
Review of protective measures and forest practices – biodiversity workshops

Southern Region

A project undertaken as part of the NSW Comprehensive Regional Assessments

July 1999

REVIEW OF PROTECTIVE MEASURES AND FOREST PRACTICES – BIODIVERSITY WORKSHOP SOUTHERN REGION

Ecologically Sustainable Forest
Management Group

A project undertaken for
the Joint Commonwealth NSW Regional Forest Agreement Steering Committee
as part of the
NSW Comprehensive Regional Assessments
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PROJECT SUMMARY

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

Project objective/s

The objective of this project was to assess and review the forest management protective measures and forest practices employed in the Southern CRA Region to protect biodiversity. The management practices contributing towards the protection of biodiversity include:

- The reserve system
- Silvicultural and fire management practices.
- The conservation protocols for timber harvesting on State forests for the duration of the Interim Forestry Agreement.

Methods

The flora and fauna Expert Panel was comprised of selected independent, State Forests of NSW and National Parks and Wildlife Service scientific experts. Each member received a package containing background information for the workshop and attended a field day to observe prescriptions implemented by State Forests of NSW in the field.

Flora and terrestrial fauna workshops were held concurrently. Priority species lists were derived from the Response to Disturbance Project (under the Environment and Heritage Technical Committee).

Flora workshops reviewed and amended the Threatened Flora prescriptions in the Conservation Protocols. Species were allocated to revised prescriptions.

Terrestrial and aquatic fauna workshops reviewed the general prescriptions and regulatory requirements applying across the landscape to listed fauna species. Improvements to the prescriptions were recommended.

Flora and terrestrial fauna experts jointly discussed the adequacy of, and made amendments to, the pre-logging and pre-roading survey design and requirements as outlined in the Upper and Lower North East Broad Area Licence 1997.

A final open discussion to identify issues of greatest concern ended the flora and terrestrial fauna ESFM workshops.

Key results and products

Flora

The four prescriptions developed by the Expert Panel for flora species were:

- Prescription A - Exclusion of 100% no buffer
- Prescription B - Exclusion of 100% buffer all individuals
- Prescription C - Species specific management plan
- Prescription D - Site specific management plan

Flora species were allocated to prescriptions A, B or C. Prescription D was to be triggered by specific on-site situations.

The Expert Panel made several recommendations to optimise the pre-logging and pre-roading flora surveys. The need for monitoring prescriptions to determine their efficacy was emphasised.

Terrestrial fauna

The Expert Panel identified 61% of fauna species reviewed as likely to persist in the landscape given the revised and/or current conservation measures, 28% were unlikely to persist, 8% would persist in selected areas and for 3% of the species the Expert Panel were unwilling to comment. The reasons given by the Expert Panel for these decisions are reported.

The Expert Panel made numerous recommendations to optimise the pre-logging and pre-roading fauna surveys.

Flora and terrestrial fauna general discussion

The Expert Panel identified the impacts of fire, persistence of hollow bearing trees, effects of introduced species and private land management as affecting the persistence of species across the Southern RFA region. The need for on going research, and monitoring of the efficacy of management strategies, were emphasised.

Aquatic fauna

The Expert Panel identified 33% of the fauna species reviewed as unlikely to persist in the landscape and for the remaining 66% of the taxa they were unwilling to comment. The Expert Panel highlighted concerns with, and recommended changes to, the protective measures used to conserve these species.

1. INTRODUCTION

1.1 BACKGROUND

This report describes a project undertaken as part of the Comprehensive Regional Assessments (CRAs) of forests in New South Wales. The CRAs provide the scientific basis on which the Commonwealth and the State Governments will negotiate the Regional Forest Agreements (RFAs). These RFAs will determine the future of these forests, establishing a balance between conservation and ecologically sustainable wood production. Additionally, CRAs will facilitate decisions concerning the improvement of on- and off-reserve management.

