sp. Majors Creek (Jones 11084)	
	Prasophyllum sp. Moama (D.L. Jones 19276)	
	Pterostylis despectans (Nicholls) M.A. Clem & D.L. Jones	

Family	*Scientific Name*	Common name
	Pterostylis oreophila Clemesha	
	Pterostylis ventricosa (D.L. Jones) G.N. Backh.	
	Pterostylis vernalis (D.L. Jones) G.N. Backh.	
	Thelymitra adorata Jeanes	Wyong Sun Orchid
	Thelymitra kangaloonica Jeanes	
	Thelymitra atronitida Jeanes	
Orobanchaceae	*Euphrasia arguta* R. Br.	
Poaceae	*Elymus multiflorus* subsp. *kingianus* (Endl.) de Lange & R. O. Gardner	
Proteaceae	*Banksia conferta* A.S. George subsp. *conferta*	
	Banksia vincentia Stimpson & P.H. Weston	
	Grevillea caleyi R. Br.	
	Grevillea iaspicula McGill.	
	Grevillea ilicifolia (R.Br.) R.Br. subsp. *ilicifolia*	
	Grevillea rivularis L.A.S.Johnson & McGill.	
	Persoonia pauciflora P.H. Weston	North Rothbury Persoonia
Rhamnaceae	*Pomaderris delicata* N.G. Walsh & F. Coates	
	Pomaderris reperta N.G. Walsh & F. Coates	
	Pomaderris walshii J.C. Millott & K.L. McDougall	
Rutaceae	*Leionema lamprophyllum* subsp. *fractum* S.A.J.Bell.	
	Phebalium speciosum I. Telford	
	Zieria adenophora Blakely	
	Zieria buxijugum J.D. Briggs & J.A. Armstr.	
	Zieria formosa J.D. Briggs & J.A. Armstr.	
	Zieria odorifera subsp. *copelandii* Duretto & P.I.Forst.	
	Zieria parrisiae J.D. Briggs & J.A. Armstr.	

Family	*Scientific Name*	Common name
Sapindaceae	*Dodonaea stenozyga* F. Muell.	
Thymelaeaceae	*Pimelea cremnophila* L.M.Copel. & I.Telford	

Populations

(Nil)

Endangered species

Animals

Phylum	Class	Family	*Scientific Name*	Common name
Vertebrates	**Amphibians**	Hylidae	*Litoria aurea* (Lesson, 1829)	Green and Golden Bell Frog
			Litoria booroolongensis (Moore, 1961)	Booroolong Frog
			Litoria raniformis (Keferstein, 1867)	Southern Bell Frog
			Litoria verreauxii alpina (Fry, 1915)	Alpine Tree Frog
		Myobatrachidae	*Mixophyes balbus* Straughan, 1968	Stuttering Frog
			Mixophyes fleayi Corben & Ingram, 1987	Fleay's Barred Frog
			Mixophyes iteratus Straughan, 1968	Giant Barred Frog
			Neobatrachus pictus Peters, 1863	Painted Burrowing Frog
			Philoria kundagungan (Ingram & Corben, 1975)	Mountain Frog
			Philoria loveridgei Parker, 1940	Loveridge's Frog
			Philoria pughi Knowles, Mahony, Armstrong and Donnellan, 2004	a frog

Phylum	Class	Family	*Scientific Name*	Common name
			Philoria richmondensis Knowles, Mahony, Armstrong and Donnellan, 2004	a frog
			Uperoleia mahonyi Clulow, Anstis, Keogh & Catullo, 2016	Mahony's Toadlet
	Reptiles	Agamidae	*Ctenophorus mirrityana* (McLean, Moussalli, Sass & Stuart-Fox 2013)	Barrier Range Dragon
			Tympanocryptis pinguicolla Mitchell, 1948	Grassland Earless Dragon
		Cheloniidae	*Caretta caretta* (Linnaeus, 1758)	Loggerhead Turtle
		Chelidae	*Myuchelys bellii* (Gray, 1844)	Western Sawshelled Turtle, Bell's Turtle
			Myuchelys purvisi (Wells and Wellington, 1985)	Manning River Helmeted Turtle, Purvis' Turtle
		Dermochelyidae	*Dermochelys coriacea* (Vandelli, 1761)	Leatherback Turtle
		Pygopodidae	*Aprasia inaurita* Kluge, 1974	Mallee Worm-lizard
			Delma australis Kluge, 1974	Marble-faced Delma
		Diplodactylidae	*Amalosia rhombifer* (J.E. Gray, 1845)	Zigzag Velvet Gecko
			Diplodactylus platyurus Parker, 1926	Eastern Fat-tailed Gecko
		Scincidae	*Anomalopus mackayi* Greer & Cogger, 1985	Five-clawed Worm-skink
			Ctenotus pantherinus ocellifer (Peters, 1866)	Leopard Ctenotus
			Cyclodomorphus melanops elongatus (Werner, 1910)	Mallee Slender Blue-tongue Lizard
			Cyclodomorphus praealtus Shea, 1995	Alpine She-oak Skink

Phylum	Class	Family	***Scientific Name***	Common name
			Cyclodomorphus venustus Shea & Miller, 1995	
			Eulamprus leuraensis Wells & Wellington, 1984	Water skink
			Liopholis guthega (Donnellan, Hutchinson, Dempsey & Osborne, 2002)	Guthega Skink
		Elapidae	*Echiopsis curta* (Schlegel, 1837)	Bardick
			Hoplocephalus bungaroides (Schlegel, 1837)	Broad-headed Snake
			Pseudonaja modesta (Günther, 1872)	Ringed Brown Snake
		Typhlopidae	*Ramphotyphlops endoterus* (Waite, 1918)	Interior Blind Snake
	Birds	Megapodiidae	*Leipoa ocellata* Gould, 1840	Malleefowl
		Anatidae	*Nettapus coromandelianus* (J.F. Gmelin, 1789)	Cotton Pygmy-goose
		Procellariidae	*Macronectes giganteus* (J.F. Gmelin, 1789)	Southern Giant Petrel
		Diomedeidae	*Diomedea exulans* Linnaeus, 1758	Wandering Albatross
		Ciconiidae	*Ephippiorhynchus asiaticus* (Latham, 1790)	Black-necked Stork
		Ardeidae	*Botaurus poiciloptilus* (Wagler, 1827)	Australasian Bittern
		Falconidae	*Falco hypoleucos* Gould, 1841	Grey Falcon
		Rallidae	*Gallirallus sylvestris* (P.L. Sclater, 1869)	Lord Howe Woodhen
		Otididae	*Ardeotis australis* (J.E. Gray, 1829)	Australian Bustard
		Pedionomidae	*Pedionomus torquatus* Gould, 1840	Plains-wanderer
		Scolopacidae	*Calidris ferruginea* (Pontoppidan, 1763)	Curlew Sandpiper
		Rostratulidae	*Rostratula australis* (Gould, 1838)	Australian Painted Snipe

Phylum	Class	Family	***Scientific Name***	Common name
		Burhinidae	*Burhinus grallarius* (Latham, 1801)	Bush Stone-curlew
		Haematopodidae	*Haematopus longirostris* Vieillot, 1817	Pied Oystercatcher
		Laridae	*Sternula albifrons* (Pallas, 1764)	Little Tern
		Columbidae	*Phaps histrionica* (Gould, 1841)	Flock Bronzewing
		Psittacidae	*Lathamus discolor* (Shaw, 1790)	Swift Parrot
			Polytelis anthopeplus monarchoides Schodde, 1993	Regent Parrot (eastern subspecies)
		Maluridae	*Amytornis barbatus barbatus*, Favaloro & McEvey, 1968	Grey Grasswren
		Dasyornithidae	*Dasyornis brachypterus* (Latham, 1801)	Eastern Bristlebird
		Acanthizidae	*Calamanthus fuliginosus* (Vigors & Horsfield, 1827) *sensu stricto*	Striated Fieldwren
	Mammals	Dasyuridae	*Antechinomys laniger* (Gould, 1856)	Kultarr
			Antechinus arktos Baker, Mutton, Hines & Van Dyck, 2014	Black-tailed Antechinus
			Dasyurus viverrinus (Shaw, 1800)	Eastern Quoll
		Peramelidae	*Isoodon obesulus obesulus* (Shaw, 1797)	Southern Brown Bandicoot (eastern)
		Vombatidae	*Lasiorhinus latifrons* (Owen, 1845)	Southern Hairy-nosed Wombat
		Burramyidae	*Burramys parvus* Broom, 1896	Mountain Pygmy-possum
			Cercartetus concinnus (Gould, 1845)	Western Pygmy Possum
		Macropodidae	*Macropus dorsalis* (Gray, 1837)	Black-striped Wallaby
			Petrogale penicillata (Gray, 1825)	Brush-tailed Rock-wallaby

Phylum	Class	Family	*Scientific Name*	Common name
			Petrogale xanthopus Gray, 1855	Yellow-footed Rock-wallaby
		Molossidae	*Mormopterus eleryi* Reardon and McKenzie, 2008	Bristle-faced free-tailed bat, Hairy-nosed Freetail Bat
		Muridae	*Notomys fuscus* (Jones, 1925)	Dusky Hopping-mouse
			Pseudomys bolami Troughton, 1932	Bolam's Mouse
			Pseudomys delicatulus (Gould, 1842)	Delicate Mouse
			Pseudomys oralis Thomas, 1921	Hastings River Mouse
	Marine mammals	Dugongidae	*Dugong dugon* (Müller, 1776)	Dugong
		Balaenidae	*Eubalaena australis* (Desmoulins, 1822)	Southern Right Whale
		Balaenopteridae	*Balaenoptera musculus* (Linnaeus, 1758)	Blue Whale
Invertebrates	**Annelida**			
	Oligochaeta			
	Opisthopera	Megascolecidae	*Pericryptodrilus nanus* Jamieson, 1977	
	Molluscs	Bulimulidae	*Placostylus bivaricosus* (Gaskoin, 1855)	a land snail
		Camaenidae	*Meridolum corneovirens* (Pfeiffer, 1851)	a land snail
			Pommerhelix duralensis (Cox, 1868)	Dural Land Snail
			Thersites mitchellae (Cox, 1864)	a land snail
Arthropoda				
Insecta	**Blattodea**	Blaberidae	*Panesthia lata* Walker, 1868	Lord Howe Island wood-feeding cockroach

Phylum	Class	Family	*Scientific Name*	Common name
	Coleoptera	Carabidae	*Nurus atlas* Castelnau, 1867	
			Nurus brevis Motschulsky, 1865	
	Lepidoptera	Castniidae	*Synemon plana* Walker, 1854	Golden Sun Moth
		Hesperiidae	*Ocybadistes knightorum* (Lambkin & Donaldson, 1994)	Black Grass-dart Butterfly
		Nymphalidae	*Argynnis hyperbius* (Linnaeus, 1763)	Laced Fritillary
		Lycaenidae	*Paralucia spinifera* Edwards and Common, 1978	Purple Copper Butterfly,
				Bathurst Copper Butterfly
		Noctuidae	*Phyllodes imperialis* Druce (ANIC 3333) southern subspecies	
	Odonata	Petaluridae	*Petalura gigantea* (Leach, 1815)	Giant Dragonfly
			Petalura litorea Theischinger 1999	

Fungi

Class	Family	*Scientific Name*	Common name
Basidiomycota	Hygrophoraceae	*Camarophyllopsis kearneyi* A.M. Young	
		Hygrocybe austropratensis A.M. Young	
		Hygrocybe collucera A.M.Young, R Kearney & E. Kearney	
		Hygrocybe griseoramosa A.M.Young, R Kearney & E. Kearney	
		Hygrocybe lanecovensis A.M. Young	
Alga			
Charophyta	Characeae	*Nitella partita* Nordst.	