Biological diversity has been identified as one of a number of forest values needing consideration as part of ecologically sustainable forest management of the NSW native forest estate. To ensure biological diversity is protected this project reviewed several mechanisms used by agencies to conserve flora and fauna species across the landscape. Landscape is intended to mean catchments in the Southern CRA/RFA Region and includes public (National Parks, State forests and Crown land) and private land.

This project reviewed and assessed the most important forest management protective measures related to forest practices and uses. Statewide reviews were conducted in a series of workshops reported in the *Review of statewide protective measures and forest practices* (NA45/ESFM). These workshops reviewed:

- Forest uses and practices;
- soil and water protective measures;
- National Parks and Wildlife Service reserve management;
- National Parks and Wildlife Service statewide biodiversity measures; and
- State Forests of NSW forest practices and protective measures.

Measures to protect biodiversity features vary between RFA Regions and therefore were reviewed on a Regional basis. This report documents the review of the biodiversity protective measures and forest practices for the Southern RFA Region.

1.2 OBJECTIVES

The objective of this project was to assess and review the forest management protective measures and forest practices employed in the Southern CRA Region to protect biodiversity. The protective measures include:

- The reserve system
- Silvicultural and fire management practices.

- The conservation protocols for timber harvesting on State Forests for the duration of the Interim Forestry Agreement.

1.3 SCOPE OF PROJECT

The intention of this project was to review and assess the current protective measures and practices applied to forests through out the state of NSW and used to inform the integration process on impacts of particular prescriptions or protective measures. The protective measures and forest practices applied to forest conservation and management including timber harvesting will be compiled in to a code system. The project has been divided into three phases:

- The first phase will describe and review protective measures and forest practices and identify improvements. The protective measures and forest practices will be compiled into what is described as a 'Code system'. A review of these measures has been conducted for the State. This report documents specifically the review of biodiversity protective measures and forest practices for the Southern CRA Region.
- The second phase will provide expressions of these protective measures and forest practices in a language compatible with information systems. This is presented in the ESFM report: *Application of the protective measures and forest practices into a quantitative database*.
- A third phase will occur after integration and will involve finalising the code system and ecosystem management field guides leading into the RFAs.

1.4 REPORT STUCTURE

The outcomes of the ESFM workshop are divided into a series of chapters. Chapter 2 describes the general methods used to select the Expert Panels, the process used to select the species to be reviewed and the general format of the workshops. Chapter 3 presents the outcomes of the review of the conservation measures applicable to threatened flora species. The outcomes of the terrestrial fauna section of the ESFM workshop comprise the subsequent seven chapters. The terrestrial fauna species reviewed were divided into seven broad taxonomic groups. Each chapter reports on an individual group and contains all sections of the workshop relevant to that group. For example Chapter 4: Ground mammals, presents the review of the conservation measures for each ground mammal species, identified on the Priority fauna list, and the revised pre-logging and pre-roading surveys relevant to ground mammals. The eleventh chapter presents the Expert Panel's views on what they considered to be the issues of greatest concern, as discussed throughout the ESFM workshop. The final chapter presents the outcomes of the additional one day aquatic fauna workshop.

The appendices for the report are contained in an additional document titled *Review of protective measures and forest practices – biodiversity workshops appendices, Southern Region*.

2. GENERAL METHODS

2.1 EXPERT SELECTION

The Ecologically Sustainable Forest Management (ESFM) Project Area 4/2/1: Review of protective measures and forest practices - flora and terrestrial fauna workshops were held in Queanbeyan from the 29th of June to the 2nd of July 1999 and an additional Aquatic Fauna Workshop was conducted on the 10th of August 1999. The Expert Panel for these workshops consisted of representatives from State Forests of NSW, the National Parks and Wildlife Service and independent scientists (Appendix A). The latter were derived from those invited by the Environment and Heritage Technical Committee (EHTC) to participate in the Response to Disturbance project. The EHTC selected experts from those nominated by State and Commonwealth agencies for the following categories:

- Flora;
- general fauna;
- ground mammals;
- arboreal mammals;
- bats;
- nocturnal birds;
- diurnal birds;
- frogs;
- reptiles; and
- aquatic fauna for the Southern CRA Region.

Nominees were listed for each position and voted on by EHTC members. Experts with the highest rank were invited to attend the workshop, if unavailable, those ranked next on the list were approached, and so on until representatives for each category were found. Where possible, participating experts were present for the appropriate section of the Response to Disturbance workshops and the entire ESFM workshop.

2.2 EXPERTS PACKAGE

Members of the Expert Panel were given a background reading package (Appendix B, C, D, E and F) providing them with an overview of the Comprehensive Regional Assessments (CRAs) and the role of ESFM within this framework. The package included:

- An explanation of Fauna Proformas.
- An example of Proforma 1: Critical habitat requirements of species X.
- An example of Proforma 2: Identified threats and ranks of their perceived importance. [Note: The information on Proformas 1 and 2 were later distilled from the Response to Disturbance workshop and used as background information for the ESFM terrestrial fauna workshop.]
- An example of Proforma 3: Summary of protective measures applicable to terrestrial species X. This proforma was only received by members of the terrestrial fauna Expert Panel.
- An example of Proforma 4: Summary of protective measures applicable to aquatic species X. This proforma was only received by members of the aquatic fauna Expert Panel.
- List of flora and fauna species to be considered at the Response to Disturbance and ESFM workshops.
- Summary of the outcomes of the previous review of flora prescriptions from existing Conservation Protocols undertaken for the Upper and Lower North East CRA Regions.
- Conservation Protocols for the timber harvesting on State forests for the duration of the Intermediate Forestry Agreements (IFA) decision.
- Discussion of the Environment Protection Authority (EPA) and Pollution Control Licence issued to State Forests of New South Wales.
- Summary of EPA Pollution Control Licence issued to State Forests of NSW.
- Summary of State Forests of NSW protective measures that affect biodiversity including an explanation of silviculture and harvesting practices in the Southern Region.
- An agenda outlining the schedule of the workshop; it's purpose and outcomes and links to preceding and proceeding workshops.

Experts were expected to review this information prior to attending the workshop.

2.3 FIELD TRIP

In order to illustrate the protective measures currently implemented by State Forests of NSW in the field, flora and terrestrial fauna experts and agency officials attended a forest tour of the south coast region on the 29th of June 1999. As the aquatic workshop was conducted at a later date the aquatic Expert Panel did not attend the field day. Background information and the field tour agenda was distributed to the participants on the morning of the field tour (Appendix G). The tour was centred on Compartment 530 of Buckenbowra State forest. This compartment was selected as it illustrated how several protective measures operate in the field. The field tour encompassed the following locations and points of discussion:

- Clyde Mountain: an overview of surrounding State forests and National Parks was given by south coast State Forest Managers. Land tenure and forest zoning in the south coast region was discussed.
- Old Bolaro Road, Buckenbowra State forest: viewing of a protected powerful owl roost and a threatened flora species.
- Buckenbowra State forest Compartment 530 - log dump 1 and surrounds: An overview of harvest planning, harvest practices and Spotted Gum silviculture was given by south coast State Forest of NSW managers. A general discussion with agency officials and experts preceded, involving clarification of protective measures implemented by State Forests of NSW including the selection of hollow bearing and recruitment trees, extent of buffer zones and the general success or failure of protective measures.

- Buckenbowra State forest Compartment 530 - log dump 2: viewing of filter and buffer strips. Discussion of the Pollution Control Licence filter and buffer strips.
- Buckenbowra State forest Compartment 530 - log dump 9: viewing of a non-harvest old growth area. State Forest Managers described the differences between forestry practises in coastal forest types compared to tableland forest types.

To compare forestry practices between the Spotted Gum silviculture at Buckenbowra and tableland silviculture the tour was to include Monga Flora Reserve and Monga State forest Compartment 819, however due to time constraints the tour was not completed.