Class	Family	*Scientific Name*	Common name

Plants

Family	*Scientific Name*	Common name
Acanthaceae	*Dipteracanthus australasicus* subsp. *corynothecus* (F. Muell. ex Benth.) R. Barker	
	Harnieria hygrophiloides (F. Muell.) R. M. Barker	
	Isoglossa eranthemoides (F. Muell.) R. Barker	
	Xerothamnella parvifolia C. White	
Anthericaceae	*Caesia parviflora* var. *minor* R.J.F. Hend.	
Apiaceae	*Gingidia rupicola* I. Telford & J.J. Bruhl	
	Trachymene scapigera (Domin) B.L. Burtt	
Apocynaceae	*Cynanchum elegans* (Benth.) Domin	
	Marsdenia longiloba Benth.	
	Ochrosia moorei (F. Muell.) F. Muell. ex Benth.	
	Tylophora woollsii Benth	
Aponogetonaceae	*Aponogeton queenslandicus* H. Bruggen	
Araceae	*Typhonium* sp. aff. *brownii* (A.G. Floyd 11/3/1958 North Coast Regional Botanic Garden Herbarium 585)	
Araliaceae	*Astrotricha* sp. Wallagaraugh (R.O. Makinson 1228)	
	Astrotricha cordata A. Bean	
	Astrotricha roddii Makinson	
Asteraceae	*Brachyscome ascendens* G.L. Davis	
	Calotis moorei P. Short	

Family	*Scientific Name*	Common name
	Calotis pubescens N.G. Walsh & K.L. McDougall	
	Cratystylis conocephala (F. Muell.) S. Moore	
	Erodiophyllum elderi F. Muell.	
	Kippistia suaedifolia F. Muell.	
	Leptorhynchos orientalis Paul G. Wilson	
	Leptorhynchos waitzia Sonder	
	Olearia flocktoniae Maiden & E. Betche	
	Ozothamnus vagans (C.T. White) Anderb.	
	Rutidosis leptorrhynchoides F. Muell.	
	Senecio linearifolius var. *dangarensis* Belcher ex I. Thomps.	
	Senecio spathulatus A. Rich.	
	Senecio squarrosus A. Rich.	
Brassicaceae	*Irenepharsus magicus* Hewson	
	Irenepharsus trypherus Hewson	
	Lepidium hyssopifolium Desv	
	Lepidium monoplocoides F. Muell.	
	Lepidium pseudopapillosum Thell.	
Calomniaceae	*Calomnion complanatum* (Hook.f. & Wilson) Lindb.	
Campanulaceae	*Wahlenbergia scopulicola* Carolin ex P.J. Smith	
Capparaceae	*Capparis canescens* Banks ex DC.	
	Capparis loranthifolia Lindley var. *loranthifolia*	
Caryophyllaceae	*Polycarpaea spirostylis* subsp. *glabra* (C. White & Francis) Pedley	
Casuarinaceae	*Allocasuarina defungens* L. Johnson	
	Allocasuarina glareicola L. Johnson	

Family	*Scientific Name*	Common name
	Allocasuarina portuensis L. Johnson	
	Casuarina obesa Miq.	
Chenopodiaceae	*Atriplex sturtii* S. Jacobs	
	Dysphania platycarpa Paul G. Wilson	
	Dysphania plantaginella F. Muell.	
	Osteocarpum scleropterum (F. Muell.) Volkens	
	Sclerolaena napiformis Paul G. Wilson	
	Threlkeldia inchoata (J. Black) J. Black	
Convolvulaceae	*Convolvulus tedmoorei* R.W. Johnson	
	Ipomoea diamantinensis J. Black	
	Ipomoea polymorpha Roemer & Schultes	
	Wilsonia rotundifolia Hook.	
Cupressaceae	*Callitris baileyi* C. White	
Cyperaceae	*Carex archeri* Boott	
	Carex klaphakei K.L. Wilson	
	Carex raleighii Nelmes	
	Cyperus aquatilis R. Br.	
	Cyperus conicus (R. Br.) Boeck	
	Cyperus semifertilis S.T. Blake	
	Eleocharis tetraquetra Nees	
Davalliaceae	*Arthropteris palisotii* (Desv.) Alston	
Davidsoniaceae	*Davidsonia jerseyana* (F. Muell. ex F.M. Bailey) G. Harden & J.B. Williams	
	Davidsonia johnsonii J.B. Williams & G. Harden	
Dilleniaceae	*Hibbertia hexandra* C. White	

Family	*Scientific Name*	Common name
	Hibbertia hexandra C. White	
	Hibbertia puberula Toelken	
	Hibbertia stricta subsp. *furcatula* Toelken	
	Hibbertia superans Toelken	
	Hibbertia tenuifolia Toelken	
Droseraceae	*Aldrovanda vesiculosa* L.	
Dryopteridaceae	*Lastreopsis hispida* (Sw.) Tind.	
	Polystichum moorei H. Christ	
Ebenaceae	*Diospyros mabacea* (F. Muell.) F. Muell.	
	Diospyros yandina Jessup	
Elaeocarpaceae	*Elaeocarpus sedentarius* Maynard & Crayn	Minyon Quandong
	Elaeocarpus williamsianus Guymer	
Ericaceae	*Epacris hamiltonii* Maiden & E. Betche	
	Leucopogon confertus Benth	
	Leucopogon fletcheri Maiden & Betche subsp. *fletcheri*	
	Melichrus hirsutus J.B. Williams ms	
	Melichrus sp. Gibberagee (A.S. Benwell & J.B. Williams 97239)	
	Monotoca rotundifolia J.H. Willis	
Eriocaulaceae	*Eriocaulon australasicum* (F. Muell.) Korn	
	Eriocaulon carsonii F. Muell.	
Euphorbiaceae	*Acalypha eremorum* Muell. Arg.	
	Bertya sp. (Chambigne NR, M. Fatemi 24)	
	Bertya sp. (Clouds Creek, M. Fatemi 4)	
	Bertya ingramii T. James	

Family	*Scientific Name*	Common name
	Chamaesyce psammogeton (P.S. Green) P.I. Foster and R.J. Henderson	
	Euphorbia sarcostemmoides J.H. Willis	
	Monotaxis macrophylla Benth	
Fabaceae	*Acacia acanthoclada* F. Muell.	
	Acacia acrionastes Pedley	
	Acacia atrox Kodela	
	Acacia bynoeana Benth.	
	Acacia chrysotricha Tind	
	Acacia dangarensis Tindale & Kodela	
	Acacia gordonii (Tind.) Pedley	
	Acacia jucunda Maiden & Blakel	
	Acacia meiantha Tindale & Herscovitch	
	Acacia notabilis F. Muell	
	Acacia petraea Pedley	
	Acacia pubifolia Pedley	
	Acacia rivalis J. Black	
	Acacia ruppii Maiden & E. Betche	
	Acacia terminalis (Salisb.) J.F. Macbr. subsp. *terminalis*	
	Almaleea cambagei (Maiden & E. Betche) Crisp & P. Weston	
	Caesalpinia bonduc (L.) Roxb.	
	Carmichaelia exsul F. Muell.	
	Cassia marksiana (F.M. Bailey) Domin	
	Crotalaria cunninghamii R. Br.	
	Cullen parvum (F. Muell.) J.W. Grimes	

Family	*Scientific Name*	Common name
	Desmodium campylocaulon F. Muell.	
	Dillwynia glaucula Jobson & P.H. Weston	
	Indigofera baileyi F. Muell	
	Indigofera efoliata F. Muell.	
	Indigofera helmsii Peter G. Wilson	
	Indigofera leucotricha E. Pritzel	
	Indigofera longibractea J. Black	
	Pultenaea sp. Olinda (R.G. Coveny 6616)	
	Pultenaea parviflora Sieber ex DC.	
	Pultenaea pedunculata Hook	
	Senna acclinis (F. Muell.) Randell	
	Sophora tomentosa L	
	Swainsona adenophylla J. Black	
	Swainsona colutoides F. Muell.	
	Swainsona flavicarinata J. Black	
	Swainsona recta A. Lee	
	Swainsona viridis J. Black	
Flacourtiaceae	*Xylosma parvifolia* Jessup	
	Xylosma terrae-reginae C. White & Sleumer	
Gentianaceae	*Gentiana baeuerlenii* L. Adams	
Geraniaceae	*Pelargonium* sp. (G.W. Carr 10345)	
Goodeniaceae	*Dampiera fusca* Rajput & Carolin	
	Goodenia occidentalis Carolin	
	Goodenia nocoleche Pellow & J.L. Porter	

Family	*Scientific Name*	Common name
	Scaevola collaris F. Muell.	
Grammitaceae	*Grammitis stenophylla* B.S. Parris	
Gyrostemonaceae	*Gyrostemon thesioides* (Hook. f.) A.S. George	
Haloragaceae	*Haloragodendron lucasii* (Maiden & E. Betche) Orch.	
Lamiaceae	*Plectranthus alloplectus* S.T. Blake	
	Plectranthus nitidus P. Forst	
	Prostanthera askania B.J. Conn	
	Prostanthera junonis B.J. Conn	
	Prostanthera staurophylla F. Muell. sensu stricto	
	Westringia kydrensis Conn	
Lauraceae	*Endiandra floydii* B. Hyland	
	Endiandra muelleri subsp. *bracteata* B. Hyland	
Linderniaceae	*Lindernia alsinoides* R. Br.	
Lindsaeaceae	*Lindsaea brachypoda* (Baker) Salomon	
	Lindsaea fraseri Hook.	
	Lindsaea incisa Prent.	
Loganiaceae	*Geniostoma huttonii* B.J. Conn	
	Mitrasacme pygmaea R. Br.	
Loranthaceae	*Amyema plicatula* (Krause) Danser	
	Muellerina myrtifolia (Cunn. ex Benth.) Barlow	
Lythraceae	*Rotala tripartita* Beesley	
Malvaceae	*Commersonia prostrata* (Maiden & Betche) C.F. Wilkins & Whitlock	
	Commersonia rosea S.A.J. Bell & L.M. Copel.	
	Sida rohlenae Domin	

Family	*Scientific Name*	Common name
Marattiaceae	*Angiopteris evecta* (G.Forst.) Hoffm	
Marsileaceae	*Pilularia novae-hollandiae* A. Braun	
Menispermaceae	*Tinospora smilacina* Benth.	
Monimiaceae	*Daphnandra johnsonii* Schodde	
Myrsinaceae	*Myrsine richmondensis* Jackes	
Myrtaceae	*Angophora exul* K.D. Hill	
	Baeckea kandos A.R. Bean	
	Choricarpia subargentea (C. White) L. Johnson	
	Eucalyptus camphora subsp. *relicta* L. Johnson & K. Hill	
	Eucalyptus castrensis K.D. Hill	
	Eucalyptus copulans L. Johnson & K. Hill	
	Eucalyptus largeana Blakely	Craven Grey Box
	Eucalyptus macarthurii H. Deane & Maiden	
	Eucalyptus magnificata L. Johnson & K. Hill	
	Eucalyptus microcodon L. Johnson & K. Hill	
	Eucalyptus pachycalyx subsp. *banyabba* K.D. Hill	
	Eucalyptus parvula L.A.S. Johnson & K.D. Hill	
	Eucalyptus saxatilis Kirkpatr. & Brooker	
	Eucalyptus scoparia Maiden	
	Eucalyptus sp. Howes Swamp Creek (M. Doherty 19/7/85, NSW 207054)	
	Gossia fragrantissima (F. Muell. ex Benth.) N. Snow & Guymer	
	Homoranthus binghiensis J.T. Hunter	
	Homoranthus croftianus J.T. Hunter	

Family	*Scientific Name*	Common name
	Kardomia prominens (A.R. Bean) Peter G. Wilson	
	Kardomia silvestris (A.R. Bean) Peter G. Wilson	
	Melaleuca irbyana R.T. Baker	
	Micromyrtus grandis J.T. Hunter	
	Micromyrtus minutiflora (F. Muell.) Benth.	
	Syzygium paniculatum Gaertn.	
	Triplarina imbricata (Sm.) A.R. Bean	
	Triplarina nowraensis A.R. Bean	
	Uromyrtus australis A.J. Scott	
Orchidaceae	*Caladenia arenaria* Fitzg.	
	Caladenia concolor Fitzg.	
	Caladenia tessellata Fitzg.	
	Calochilus pulchellus D.L. Jones	
	Chiloglottis anaticeps D.L. Jones	
	Corybas dowlingii D.L. Jones	
	Dendrobium melaleucaphilum M.A. Clem. & D.L. Jones	
	Diuris aequalis F. Muell. ex Fitzg.	
	Diuris arenaria D.L. Jones	
	Diuris bracteata Fitzg.	
	Diuris disposita D.L. Jones	
	Diuris eborensis D.L. Jones	
	Diuris ochroma D.L. Jones	
	Diuris pedunculata R. Br.	
	Diuris sp. aff. *chrysantha* (Byron Bay) (D.L. Jones ORG 2761)	

Family	*Scientific Name*	Common name
	Diuris sp. (Oaklands, D.L. Jones 5380)	
	Genoplesium baueri R. Br.	
	Genoplesium rhyoliticum D.L. Jones & M.A. Clem.	
	Genoplesium superbum D.L. Jones	
	Geodorum densiflorum (Lam.) Schltr.	
	Microtis angusii D.L. Jones	
	Oberonia complanata (A. Cunn.) M.A. Clem. & D.L. Jones	
	Phaius australis F. Muell.	
	Prasophyllum affine Lindl.	
	Prasophyllum petilum D.L. Jones & R.J. Bates	
	Pterostylis bicornis D.L. Jones & M.A. Clem	Horned Greenhood
	Pterostylis gibbosa R. Br.	
	Pterostylis metcalfei D.L. Jones	
	Pterostylis saxicola D.L. Jones & M.A. Clem.	
	Pterostylis sp. Botany Bay (A. Bishop J221/1-13)	
	Sarcochilus dilatatus F. Muell.	
Orobanchaceae	*Centranthera cochinchinensis* (Lour.) Merr.	
	Euphrasia collina subsp. muelleri (Wettst.) W.R. Barker	
	Euphrasia orthocheila subsp. *peraspera* W.R. Barker	
	Euphrasia scabra R. Br.	
Phyllanthaceae	*Phyllanthus maderaspatensis* L.	
	Phyllanthus microcladus Muell. Arg.	
Picrodendraceae	*Pseudanthus ovalifolius* F. Muell.	
Platyzomataceae	*Platyzoma microphyllum* R. Br.	

Family	*Scientific Name*	Common name
Poaceae	*Alexfloydia repens* B.K. Simon	
	Austrostipa nullanulla (J. Everett & S.W.L. Jacobs) S.W.L. Jacobs & J. Everett	
	Austrostipa wakoolica (Vickery, S.W.L. Jacobs & J. Everett) S.W.L. Jacobs & J. Everett	
	Deyeuxia appressa Vickery	
	Digitaria porrecta S.T. Blake	
	Distichlis distichophylla (Labill.) Fassett	
	Elionurus citreus (R. Br.) Munro ex Benth.	
	Homopholis belsonii C.E. Hubb	
	Plinthanthesis rodwayi (C.E. Hubb) S.T. Blake	
	Rytidosperma vickeryae M. Gray & H. P. Linder	
Podocarpaceae	*Pherosphaera fitzgeraldii* (F. Muell.) F. Muell. ex Hook. f.	
Polygalaceae	*Polygala linariifolia* Willd.	
Polypodiaceae	*Belvisia mucronata* (Fée) Copel.	
	Drynaria rigidula (Sw.) Beddome	
Primulaceae	*Lysimachia vulgaris* var. *davurica* (Ledeb.) Knuth	
Proteaceae	*Eidothea hardeniana* P.H. Weston & R.M. Kooyman	
	Grevillea acanthifolia subsp. *paludosa* Makinson & Albrecht	
	Grevillea beadleana McGillivray	
	Grevillea divaricata R. Br.	
	Grevillea guthrieana P. Olde & N. Marriott	
	Grevillea hilliana F. Muell.	
	Grevillea masonii P. Olde & N. Marriott	

Family	*Scientific Name*	Common name
	Grevillea mollis P. Olde & Molyneux	
	Grevillea obtusiflora R. Br.	
	Grevillea parviflora subsp. *supplicans* Makinson	
	Grevillea renwickiana F. Muell.	
	Grevillea wilkinsonii R. Makinson	
	Hakea dohertyi Haegi	
	Hakea pulvinifera L. Johnson	
	Persoonia bargoensis P.H. Weston & L.A.S. Johnson	
	Persoonia glaucescens Sieber ex Spreng.	
	Persoonia hindii P.H. Weston & L.A.S. Johnson	
	Persoonia hirsuta Pers.	
	Persoonia mollis subsp. *maxima* Krauss & L. Johnson	
	Persoonia nutans R. Br.	
Psilotaceae	*Psilotum complanatum* Sw.	
Pteridaceae	*Cheilanthes sieberi* subsp. *pseudovellea* H. Quirk & T.C. Chambers	
Rhamnaceae	*Pomaderris adnata* N.G. Walsh & F. Coates	
	Pomaderris brunnea N.A. Wakef.	
	Pomaderris cocoparrana N.G. Walsh	
	Pomaderris cotoneaster Wakef.	
	Pomaderris elachophylla F. Muell.	
	Pomaderris queenslandica C. White	
	Pomaderris sericea Wakef.	
Rubiaceae	*Coprosma inopinata* I. Hutton & P.S. Green	
	Dentella minutissima C. White & Francis	

Family	*Scientific Name*	Common name
	Galium australe DC.	
	Oldenlandia galioides (F. Muell.) F. Muell.	
	Randia moorei F. Muell. ex Benth.	
	Triflorensia cameronii (C. T. White) S. T. Reynolds	
Rutaceae	*Acronychia littoralis* T. Hartley & J. Williams	
	Asterolasia buxifolia Benth.	
	Asterolasia elegans McDougall & Porteners	
	Asterolasia beckersii Orme & Duretto	
	Boronia boliviensis J.B. Williams & J.T. Hunter	
	Boronia hapalophylla Duretto, F.J. Edwards & P.G. Edwards	
	Boronia repanda (F. Muell. ex E. Betche) Maiden & E. Betche	
	Boronia ruppii Cheel	
	Coatesia paniculata F. Muell.	
	Correa lawrenceana var. *genoensis* Paul G. Wilson	
	Leionema lachnaeoides (A. Cunn.) Paul G. Wilson	
	Melicope vitiflora (F. Muell.) T.G. Hartley	
	Phebalium bifidum P.H. Weston & M. Turton	
	Phebalium glandulosum subsp. *eglandulosum* (Blakely) Paul G. Wilson	
	Philotheca obovatifolia (Bayly) P.I. Forst.	
	Zieria adenodonta (F. Muell.) J.A. Armstrong	
	Zieria baeuerlenii J.A. Armstrong	
	Zieria citriodora J.A. Armstrong	
	Zieria covenyi J.A. Armstrong	

Family	*Scientific Name*	Common name
	Zieria floydii J.A. Armstrong	
	Zieria granulata C. Moore ex Benth.	
	Zieria ingramii J.A. Armstrong	
	Zieria involucrata R. Br. ex Benth.	
	Zieria lasiocaulis J.A. Armstrong	
	Zieria obcordata A. Cunn.	
	Zieria prostrata J.A. Armstrong	
Santalaceae	*Santalum murrayanum* (Mitchell) Gardner	
Sapindaceae	*Cupaniopsis serrata* (F. Muell.) Radlk.	
	Diploglottis campbellii Cheel	
	Dodonaea microzyga F. Muell. var. *microzyga*	
	Dodonaea sinuolata subsp. *acrodentata* J. West	
Sapotaceae	*Niemeyera chartacea* (Bailey) C. White	
Simaroubaceae	*Quassia* sp. Moonee Creek (King s.n., 1949)	
Solanaceae	*Solanum amourense* A.R. Bean	
	Solanum celatum A.R. Bean	
	Solanum limitare A.R. Bean	
	Solanum sulphureum A.R. Bean	
Stackhousiaceae	*Stackhousia clementii* Domin	
Thymelaeaceae	*Pimelea axiflora* subsp. *pubescens* Rye	
	Pimelea elongata Threlfall	
	Pimelea serpyllifolia R. Br. subsp. *serpyllifolia*	
	Pimelea spicata R. Br.	
	Pimelea venosa Threlfall	

Family	*Scientific Name*	Common name
Tiliaceae	*Corchorus cunninghamii* F. Muell.	
Urticaceae	*Dendrocnide moroides* (Wedd.) Chew	
Violaceae	*Viola cleistogamoides* (L. Adams) Seppelt	
Zamiaceae	*Macrozamia humilis* D.L. Jones	
	Macrozamia johnsonii D.L. Jones & K. Hill	
Zannichelliaceae	*Zannichellia palustris* L.	

Populations

Animals

Phylum	Class	Family	*Scientific Name*	Common name
Invertebrates				
	Arthropoda			
	Coleoptera	Chrysomelidae	*Menippus darcyi* Reid & Nally, 2008	*Menippus darcyi* population in the Sutherland Shire
Vertebrates				
	Amphibians	Myobatrachidae	*Adelotus brevis* (Günther, 1863)	Tusked Frog population in the Nandewar and New England Tableland Bioregions
	Reptiles	Scincidae	*Liopholis whitii* (Lacépède, 1804)	White's Skink population in the Broken Hill Complex

Phylum	Class	Family	*Scientific Name*	Common name
				Bioregion
	Birds	Casuariidae	*Dromaius novaehollandiae* (Latham, 1790)	Emu population in the New South Wales North Coast Bioregion and Port Stephens LGA
		Megapodiidae	*Alectura lathami* Gray, 1831	Australian Brush-turkey population in the Nandewar and Brigalow Belt South Bioregions
		Cacatuidae	*Callocephalon fimbriatum* (Grant, 1803)	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai LGAs
			Calyptorhynchus lathami (Temminck, 1807)	Glossy Black-Cockatoo, Riverina population
		Spheniscidae	*Eudyptula minor* (Forster, 1781)	Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)

Phylum	Class	Family	*Scientific Name*	Common name
		Climacteridae	*Climacteris affinis* Blyth, 1864	White-browed Treecreeper population in Carrathool LGA south of the Lachlan River and Griffith LGA
		Meliphagidae	*Epthianura albifrons* (Jardine & Selby, 1828)	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area
	Mammals	Macropodidae		
		Muridae	*Mastacomys fuscus* Thomas, 1882	Broad-toothed Rat at Barrington Tops in the LGAs of Gloucester, Scone and Dungog
		Peramelidae	*Perameles nasuta* Geoffroy, 1804	Long-nosed Bandicoot, North Head
			Perameles nasuta Geoffroy, 1804	Long-nosed Bandicoot population in inner western Sydney
		Petauridae	*Petaurus australis* Shaw, 1791	Yellow-bellied Glider population on the Bago Plateau (as described in the final determination of the Scientific Committee published in the Gazette on 28