2.4 WORKSHOPS

2.4.1 Flora workshop

A total of 165 flora species were listed on the Draft Flora Priority Shortlist for the Southern CRA Region (Environment and Heritage Technical Committee, 1999; Appendix H). The list was compiled by State and Commonwealth Agencies and reviewed by independent experts. It incorporated:

- Critically Threatened Species, as listed on the New South Wales Threatened Species Conservation Act and the Commonwealth Endangered Species Protection Act.
- Threatened Species, listed as Rare or Threatened Australian Plant taxa or as noted in the Flora of New South Wales.
- Regionally significant species identified as regionally endemic; taxa considered by the experts to have regional conservation significance, and may warrant listing as a Threatened or Critically Threatened taxon or should be considered as part of this process. A species is defined as endemic if 75% of its known range is within the Southern CRA Region.
- Scientifically important species identified as priority taxon, including; taxa that have disjunct populations, reach their distributional limits or are phylogenetically distinct within the region; taxa considered by experts to have scientific importance but have not been identified as having National, State or Regional conservation significance in the Southern CRA Region.

The Flora Workshop included representatives of State Forests of NSW, the National Parks and Wildlife Service and independent scientists. The Expert Panel reviewed the Threatened Flora Prescriptions within the Conservation Protocols. The current flora prescriptions were discussed and alternative prescriptions were recommended, with flora species allocated to revised prescriptions. A discussion of the general prescriptions in the Conservation Protocols and other connected issues ended the flora workshop.

2.4.2 Terrestrial fauna workshop

Sixty-four vertebrate terrestrial fauna species were listed on the Draft Fauna Priority Shortlist for the Southern CRA Region (Environment and Heritage Technical Committee, 1999; Appendix I). The list was compiled by State and Commonwealth Agencies and reviewed by independent experts. It incorporated:

- Critically Threatened Species, as listed on the New South Wales Threatened Species Conservation Act and the Commonwealth Endangered Species Protection Act;
- Threatened Species, listed on the New South Wales Threatened Species Conservation Act.

- Regionally significant species identified as regionally endemic; taxa considered by the experts to have regional conservation significance, and may warrant listing as a Threatened or Critically Threatened taxon or should be considered as part of this process. A species is defined as endemic if 75% of its known range is within the Southern CRA Region.
- Scientifically important species identified as priority taxon, including taxa that have disjunct populations, reach their distributional limits or are phylogenetically distinct within the region; taxa considered by experts to have scientific importance but have not been identified as having National, State or Regional conservation significance in the Southern CRA Region.

The terrestrial fauna Workshop included representatives from State Forests of NSW, the National Parks and Wildlife Service, and independent scientists. Attendants received a summary of the outcomes of the Response to Disturbance workshop and a summary of the protective measures and regulatory requirements currently in place under the Pollution Control Licence, State Forests of NSW and the Conservation Protocols (Proforma 3, Appendix D). Documents were collated into taxon groupings of:

- Ground mammals;
- arboreal mammals;
- bats
- nocturnal birds;
- diurnal birds;
- frogs; and
- reptiles.

Regulatory requirements were discussed for each species within taxon groupings. Experts identified the general prescriptions and regulatory requirements applying across the forest landscape that contributed to the conservation of a species. Landscape in this context is intended to mean public (National Parks, State forests and Crown land) and private land within catchments in the Southern CRA Region. Prescriptions, within the Conservation Protocols, applying to specific species were discussed and if inappropriate modifications were recommended. The Expert Panel was asked: “Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?” If the response was “likely” the Panel was requested to identify what elements of the prescriptions and requirements that could be reduced. Alternatively, if the response was “unlikely” explanations were given as to where resource requirements were not met and recommendations for improvement made.

A general discussion also followed the completion of each taxonomic grouping to highlight general concerns applicable to faunal groups.

Flora and fauna experts joined to discuss the pre-logging and pre-roading survey design and requirements as outlined in the Upper and Lower North Eastern Broad Area Licence 1997. Field methodology for threatened flora and fauna were reviewed, with recommendations suggested. Targeted fauna surveys were discussed in detail and additional surveys outlined for specific Threatened Species located in the Southern CRA Region.