Phylum	Class	Family	*Scientific Name*	Common name
				November 2014)
			Petaurus norfolcensis (Kerr, 1792)	Squirrel Glider in the Wagga Wagga LGA
			Petaurus norfolcensis (Kerr, 1792)	Squirrel Glider on Barrenjoey Peninsula, north of Bushrangers Hill
		Pseudocheiridae	*Petauroides volans* (Kerr, 1792)	Greater Glider population in the Eurobodalla LGA
			Petauroides volans (Kerr, 1792)	Greater Glider population in the Mount Gibraltar Reserve area
			Petauroides volans (Kerr, 1792)	Greater Glider population in the Seven Mile Beach National Park area
		Phascolarctidae	*Phascolarctos cinereus* (Goldfuss, 1817)	Koala, Hawks Nest and Tea Gardens population
			Phascolarctos cinereus (Goldfuss, 1817)	Koala in the Pittwater LGA
			Phascolarctos cinereus (Goldfuss, 1817)	Koala population between the Tweed

Phylum	Class	Family	*Scientific Name*	Common name
				River and Brunswick River east of the Pacific Highway
		Potoroidae	*Potorous tridactylus* (Kerr, 1792)	Long-nosed Potoroo, Cobaki Lakes and Tweed Heads West population

Plants

Family	*Scientific Name*	Common name
Apocynaceae	*Marsdenia viridiflora* R. Br. subsp. *viridiflora*	*Marsdenia viridiflora* R. Br. subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith LGAs
Campanulaceae	*Wahlenbergia multicaulis* Benth.	Tadgell's Bluebell in the LGAs of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield

Family	*Scientific Name*	Common name
Casuarinaceae	*Allocasuarina diminuta* subsp. *mimica* L.A.S. Johnson	*Allocasuarina diminuta* subsp. *mimica* population in the Sutherland Shire and Liverpool City LGAs
	Allocasuarina inophloia (F. Muell. & F.M. Bailey) L.A.S. Johnson	Stringybark She-Oak population in the Clarence Valley LGA
Cupressaceae	*Callitris endlicheri* (Parl.) Bailey	Black Cypress Pine, Woronora Plateau population
Fabaceae	*Acacia pendula* A. Cunn. ex G. Don	*Acacia pendula* population in the Hunter catchment
	Acacia prominens Cunn. ex Don	Gosford Wattle, Hurstville and Kogarah LGAs
	Chorizema parviflorum Benth.	*Chorizema parviflorum* Benth. in the Wollongong and Shellharbour LGAs
	Dillwynia tenuifolia Sieber ex D.C.	*Dillwynia tenuifolia*, Kemps Creek
	Dillwynia tenuifolia Sieber ex D.C.	*Dillwynia tenuifolia* Sieber ex D.C. in the Baulkham Hills LGA
	Glycine clandestina (broad leaf form) (Pullen 13342)	*Glycine clandestina* (broad leaf form) in the Nambucca LGA
	Lespedeza juncea subsp. *sericea* (Thunb.) Steenis	*Lespedeza juncea* subsp. *sericea* in the Wollongong LGA
	Pultenaea villifera Sieber ex DC.	*Pultenaea villifera* Sieber ex DC. population in the Blue Mountains LGA
Lamiaceae	*Prostanthera saxicola* R. Br.	*Prostanthera saxicola* population in Sutherland and Liverpool LGAs

Family	*Scientific Name*	Common name
Malvaceae	*Keraudrenia corollata* var. *denticulata* C. T. White	*Keraudrenia corollata* var. *denticulata* in the Hawkesbury LGA
Myrtaceae	*Darwinia fascicularis* subsp. *oligantha*	*Darwinia fascicularis* subsp. *oligantha* population in the Baulkham Hills and Hornsby LGAs
	Eucalyptus aggregata H. Deane & Maiden	*Eucalyptus aggregata* population in the Wingecaribee LGA
	Eucalyptus camaldulensis Dehnh.	*Eucalyptus camaldulensis* population in the Hunter catchment
	Eucalyptus langleyi L.A.S. Johnson & Blaxell	*Eucalyptus langleyi* population north of the Shoalhaven River in the Shoalhaven LGA
	Eucalyptus oblonga DC.	*Eucalyptus oblonga* population at Bateau Bay, Forresters Beach and Tumbi Umbi in the Wyong LGA
	Eucalyptus parramattensis C. Hall. subsp. *parramattensis*	*Eucalyptus parramattensis* C. Hall. subsp. *parramattensis* in Wyong and Lake Macquarie LGAs
	Eucalyptus seeana Maiden	*Eucalyptus seeana* population in the Greater Taree LGA
	Gossia acmenoides (F. Muell) N. Snow & Guymer	*Gossia acmenoides* population in the Sydney Basin Bioregion south of the Georges River

Family	*Scientific Name*	Common name
Orchidaceae	*Cymbidium canaliculatum* R. Br.	*Cymbidium canaliculatum* population in the Hunter Catchment
	Diuris tricolor Fitzg.	Pine Donkey Orchid population in the Muswellbrook LGA
	Rhizanthella slateri (Rupp) M.A. Clem. & Cribb	*Rhizanthella slateri* (Rupp) M.A. Clem. & Cribb in the Great Lakes LGA
Rhamnaceae	*Pomaderris prunifolia* Fenzl	*P. prunifolia* in the Parramatta, Auburn, Strathfield and Bankstown LGAs
	Spyridium burragorang K.R. Thiele	*Spyridium burragorang* in the Cessnock LGA
Rutaceae	*Zieria smithii* Jackson	Low growing form of *Z. smithii*, Diggers Head

Vulnerable species

Animals

Phylum	Class	Family	*Scientific Name*	Common name
Vertebrates	**Amphibians**	Hylidae	*Litoria brevipalmata* Tyler, Martin & Watson, 1972	Green-thighed Frog
			Litoria daviesae Mahony, Knowles, Foster & Donnellan, 2001	
			Litoria littlejohni A.M. White, Whitford and Mahoney, 1994	Littlejohn's Tree Frog
			Litoria olongburensis Liem & Ingram, 1977	Olongburra Frog
			Litoria subglandulosa Tyler & Anstis, 1983	Glandular Frog
		Myobatrachidae	*Assa darlingtoni* (Loveridge, 1933)	Pouched Frog

Phylum	Class	Family	*Scientific Name*	Common name
			Crinia sloanei Littlejohn, 1958	Sloane's Froglet
			Crinia tinnula Straughan & Main, 1966	Wallum Froglet
			Heleioporus australiacus (Shaw & Nodder, 1795)	Giant Burrowing Frog
			Philoria sphagnicolus (Moore, 1958)	Sphagnum Frog
			Pseudophryne australis (Gray, 1835)	Red-crowned Toadlet
	Reptiles	Carphodactylidae	*Uvidicolus sphyrurus* (Ogilby, 1892)	
		Cheloniidae	*Chelonia mydas* (Linnaeus, 1758)	Green Turtle
		Diplodactylidae	*Lucasium stenodactylum* (Boulenger, 1896)	Crowned Gecko
			Strophurus elderi (Stirling & Zietz, 1893)	Jewelled Gecko
		Gekkonidae	*Christinus guentheri* (Boulenger, 1885)	Lord Howe Island Southern Gecko
		Pygopodidae	*Aprasia parapulchella* Kluge, 1974	Pink-tailed Legless Lizard
			Delma impar (Fischer, 1882)	Striped Legless Lizard
		Varanidae	*Varanus rosenbergi* Mertens, 1957	Rosenberg's Goanna
		Scincidae	*Coeranoscincus reticulatus* (Günther, 1873)	Three-toed Snake-tooth Skink
			Ctenotus brooksi (Loveridge, 1933)	Wedgesnout Ctenotus
			Lerista xanthura Storr, 1976	Yellow-tailed Plain Slider
			Oligosoma lichenigera (O'Shaughnessy, 1874)	Lord Howe Island Skink
			Tiliqua multifasciata Sternfeld, 1919	Centralian Blue-tongued Lizard
			Tiliqua occipitalis (Peters, 1863)	Western Blue-tongued

Phylum	Class	Family	*Scientific Name*	Common name
				Lizard
		Pythonidae	*Antaresia stimsoni* (Smith, 1985)	Stimson's Python
			Aspidites ramsayi (Macleay, 1882)	Woma
		Elapidae	*Cacophis harriettae* Krefft, 1869	White-crowned Snake
			Demansia rimicola Scanlon, 2007	A whip snake
			Hoplocephalus bitorquatus (Jan, 1859)	Pale-headed Snake
			Hoplocephalus stephensii Krefft, 1869	Stephens' Banded Snake
			Simoselaps fasciolatus (Gunther, 1872)	Narrow-banded Snake
			Suta flagellum (McCoy, 1878)	Little Whip Snake
	Birds	Anseranatidae	*Anseranas semipalmata* (Latham, 1798)	Magpie Goose
		Anatidae	*Oxyura australis* Gould, 1837	Blue-billed Duck
			Stictonetta naevosa (Gould, 1841)	Freckled Duck
		Procellariidae	*Ardenna carneipes* (Gould, 1844)	Flesh-footed Shearwater
			Macronectes halli Mathews, 1912	Northern Giant-petrel
			Pterodroma leucoptera leucoptera (Gould, 1844)	Gould's Petrel
			Pterodroma neglecta neglecta (Schlegel, 1863)	Kermadec Petrel (west Pacific subspecies)
			Pterodroma nigripennis (Rothschild, 1893)	Black-winged Petrel
			Pterodroma solandri (Gould, 1844)	Providence Petrel
			Puffinus assimilis Gould, 1838	Little Shearwater
		Oceanitidae	*Fregetta grallaria* (Vieillot, 1818)	White-bellied Storm-Petrel
		Diomedeida	*Diomedea antipodensis* Robertson & Warham, 1992	Antipodean Albatross

Phylum	Class	Family	*Scientific Name*	Common name
		e		
			Diomedea gibsoni Robertson & Warham, 1992	Gibson's Albatross
			Phoebetria fusca (Hilsenberg, 1822)	Sooty Albatross
			Thalassarche cauta (Gould, 1841)	Shy Albatross
			Thalassarche melanophris (Temminck, 1828)	Black-browed Albatross
		Phaethontidae	*Phaethon rubricauda* Boddaert, 1783	Red-tailed Tropicbird
		Sulidae	*Sula dactylatra* Lesson, 1831	Masked Booby
		Ardeidae	*Ixobrychus flavicollis* (Latham, 1790)	Black Bittern
		Falconidae	*Falco subniger* G.R. Gray, 1843	Black Falcon
		Accipitridae	*Circus assimilis* Jardine & Selby, 1828	Spotted Harrier
			Haliaeetus leucogaster (Gmelin, 1788)	White-bellied Sea-eagle
			Hamirostra melanosternon (Gould, 1841)	Black-breasted Buzzard
			Hieraaetus morphnoides (Gould, 1841)	Little Eagle
			Lophoictinia isura (Gould, 1838)	Square-tailed Kite
			Pandion cristatus (Vieillot, 1816)	Eastern Osprey
		Gruidae	*Grus rubicunda* (Perry, 1810)	Brolga
		Rallidae	*Amaurornis moluccana* (Wallace, 1865)	Pale-vented Bush-hen
		Turnicidae	*Turnix maculosus* (Temminck, 1815)	Red-backed Button-quail
		Scolopacidae	*Calidris alba* (Pallas, 1764)	Sanderling
			Calidris tenuirostris (Horsfield, 1821)	Great Knot
			Limicola falcinellus (Pontoppidan, 1763)	Broad-billed Sandpiper
			Limosa limosa (Linnaeus, 1758)	Black-tailed Godwit

Phylum	Class	Family	***Scientific Name***	Common name
			Xenus cinereus (Güldenstädt, 1775)	Terek Sandpiper
		Jacanidae	*Irediparra gallinacea* (Temminck, 1828)	Comb-crested Jacana
		Haematopodidae	*Haematopus fuliginosus* Gould, 1845	Sooty Oystercatcher
		Charadriidae	*Charadrius leschenaultii* Lesson, 1826	Greater Sand-plover
			Charadrius mongolus Pallas, 1776	Lesser Sand-plover
		Laridae	*Gygis alba* (Sparrman, 1786)	White Tern
			Onychoprion fuscata (Linnaeus, 1766)	Sooty Tern
			Procelsterna cerulea (Bennett, 1840)	Grey Ternlet
		Columbidae	*Ptilinopus magnificus* (Temminck, 1821)	Wompoo Fruit-dove
			Ptilinopus regina Swainson, 1825	Rose-crowned Fruit-dove
			Ptilinopus superbus (Temminck, 1809)	Superb Fruit-dove
		Cacatuidae	*Callocephalon fimbriatum* (Grant, 1803)	Gang-gang Cockatoo
			Calyptorhynchus banksii samueli Mathews, 1917	Red-tailed Black-Cockatoo (inland subspecies)
			Calyptorhynchus lathami (Temminck, 1807)	Glossy Black-Cockatoo
			Lophochroa leadbeateri (Vigors, 1831)	Major Mitchell's Cockatoo
		Psittacidae	*Glossopsitta porphyrocephala* (Dietrichsen, 1837)	Purple-crowned Lorikeet
			Glossopsitta pusilla (Shaw, 1790)	Little Lorikeet
			Neophema pulchella (Shaw, 1792)	Turquoise Parrot
			Neophema splendida (Gould, 1841)	Scarlet-chested Parrot

Phylum	Class	Family	***Scientific Name***	Common name
			Pezoporus wallicus wallicus (Kerr, 1792)	Eastern Ground Parrot
			Polytelis swainsonii (Desmarest, 1826)	Superb Parrot
		Strigidae	*Ninox connivens* (Latham, 1801)	Barking Owl
			Ninox strenua (Gould, 1838)	Powerful Owl
		Tytonidae	*Tyto longimembris* (Jerdon, 1839)	Eastern Grass Owl
			Tyto novaehollandiae (Stephens, 1826)	Masked Owl
			Tyto tenebricosa (Gould, 1845)	Sooty Owl
		Podargidae	*Podargus ocellatus* Quoy & Gaimard, 1830	Marbled Frogmouth
		Alcedinidae	*Todiramphus chloris* (Boddaert, 1783)	Collared Kingfisher
		Menuridae	*Menura alberti* Bonaparte, 1850	Albert's Lyrebird
		Atrichornithidae	*Atrichornis rufescens* (Ramsay, 1867)	Rufous Scrub-bird
		Climacteridae	*Climacteris picumnus victoriae* Mathews, 1912	Brown Treecreeper (eastern subspecies)
		Maluridae	*Amytornis striatus* (Gould, 1840)	Striated Grasswren
		Acanthizidae	*Calamanthus campestris* (Gould, 1841)	Rufous Fieldwren
			Chthonicola sagittata (Latham, 1801)	Speckled Warbler
			Hylacola cautus Gould, 1843	Shy Heathwren
			Pyrrholaemus brunneus Gould, 1841	Redthroat
		Meliphagidae	*Certhionyx variegatus* Lesson, 1830	Pied Honeyeater
			Epthianura albifrons (Jardine & Selby, 1828)	White-fronted Chat
			Grantiella picta (Gould, 1838)	Painted Honeyeater
			Lichenostomus cratitius (Gould, 1841)	Purple-gaped Honeyeater

Phylum	Class	Family	***Scientific Name***	Common name
			Lichenostomus fasciogularis (Gould, 1854)	Mangrove Honeyeater
			Melithreptus gularis gularis (Gould, 1837)	Black-chinned Honeyeater (eastern subspecies)
		Petroicidae	*Drymodes brunneopygia* Gould, 1841	Southern Scrub-robin
			Melanodryas cucullata cucullata (Latham, 1801)	Hooded Robin (south-eastern form)
			Petroica boodang (Lesson, 1838)	Scarlet Robin
			Petroica phoenicea Gould, 1837	Flame Robin
			Petroica rodinogaster (Drapiez, 1819)	Pink Robin
		Pomatostomidae	*Pomatostomus halli* Cowles, 1964	Hall's Babbler
			Pomatostomus temporalis temporalis (Vigors & Horsfield, 1827)	Grey-crowned Babbler (eastern subspecies)
		Psophodidae	*Cinclosoma castanotum* Gould, 1840	Chestnut Quail-thrush
		Neosittidae	*Daphoenositta chrysoptera* (Latham, 1801)	Varied Sittella
		Pachycephalidae	*Pachycephala inornata* Gould, 1841	Gilbert's Whistler
			Pachycephala olivacea Vigors & Horsfield, 1827	Olive Whistler
			Pachycephala pectoralis contempta Hartert, 1898	Golden Whistler (Lord Howe Is. subsp.)
		Monarchidae	*Carterornis leucotis* (Gould, 1850)	White-eared Monarch
		Campephagidae	*Coracina lineata* (Swainson, 1825)	Barred Cuckoo-shrike
		Artamidae	*Artamus cyanopterus cyanopterus* (Latham, 1802)	Dusky Woodswallow

Phylum	Class	Family	*Scientific Name*	Common name
			Strepera graculina crissalis Sharpe, 1877	Pied Currawong (Lord Howe Is. subsp.)
		Timaliidae	*Zosterops lateralis tephropleurus* Gould, 1855	Silvereye (Lord Howe Is. subsp.)
		Estrildidae	*Stagonopleura guttata* (Shaw, 1796)	Diamond Firetail
	Mammals	Burramyidae	*Cercartetus nanus* (Desmarest, 1818)	Eastern Pygmy-possum
		Dasyuridae	*Dasyurus maculatus* (Kerr, 1792)	Spotted-tailed Quoll
			Ningaui yvonneae Kitchener, Stoddart & Henry, 1983	Southern Ningaui
			Phascogale tapoatafa (Meyer, 1793)	Brush-tailed Phascogale
			Planigale maculata (Gould, 1851)	Common Planigale
			Sminthopsis leucopus (Gray, 1842)	White-footed Dunnart
			Sminthopsis macroura (Gould, 1845)	Stripe-faced Dunnart
		Phascolarctidae	*Phascolarctos cinereus* (Goldfuss, 1817)	Koala
		Petauridae	*Petaurus australis* Shaw, 1791	Yellow-bellied Glider
			Petaurus norfolcensis (Kerr, 1792)	Squirrel Glider
		Potoroidae	*Aepyprymnus rufescens* (Gray, 1837)	Rufous Bettong
			Potorous tridactylus (Kerr, 1792)	Long-nosed Potoroo
		Macropodidae	*Macropus parma* Waterhouse, 1845	Parma Wallaby
			Thylogale stigmatica (Gould, 1860)	Red-legged Pademelon
		Pteropodidae	*Nyctimene robinsoni* Thomas, 1904	Eastern Tube-nosed Bat
			Pteropus poliocephalus Temminck, 1825	Grey-headed Flying-fox
			Syconycteris australis (Peters, 1867)	Common Blossom-bat

Phylum	Class	Family	*Scientific Name*	Common name
		Emballonuridae	*Saccolaimus flaviventris* (Peters, 1867)	Yellow-bellied Sheathtail-bat
		Molossidae	*Mormopterus lumsdenae* Reardon, McKenzie and Adams, 2014	Northern Free-tailed Bat
			Mormopterus norfolkensis (Gray, 1839)	Eastern Freetail-bat
		Vespertilionidae	*Chalinolobus dwyeri* Ryan, 1966	Large-eared Pied Bat
			Chalinolobus nigrogriseus (Gould, 1856)	Hoary Wattled Bat
			Chalinolobus picatus (Gould, 1852)	Little Pied Bat
			Falsistrellus tasmaniensis (Gould, 1858)	Eastern False Pipistrelle
			Kerivoula papuensis Dobson, 1878	Golden-tipped Bat
			Miniopterus australis (Tomes, 1858)	Little Bentwing-bat
			Miniopterus schreibersii oceanensis Maeda, 1982	Eastern Bentwing-bat
			Myotis macropus (Gould, 1855)	Southern Myotis
			Nyctophilus bifax Thomas, 1915	Eastern Long-eared Bat
			Nyctophilus corbeni Parnaby, 2009	Corben's Long-eared Bat
			Scoteanax rueppellii (Peters, 1866)	Greater Broad-nosed Bat
			Vespadelus baverstocki (Kitchener, Jones & Caputi, 1987)	Inland Forest Bat
			Vespadelus troughtoni (Kitchener, Jones & Caputi, 1987)	Eastern Cave Bat
		Muridae		
			Leggadina forresti (Thomas, 1906)	Forrest's Mouse
			Mastacomys fuscus Thomas, 1882	Broad-toothed Rat
			Pseudomys gracilicaudatus (Gould, 1845)	Eastern Chestnut Mouse
			Pseudomys hermannsburgensis (Waite, 1896)	Sandy Inland Mouse

Phylum	Class	Family	*Scientific Name*	Common name
			Pseudomys pilligaensis Fox & Briscoe, 1980	Pilliga Mouse
			Rattus villosissimus (Waite, 1898)	Long-haired Rat
	Marine mammals	Otariidae	*Arctocephalus forsteri* (Lesson, 1828)	New Zealand Fur-seal
			Arctocephalus pusillus doriferus Jones, 1925	Australian Fur-seal
		Physeteridae	*Physeter macrocephalus* Linnaeus, 1758	Sperm Whale
		Balaenopteridae	*Megaptera novaeangliae* (Borowski, 1781)	Humpback Whale

Fungi

Class	Family	*Scientific Name*	Common name
Basidiomycota	Hygrophoraceae	*Hygrocybe anomala* var. *ianthinomarginata* A.M. Young	
		Hygrocybe aurantipes A.M. Young	
		Hygrocybe reesiae A.M. Young	
		Hygrocybe rubronivea A.M. Young	

Plants

Family	*Scientific Name*	Common name
Apiaceae	*Xanthosia scopulicola* J.M. Hart & Henwood	
Apocynaceae	*Parsonsia dorrigoensis* J.B. Williams	
	Tylophora linearis P.I. Forst.	

Family	*Scientific Name*	Common name
Araliaceae	*Astrotricha crassifolia* Blakely	
Argophyllaceae	*Corokia whiteana* L.S. Sm.	
Asteliaceae	*Neoastelia spectabilis* J.B. Williams	
Asteraceae	*Ammobium craspedioides* Benth.	
	Argyrotegium nitidulum (Hook. f.) J.M. Ward & Breitw.	
	Brachyscome muelleroides G. L. R. Davis	
	Brachyscome papillosa G. L. R. Davis	
	Calotis glandulosa F. Muell.	
	Olearia cordata Lander	
	Ozothamnus tesselatus (Maiden & R. Baker) Anderberg	
	Picris evae Lack	
	Rutidosis heterogama Philipson	
	Rutidosis leiolepis F. Muell.	
	Senecio garlandii F. Muell. ex Belcher	
Brassicaceae	*Lepidium aschersonii* Thell.	
Casuarinaceae	*Allocasuarina simulans* L. Johnson	
Chenopodiaceae	*Atriplex infrequens* Paul G. Wilson	
	Maireana cheelii (R. Anderson) Paul G. Wilson	
Convolvulaceae	*Wilsonia backhousei* Hook. f.	
Corynocarpaceae	*Corynocarpus rupestris* Guymer subsp. *rupestris*	
Cunoniaceae	*Acrophyllum australe* (Cunn.) Hoogl.	
Cupressaceae	*Callitris oblonga* A. Rich. & Rich.	
Cyperaceae	*Cyperus rupicola* S.T. Blake	
	Eleocharis obicis L.A.S. Johnson & O.D. Evans	
	Lepidosperma evansianum K.L. Wilson	

Family	*Scientific Name*	Common name
Dilleniaceae	*Hibbertia marginata* Conn	
Doryanthaceae	*Doryanthes palmeri* W. Hill ex Benth.	
Elaeocarpaceae	*Tetratheca glandulosa* Sm.	
	Tetratheca juncea Sm.	
Ericaceae	*Budawangia gnidioides* (Summerh.) Telford	
	Dracophyllum macranthum E.A.Br. & N. Streiber	
	Epacris purpurascens Sims var. *purpurascens*	
	Epacris sparsa R. Br.	
	Gaultheria viridicarpa subsp. *merinoensis* J.B. Williams ms	
	Gaultheria viridicarpa J.B. Williams ms subsp. *viridicarpa*	
	Leucopogon exolasius (F. Muell.) F. Muell. ex Benth.	
	Styphelia perileuca J. Powell	
Euphorbiaceae	*Baloghia marmorata* C. White	
	Bertya opponens (F. Muell. ex Benth) Guymer	
	Fontainea australis Jessup & Guymer	
Fabaceae	*Acacia ausfeldii* Regel	
	Acacia bakeri Maiden	
	Acacia baueri subsp. *aspera* (Maiden & E. Betche) Pedley	
	Acacia carneorum Maiden	
	Acacia clunies-rossiae Maiden	
	Acacia constablei Tind.	
	Acacia courtii Tind. & Herscovitch	
	Acacia curranii Maiden	
	Acacia flocktoniae Maiden	

Family	*Scientific Name*	Common name
	Acacia georgensis Tind.	
	Acacia macnuttiana Maiden & Blakely	
	Acacia phasmoides J.H. Willis	
	Acacia pubescens (Vent.) R. Br.	
	Acacia pycnostachya F. Muell.	
	Archidendron hendersonii (F. Muell.) Nielsen	
	Bossiaea bombayensis K.L. McDougall	
	Bossiaea oligosperma A. Lee	
	Desmodium acanthocladum F. Muell.	
	Dillwynia tenuifolia Sieber ex DC.	
	Kennedia retrorsa Hemsley	
	Phyllota humifusa Benth.	
	Pultenaea aristata Sieber ex DC.	
	Pultenaea baeuerlenii F. Muell.	
	Pultenaea glabra Benth.	
	Pultenaea humilis Benth. ex Hook.f.	
	Pultenaea maritima de Kok	
	Pultenaea parrisiae J.D. Briggs & Crisp	
	Rhynchosia acuminatissima Miq.	
	Sophora fraseri Benth.	
	Swainsona murrayana Wawra	
	Swainsona plagiotropis F. Muell.	
	Swainsona pyrophila J. Thompson	
	Swainsona sericea (A. Lee) J. Black ex H. Eichler	

Family	*Scientific Name*	Common name
	Tephrosia filipes Benth.	
Gentianaceae	*Gentiana wissmannii* J. Williams	
Goodeniaceae	*Velleia perfoliata* R. Br.	
Haloragaceae	*Haloragis exalata* F. Muell. subsp. *exalata*	
	Haloragis exalata subsp. *velutina* Orch.	
Juncaginaceae	*Maundia triglochinoides* F. Muell.	
Lamiaceae	*Prostanthera cineolifera* R. Baker & H.G. Smith	
	Prostanthera cryptandroides Cunn. ex Benth. subsp. *cryptandroides*	
	Prostanthera densa A.A. Ham.	
	Prostanthera discolor R. Baker	
	Prostanthera palustris B.J. Conn	
	Prostanthera sejuncta M.L. Williams, Drinnan & N.G. Walsh	
	Prostanthera stricta R. Baker	
	Westringia davidii Conn	
Lauraceae	*Cryptocarya foetida* R. Baker	
	Endiandra hayesii Kosterm.	
Malvaceae	*Commersonia procumbens* (Maiden & Betche) Guymer	
	Lasiopetalum joyceae Blakely	
	Lasiopetalum longistamineum Maiden & Betche	
Meliaceae	*Owenia cepiodora* F. Muell.	
Menispermaceae	*Tinospora tinosporoides* (F. Muell.) Forman	
Myrtaceae	*Angophora inopina* K.D. Hill	
	Angophora robur L. Johnson & K. Hill	
	Callistemon linearifolius (Link) DC.	

Family	*Scientific Name*	Common name
	Darwinia biflora (Cheel) B. Briggs	
	Darwinia glaucophylla B.G. Briggs	
	Darwinia peduncularis B. Briggs	
	Eucalyptus aggregata Deane & Maiden	
	Eucalyptus alligatrix L.A.S. Johnson & K.D. Hill subsp. *alligatrix*	
	Eucalyptus approximans Maiden	
	Eucalyptus aquatica (Blakely) L. Johnson & K. Hill	
	Eucalyptus benthamii Maiden & Cambage	
	Eucalyptus boliviana J.B. Williams & K.D. Hill	
	Eucalyptus caleyi subsp. *ovendenii* L. Johnson & K. Hill	
	Eucalyptus camfieldii Maiden	
	Eucalyptus cannonii R. Baker	
	Eucalyptus canobolensis (L.A.S. Johnson & K.D. Hill) J.T. Hunter	
	Eucalyptus corticosa L.A.S. Johnson	Black Gum
	Eucalyptus dissita K.D. Hill	
	Eucalyptus fracta K.D. Hill	
	Eucalyptus glaucina Blakely	
	Eucalyptus kartzoffiana L. Johnson & Blaxell	
	Eucalyptus langleyi L. Johnson & Blaxell	
	Eucalyptus leucoxylon subsp. *pruinosa* (F. Muell. ex. Miq.) Boland	
	Eucalyptus mckieana Blakely	
	Eucalyptus nicholii Maiden & Blakely	
	Eucalyptus oresbia Hunter and Bruhl	
	Eucalyptus parramattensis subsp. *decadens* L. Johnson & Blaxell	

Family	*Scientific Name*	Common name
	Eucalyptus pulverulenta Sims	
	Eucalyptus pumila Cambage	
	Eucalyptus robertsonii subsp. *hemisphaerica* L. Johnson & K. Hill	
	Eucalyptus rubida subsp. *barbigerorum* L. Johnson & K. Hill	
	Eucalyptus sturgissiana L. Johnson & Blaxell	
	Eucalyptus tetrapleura L. Johnson	Yellow Gum
	Homoranthus darwinioides (Maiden & E. Betche) Cheel	
	Homoranthus lunatus Craven & S.R. Jones	
	Homoranthus prolixus Craven & S.R. Jones	
	Kunzea cambagei Maiden & E. Betche	
	Kunzea rupestris Blakely	
	Leptospermum deanei J. Thompson	
	Leptospermum thompsonii J. Thompson	
	Melaleuca biconvexa Byrnes	
	Melaleuca deanei F. Muell.	
	Melaleuca groveana Cheel & C. White	
	Micromyrtus blakelyi J. Green	
	Syzygium hodgkinsoniae (F. Muell.) L. Johnson	
	Syzygium moorei (F. Muell.) L. Johnson	
Olacaceae	*Olax angulata* A.S. George	
Orchidaceae	*Bulbophyllum globuliforme* Nicholls	
	Caladenia montana G.W. Carr	
	Chiloglottis platyptera D.L. Jones	
	Cryptostylis hunteriana Nicholls	

Family	*Scientific Name*	Common name
	Diuris praecox D.L. Jones	
	Diuris tricolor Fitzg.	
	Diuris venosa Rupp	
	Genoplesium vernale D.L. Jones	
	Oberonia titania Lindl.	
	Peristeranthus hillii (F. Muell.) T.E. Hunt.	
	Prasophyllum pallens D.L. Jones	
	Prasophyllum retroflexum D.L. Jones	
	Pterostylis alpina R.S. Rogers	
	Pterostylis chaetophora M.A. Clem. & D.L. Jones	
	Pterostylis cobarensis M.A. Clem.	
	Pterostylis elegans D.L. Jones	
	Pterostylis foliata Hook. f.	
	Pterostylis nigricans L. Jones & M.A. Clem.	
	Pterostylis pulchella Messmer	
	Pterostylis riparia D.L. Jones	
	Rhizanthella slateri (Rupp) M.A. Clem. and P.J. Cribb	
	Sarcochilus fitzgeraldii F. Muell.	
	Sarcochilus hartmannii F. Muell.	
	Sarcochilus weinthalii F.M. Bailey	
	Thelymitra alpicola Jeanes	
Orobanchaceae	*Euphrasia bella* S.T. Blake	
	Euphrasia bowdeniae W.R. Barker	
	Euphrasia ciliolata W.R. Barker	

Family	*Scientific Name*	Common name
Plantaginaceae	*Veronica blakelyi* (B.G. Briggs & Ehrend.) B.G. Briggs	
Poaceae	*Amphibromus fluitans* Kirk	
	Ancistrachne maidenii (A.A. Ham.) Vickery	
	Arthraxon hispidus (Thunb.) Makino	
	Austrostipa metatoris (J. Everett & S.W.L. Jacobs) S.W.L. Jacobs & J. Everett	
	Dichanthium setosum S.T. Blake	
	Paspalidium grandispiculatum B.K Simon	
	Rytidosperma pumilum (Kirk) Linder	
Polygonaceae	*Muehlenbeckia costata* K.L. Wilson and Makinson ms	
	Persicaria elatior (R. Br.) Sojak	
Proteaceae	*Floydia praealta* (F. Muell.) L. Johnson & B. Briggs	
	Grevillea banyabba P. Olde & N. Marriott	
	Grevillea evansiana McKee	
	Grevillea juniperina R. Br. subsp. *juniperina*	
	Grevillea kennedyana F. Muell.	
	Grevillea molyneuxii D.J. McGillivray	
	Grevillea parviflora R. Br. subsp. *parviflora*	
	Grevillea quadricauda P. Olde & N. Marriott	
	Grevillea rhizomatosa P. Olde & N. Marriott	
	Grevillea scortechinii subsp. *sarmentosa* (Blakely & McKie) McGillivray	
	Grevillea shiressii Blakely	
	Hakea archaeoides W.R. Barker	

Family	*Scientific Name*	Common name
	Hakea fraseri R. Br.	
	Hicksbeachia pinnatifolia F. Muell.	
	Isopogon fletcheri F. Muell.	
	Macadamia tetraphylla L. Johnson	
	Persoonia acerosa Sieber ex Schultes & Schultes f.	
	Persoonia marginata Cunn. ex R. Br.	
Ranunculaceae	*Clematis fawcettii* F. Muell.	
	Ranunculus anemoneus F. Muell.	
Restionaceae	*Baloskion longipes* (L.A.S. Johnson & O.D. Evans) B.G. Briggs & L.A.S. Johnson	
Rhamnaceae	*Discaria nitida* Tortosa	
	Pomaderris bodalla N.G. Walsh & F. Coates	
	Pomaderris gilmourii var. *cana* N. Walsh	
	Pomaderris notata S.T. Blake	
	Pomaderris pallida Wakef.	
	Pomaderris parrisiae N. Walsh	
Rubiaceae	*Asperula asthenes* Airy Shaw & Turrill	
Rutaceae	*Boronia deanei* Maiden & E. Betche	
	Boronia granitica Maiden & E. Betche	
	Boronia umbellata P. Weston	
	Bosistoa transversa J.F. Bailey & C.T. White	
	Correa baeuerlenii F. Muell.	
	Leionema ralstonii (F. Muell.) Paul G. Wilson	
	Leionema sympetalum (Paul G. Wilson) Paul G. Wilson	

Family	***Scientific Name***	**Common name**
	Nematolepis rhytidophylla (Alb. & N.G. Walsh) Paul G. Wilson	
	Zieria murphyi Blakely	
	Zieria tuberculata J.A. Armstrong	
Santalaceae	*Thesium australe* R. Br.	
Sapindaceae	*Dodonaea procumbens* F. Muell.	
	Lepiderema pulchella Radlk.	
Sapotaceae	*Niemeyera whitei* (Aubrev.) Jessup	
Solonaceae	*Solanum karsense* Symon	
Surianaceae	*Cadellia pentastylis* F. Muell.	
Symplocaceae	*Symplocos baeuerlenii* R. Baker	
Thymelaeaceae	*Pimelea curviflora* R. Br. var. *curviflora*	
Winteraceae	*Tasmannia glaucifolia* J. Williams	
	Tasmannia purpurascens (Vick.) A.C. Smith	

Populations

(Nil)

Appendix 4

Nationally Important Wetlands located within NSW RFA regions

Wetland Name	RFA	Wetland Name	RFA
Bega Swamp	E	Everlasting Swamp	NE
Bondi Lake	E	Hexham Swamp	NE
Jacksons Bog	E	Jewells Wetland	NE
Merimbula Lake	E	Kooragang Nature Reserve	NE
Nadgee Lake and tributary wetlands	E	Lake Hiawatha and Minnie Water	NE
Nelson Lagoon	E	Lake Macquarie	NE
Nunnock Swamp	E	Limeburners Creek Nature Reserve	NE
Packers Swamp	E	Little Llangothlin Lagoon	NE
Pambula Estuarine Wetlands	E	Lower Bungawalbin Catchment Wetland Complex	NE
Wallagoot Lagoon (Wallagoot Lake)	E	Myall Lakes	NE
100 Acre Swamp	NE	New England Wetlands	NE
Alumy Creek/Bunyip Swamp	NE	Port Stephens Estuary	NE
Avoca Lagoon	NE	Round Mountain Swamps	NE
Barrington Top Swamps	NE	Salt Ash Air Weapons Range	NE
Billinudgel Nature Reserve	NE	Shortland Wetlands Centre	NE
Brisbane Water Estuary	NE	Stotts Island Nature Reserve	NE
Budgewoi Lake Sand Mass	NE	Swan Pool/Belmore Swamp	NE
Bundjalung National Park	NE	Terrigal Lagoon	NE
Clarence River Estuary	NE	The Broadwater	NE
Clybucca Creek Estuary	NE	Tuckean Swamp	NE
Cockrone Lagoon	NE	Tuggerah Lake	NE
Colongra Swamp	NE	Ukerebagh Island Nature Reserve	NE
Cook Island Nature Reserve	NE	Upper Coldstream	NE
Cowans Pond	NE	Wallis Lake and adjacent estuarine islands	NE

Wetland Name	RFA	Wetland Name	RFA
Crowdy Bay National Park	NE	Wamberal Lagoon	NE
Cudgen Nature Reserve	NE	Wooloweyah Lagoon	NE
Ellalong Lagoon	NE	Wyong Racecourse Swamp	NE
Big Badja Swamp	S	Beecroft Peninsula	S
Lowbidgee Floodplain	S	Meroo Lake Wetland Complex	S
Lagoon Head	S	Micalong Swamp	S
Lake Bathurst	S	Minnamurra River Estuary	S
Jervis Bay	S	Monaro Lakes	S, E
Lake George	S	Moruya River Estuary Saltmarshes	S
Lake Illawarra	S	Nargal Lake	S
Long Swamp	S	Rennex Gap	S
Killalea Lagoon	S	Shoalhaven/Crookhaven Estuary	S
Kosciusko Alpine Fens, Bogs and Lakes	S	Snowgum Flat	S
Blue Lake (Kosciuszko)	S	St Georges Basin	S
Budderoo National Park Heath Swamps	S	Swan Lagoon	S
Clyde River Estuary	S	Tabourie Lake	S
Coila Creek Delta	S	Termeil Lake Wetland Complex	S
Coomonderry Swamp	S	Tomneys Plain	S
Coopers Swamp	S	Tuross River Estuary	S
Coree Flats	S	Waldrons Swamp	S
Jervis Bay Sea Cliffs	S	Wallaga Lake	S, E
Cormorant Beach	S	Wingecarribee Swamp	S
Cullendulla Creek and Embayment	S	Wollumboola Lake	S
Durras Lake	S	Yaouk Swamp	S

Appendix 5

Principles of Ecologically Sustainable Forest Management (ESFM)

Below are the Principles of ecologically sustainable forest management adopted in all three NSW RFAs.

Principle 1: Maintain or increase the full suite of forest values for present and future generations across the NSW native forest estate

- The principle of intergenerational equity (that in meeting the needs of the present generation, the ability of the future generations to meet their own needs is not compromised) is embodied in this principle.
- Ensure that ESFM at the regional and smaller scales is implemented by ecologically appropriate planning and operational practices, and that ESFM targets are set and indicators of performance are monitored.
- Ensure the long-term maintenance of the full range of values of the NSW existing forest estate. The intention is to maintain or increase not only the full range of values, but also the magnitude or level at which those values are maintained or increased.
- Encourage the increased production of plantation-grown timber and the social and economic benefits flowing from this increased production to supplement the wood supply from native forests.

Aims for values include:

A Biodiversity

- Biological diversity of forests at the ecosystem, species and genetic levels where biological diversity includes natural patterns of ecosystems, species and gene pools in time and space.
- Address the requirements of vulnerable species, assist with the recovery of threatened species, and maintain the full range of ecological communities at viable levels.
- Protect landscape values through the careful planning of operations and the reservation of appropriate patches and corridors of vegetation.

B The productive capacity and sustainability of forest ecosystems

- Maintain ecological processes within forests (such as the formation of soil, energy flows and the carbon, nutrient and water cycles, fauna and flora communities and their interactions).
- Maintain or increase the ability of forest ecosystems to produce biomass whether utilised by society or as part of nutrient and energy cycles.

- Ensure the rate of removal of any forest products is consistent with ecologically sustainable levels.
- Ensure the deleterious effects of activities/disturbances which threaten forests, forest health or forest values are minimised.

C Forest ecosystem health and vitality

- Reduce or avoid threats to forest ecosystems from introduced diseases, exotic plants and animals, unnatural regimes of fire or flooding, wind shear, land clearing and urbanisation.
- Promote good environmental practice in relation to pest management.
- Ensure the deleterious effects of activities/disturbances within forests, their scale and intensity, including their cumulative effects are minimised.
- Restore and maintain the suite of attributes (ecological condition, species composition and structure of native forests) where forest health and vitality have been degraded.

D Soil and water

- Maintain the chemical and biological functions of soils by protecting soils from unnatural nutrient losses, exposure, degradation and loss.
- Maintain the physical integrity of soils by protecting soils from erosion, mass movement, instability, compaction, pulverisation and loss.
- Protect water quality (physical, chemical, biological) by measures controlling disturbance resulting from forest activities.
- Identify and maintain at appropriate levels, water yield and flow duration in catchments.

E Positive contribution of forests to global geochemical cycles

- Maintain the positive contribution of forests to the global geochemical cycle (includes climate, air and water quality and deposition).

F Long-term social and economic benefits

- Maintain and enhance, on an ecologically sustainable basis, production of wood and wood products, including value adding, investment and resource security.
- Provided it is ecologically sustainable, set, maintain or enhance the level of use of non-wood products and uses, including bee-keeping, grazing, mining, recreation and tourism, reliable water supply.
- Maintain and enhance, on an ecologically sustainable basis, the provision of employment and community needs such as economic diversification, investment skills, education, jobs stability, training and Indigenous needs.
- Encourage the establishment and use of plantation forests on existing cleared land to expand social and economic values.
- Maintain and enhance the intangible social welfare benefits which forests provide.

G Natural and cultural heritage values

- Protect social, natural and cultural heritage values and sites, including aesthetic, landscape, historic, cultural, educational, scenic, spiritual and scientific values, including Indigenous values and sites.

Principle 2: Ensure public participation, access to information, accountability and transparency in the delivery of ESFM.

- Ensure public participation in decision-making processes at local, regional and State and Federal levels.
- Ensure comprehensive, timely and reasonable public access to information.
- Ensure transparency, openness and accountability in decision making processes and performance.

Principle 3: Ensure legislation, policies, institutional framework, codes, standards and practices related to forest management require and provide incentives for ecologically sustainable management of the native forest estate.

Establish a process for shared management and administration, recognising the customary and traditional rights of Indigenous people, and the interests of private land-holders and other stakeholders in an area's management.

Principle 4: Apply precautionary principles for prevention of environmental degradation

The incorporation of the precautionary principle into decision making has been endorsed by State and Commonwealth Governments (Commonwealth of Australia 1992 p. 49, IGAE 1992) and is defined as *'where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

- *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and*
- *an assessment of the risk-weighted consequences of various options.'*

Principle 5: Apply best available knowledge and adaptive management processes

ESFM would utilise the concept of adaptive management and continuous improvement based on best science and expert advice and targeted research on critical gaps in knowledge, monitoring or evaluation.

Appendix 6

Excerpt from *Independent review of the report on progress with implementation of the NSW Regional Forest Agreements for the second and third five-yearly reviews 2004 – 2014*

Recommendations from the first five-yearly independent review of NSW RFAs

With comments from the reviewer of the second and third five yearly reviews

For the first five-yearly review of the NSW RFAs, the Parties appointed Mr Scott Spencer of Queensland as the Independent Assessor to review the *Draft Report on Progress with Implementation of the New South Wales Regional Forest Agreements (RFAs)* and the 32 public submissions received as part of this review.

In November 2009, the Independent Assessor provided his report[122], which included 18 recommendations for the Australian and NSW governments to consider in the ongoing implementation of the NSW RFAs.

On 15 March 2010, the Independent Assessor's report was tabled in the Australian Parliament.

The NSW and Australian governments produced a Joint Government Response to the Independent Assessor's report[123], which was tabled in the House of Representatives of the Australian Parliament on 30 October 2014.

This section provides an overview of progress against the recommendations from the independent review of the first five-yearly implementation report under the NSW RFAs.

Of the 18 recommendations for continued implementation of the NSW RFAs arising from the 2009 independent review, the Parties have indicated that:

- · 11 have been completed or fully implemented
- · 2 have been partly implemented
- · 5 are underway through ongoing actions that have been implemented since 2014.

The reviewer has assessed progress on implementing the recommendation as:

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[122]Spencer S 2009, *Final Report on Progress with Implementation of NSW Regional Forest Agreements: Report of Independent Assessor*, accessed 9 November 2016, www.agriculture.gov.au/forestry/policies/rfa/publications/annual-reports/nsw

[123] NSW and Australian Governments 2014b, Joint Australian and New South Wales Government Response to the Final Report on Progress with Implementation of the NSW Regional Forest Agreements: Report of the Independent Assessor, accessed 9 November 2016 www.agriculture.gov.au/SiteCollectionDocuments/rfa/publications/annual-reports/nsw/jointresponsenswrfa.pdf

- · 10 have been achieved / implemented
- · 2 have been part achieved
- · 2 are underway and ongoing
- · 4 have not been achieved or satisfactorily implemented.

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
1. That for future reviews the Parties consider supplementing the notification process by directly advising key community, conservation and industry groups of the review and the various processes involved.	Considered important. Public notices were placed for the first period review seeking comment.	Underway and completed when the Implementation report is released Key stakeholder list has been prepared and used to notify groups once the Implementation Report was released.	Achieved although submitters including some who would be key stakeholders, commonly complained they had not been notified and were 'taken by surprise' with the review announcement. The then short time line for submissions was also seen as an issue.
2. With the approval of the submitters, the Parties refer the submissions to this review to: • the NSW Review • the Australian Government, to be taken into account during development of its response of the Independent Review of the EPBC Act (EPBC Review 2008) • Executive Management of the NSW forest agencies.	Both Parties supported the submissions being used outside the review process.	Completed	Achieved
3. The Parties consider initiating a further review process as soon as possible to meet the agreed RFAs second review time requirements and;	Both Parties supported the intent of the recommendation to commence further five-year review on time.	Underway. The Parties acknowledge there have been delays. The combined second and third five-yearly review will focus milestones as well as	Not achieved - 4 years late on the third review and 9 years on the second review. This delay reflects poorly on the stated intent of transparency,

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
these reviews focus on progress with milestones due to commence in the second 5 years of the RFAs, actions underway from the first 5 years, and indicators that are considered critical to the success of the RFAs in areas such as reserve management, species protection (including pest animal and weed management), management planning and wood supply estimates.		commitments or obligations, sustainability indicators and demonstrate ESFM.	commitment and accountability through the RFA process.
4. That the Parties to the RFA consider: • The resource requirements of ongoing and yet to commence undertakings under the three RFAs to determine whether implementation is likely within agreed timelines, and/or • Whether reprioritization of any milestones is necessary to ensure delivery of initiatives which are essential to the implementation of the RFAs.	- Both Parties committed to implementation of the milestones and applying resources to achieve this.	Fully implemented. The Parties have worked on the requirements within available resources and most have been achieved fully, in part or underway. No milestones have been amended except the timing of the second five-yearly review.	Not achieved with many milestones, commitments and obligations lagging. As well, milestones have not been amended when the Parties have been aware that changes were needed.
5. In future five-yearly reviews the Parties consider further including more commentary for Milestones in the "Underway" and "Concluded" categories	Supported by both Parties	Implemented with more commentary on progress and implementation	Achieved

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
to provide an assessment of the adequacy of progress of these milestones.			
6. The Parties continue to ensure their current data release and publication strategies align with modern practice for the release of publicly held information.	Implemented	Implemented with the Parties engaging with interested groups and regularly releasing reports and information on the states forest.	Achieved
7. The NSW Government continue to give priority to completion and publication of plans of management for various dedicated areas.	NSW continues to prioritise completion and publication of management plans for various dedicated areas.	Underway	Underway with progress considering the expansion of reserves and parks. The interim step of preparing plans / strategies to cover the key risks of fire, pests and visitor management is commended.
8. In future reviews the Parties should provide more information about development of various threatened species recovery plans to allow an assessment of the adequacy of progress in the management of threatened species as it relates to Milestone 23.	Both Parties support the provision of information on the development and implementation of threatened species and ecological communities' recovery plans and recovery actions.	Fully implemented	Implemented
9. The NSW Government should give high priority to finalisation of its Park Management Program and this issue should be specifically reported on as part of the second 5 yearly RFAs Review.	The Parties agree that the PMP should continue to be developed and made publicly available, where appropriate.	Underway with good progress on legislation, assessment of all parks within New South Wales four times since 2005 and state-wide reporting on progress.	Underway and ongoing. The PMP is dynamic and an adaptive program that will be adjusted over time to meet the needs of the park system and its management.
10. The NSW Government should continue to give priority to audit and	Both Parties agree that an effective and credible audit and compliance framework	Fully implemented	Implemented and ongoing with independent DPI audits of Crown-timber land

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
compliance activity by each agency involved in the RFAs and that auditing be closely scrutinised as part of the NSW Review.	is essential for both the implementation of and public confidence in the three NSW RFAs.		compliance, and private native forestry and plantation forestry audits. Needs to be extended to all agencies.
11. The NSW Government should continue to give high priority to the release of the NSW Forest Management System covering public and private land. It should be completed before the next review.	Both Parties agree that a high priority should be given to the release of the New South Wales and met F MS covering public and private land.	Underway and will be fully implemented on the publication of the implementation report	Not achieved - outside the timeline set in recommendation 11. It is important that the forest management system is readily available and that it clearly illustrates how the States forests are managed.
12. The NSW Government should initiate immediate action to establish and deliver the regional ESFM performance reports as required under Milestone 41.	Both Parties agree that the regional ESFM performance reports should be publicly available.	Fully implemented	Implemented in Part I. ESFM performance reports are the responsibility of FCNSW. The ESFM indicators have been revised by Government and released as an EPA publication. The new indicators align with MIG 2018 indicators.
13. The NSW Government should give the highest priority to the continuous improvement system for FRAMES as required under Milestone 48 and development of the inventory plot measurement systems required across the various regions as required under Milestone 49.	Both Parties agree that the FRAMES provides the toolkit of applications for long term wood supply determinations from State forests in the three RFA regions where harvesting is permitted.	Implemented in part	Implemented. FCNSW continues to improve FRAMES and this will be ongoing. The measurement of inventory plots will be required to provide base data.
14. The NSW Government should ensure that its FRAMES and associated supply models undergo regular (5 yearly) expert independent	Both Parties agree that the frames program would benefit from expert independent assessment to support confidence in the program	Fully implemented	Implemented with two reviews of FRAMES and regional woods flow models by a timber supply expert.

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
assessment to confirm the efficacy of any improvement and other amendments to the system			
15. The Parties should: Satisfy themselves that the requirements of Milestone 51 to provide annual comparisons of actual and modelled yields cannot be cost effectively or safely delivered in the form originally envisioned in the RFAs and If so, initiate action to develop an alternative arrangement that allows consideration of actual v modelled performance using the information already produced by Forests NSW. This data should be published annually. Keep this matter under continuous review to take advantage of refinements in FRAMES that might allow better comparison of actual v modelled performance at a sub-regional scale.	Not described	Implemented in part	Not achieved – the main recommendation was that the actual yield would be checked against the predicted. FCNSW are working to make FRAMES operative at the state, RFA and tactical levels and to be able to compare actual with predicted product flows.
16. The NSW Government should take early action to complete the various reviews of sustainable yield calculations as required under Milestone 53. These reviews should be made available publicly when completed. Publication of a description of sustainable yield calculation	Both Parties agree that reviews of sustainable yield which delivers wood supply yields for the three New South Wales RFA regions are essential to the socioeconomic outcomes under the New South Wales RFAs.	Fully implemented	Achieved- there has been a lot of work refining the sustainable yield calculations including expert reviews. This work is ongoing to improve components of the inputs such as described in response to Recommendation 15.

Recommendation	Joint Government Response	Status for Periods 2&3	Reviewer's comments
methodologies as required by Milestone 54 should occur as soon as possible.			
17. That the Parties to the RFAs consider whether more systematic, cost effective approaches could be available to collect data on threatened species over time or in its absence, whether it would be valid to release appropriately qualified comparative data developed from existing sources.	Both Parties support the collection of data on threatened species on a systematic basis.	Fully implemented	Implemented. New South Wales established a systematic and cost effective program for addressing threatened species management through the 'savings our species' program. This program sets out the government's species management plan and what needs to be done to secure New South Wales threatened species in the wild over the next hundred years.
18. The NSW Government should explore accessing data on soil and water quality from all relevant Commonwealth, State and Local government agencies including community NRM volunteer groups, with a view to developing a more systematic and comprehensive approach to monitoring of these attributes in forest areas.	Both Parties agreed to access all data that may be beneficial to the monitoring of the ESFM criteria and indicators as adopted.	Fully implemented	Implemented and ongoing.

Points raised in the submissions

The recommendations made by the Independent Assessor seem to address many of the issues raised by the submissions made as part of this review. The Status for Period 2&3 column indicates most of the actions outlined in the Joint Government Response are complete. It is therefore strange that the majority of submissions submitted as part of this review considered these issues to remain unresolved.

Specific issues raised by the submissions included:

- Overall dissatisfaction with the level of resourcing provided and the systems in place for conducting the five-yearly reviews and monitoring achievement of ESFM.
- Insufficient EPA field staff to audit on-ground logging operations for breach of prescription.
- Insufficient monitoring of sustainability indicators across all land tenures to give a landscape perspective.
- Poor engagement with local interest groups regarding the collection and use of data on threatened species.
- Lack of a process to address issues once identified, such as issues regarding shortages in sustainable yield.
- The absence of sufficient threatened species Recovery Plans.

Reviewer's comments

Overall there is been progress implementing the recommendations from the first review and a number of pleasing developments prompted by these recommendations. These developments include significant progress in developing the Park Management Program and work on the high-risk areas pending the writing of actual plans for all areas. There is also been significant progress on collaborative work with threatened species protection and planning.

While it is still work in progress, FRAMES is improving in providing sustainable yield estimates. The FRAMES system and the derived sustainable yield estimates have been closely examined by experts, with subsequent progressive refinements. The first review of the RFA recommended the FRAMES predicted volumes be compared to actual log volumes and there have been three reconciliations of this important check.

There remain a number of areas where the Parties need to improve including:

- publishing of the current status of the ESFM indicators for each RFA. While this is partly covered by other reports, a consolidated report on these important descriptors is essential. (Note – this was achieved in 2016)
- publishing the NSW Forest Management System, clearly outlining the processes for managing forests on both private and public land.

There is still work to be done in regard to the agencies contacting all stakeholders well in advance of an RFA review. While the agencies have identified many key stakeholders, it is important they keep this list updated to include the many groups with an interest in forest management.

The ongoing problem of lagging on timelines for review of the RFAs is a concern. The review of period two and three of the three RFAs was around 9 and 4 years behind schedule. This follows the first review being four years behind schedule, although it was limited to milestones only.

Because the Parties failed to meet what many consider to be the most important milestone of the RFAs (that is, the review of progress in implementing the RFAs), many submitters questioned whether the Parties are genuinely committed to RFA processes. However, the reviewer finds the Report to be an impressive document that supports the Parties' commitment to RFA processes.

The reviewer recognises the agencies may find it difficult to provide adequate resources to support all the processes and commitments of the RFAs, especially where RFA processes have

remained static while an evolving work environment has resulted in the need for agencies to prioritise the many competing demands on their resources.

The reviewer hopes future RFAs will be written to be more relevant, adaptive and focused on the elements that are important and current in forest management, while also protecting the integrity, accountability and transparency of the original RFAs. Hopefully this will then lead to the agencies providing adequate resourcing to both implement and review the RFAs on schedule.