2.4.3 Flora and terrestrial fauna final discussion

The Expert Panel was asked to identify what they considered to be issues of greatest concern, as discussed throughout the ESFM workshop. The Panel suggested possible solutions to alleviate concerns and alternative directions for the future.

2.4.4 Aquatic fauna workshop

Six aquatic fauna species were listed for review in the Southern CRA Region (Environment and Heritage Technical Committee, 1999; Appendix J). The list was compiled by State and Commonwealth Agencies and independent experts. It incorporated:

- Scheduled Threatened Species, listed on the New South Wales Threatened Species Conservation (TSC) Act.
- Threatened Species recommended by the review committee for scheduling on the TSC Act.

Regulatory requirements were discussed for each species. Experts identified the general prescriptions and regulatory requirements applying across the forest landscape that contribute to the conservation of this taxon group. Landscape in this context is intended to mean public (National Parks, State forests and Crown land) and private land within catchments in the Southern CRA Region. Prescriptions, within the Conservation Protocols, applying to specific species were discussed and if inappropriate modifications were recommended. The Expert Panel was asked: “Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?” If the response was “likely” the Panel was requested to identify what elements of the prescriptions and requirements that could be reduced. Alternatively, if the response was “unlikely” explanations were given as to where resource requirements were not met and recommendations for improvement made.

A general discussion followed the completion of the reviews to highlight general concerns applicable to aquatic fauna.

3. FLORA

3.1 SELECTION OF FLORA SPECIES FOR CONSIDERATION

A total of 165 flora species were listed on the Draft Flora Priority Shortlist for the Southern CRA Region (Appendix H). Only those listed under the *Threatened Species Conservation Act 1995* as Endangered or Vulnerable or deemed by the expert panel to be at risk by State Forest activities in the Southern CRA Region (81 species) were considered.

3.2 RECOMMENDED PRESCRIPTIONS

Prescriptions were recommended based on the likely response of species to the type and frequency of disturbances associated with forestry operations. Four prescriptions were recommended:

3.2.1 Prescription A – exclusion of specified forestry activities from 100% and no buffer.

This prescription excludes all specified forestry activities from all individuals within an identified population. It is applicable to taxa that will tolerate the nature and frequency of disturbances associated with forestry activities, including obligate seeders and resprouters for which the response to disturbance is well understood. Exceptions to this rule are noted in Prescriptions C and D.

3.2.2 Prescription B - exclusion of specified forestry activities from 100% and buffer all individuals.

This prescription requires a 20 m buffer to be applied around all populations or individuals of taxa not covered by Prescription A; this buffer comprising an initial 10 m of total exclusion of specified forestry activities and an outer 10 m in which limited operations (snigging, burning, selective tree removal) are permitted and in which post-logging burns would be excluded to the extent practicable. Exceptions to this rule are noted in Prescriptions C and D.

3.2.3 Prescription C - Species Specific Management Plan.

If State Forests of NSW believe applying Prescription A or B to a species will impact unacceptably on the Net Harvestable Area then State Forests of NSW may produce evidence and/or data on species distribution in the landscape and on its ecology to demonstrate that an alternative management strategy is appropriate. In such cases the National Parks and Wildlife Service and State Forests of NSW in consultation with independent experts should develop a

Species Specific Management Plan. Recovery Plans and Threat Abatement Plans should be taken into account where appropriate.

3.2.4 Prescription D - Site Specific Management Plan.

A Site Specific Management Plan may be developed where a variation to Prescription A or B is warranted because of exceptional circumstances where impacts on individuals, populations or otherwise prescribed buffers are “unavoidable” within the planning unit. For example, where a few individuals separate from the main population would prevent roading for a large part of the compartment. Issues to be considered in the development of Site Specific Management Plans include:

- Population size, overall and at the site;
- conservation status of the Threatened Species and extent of formal reservation;
- the distributional significance of the site;
- the viability of population at site;
- the extent of proposed impact, and;
- alternative opportunities for amelioration of impact.

3.2.5 Relationship between the revised prescriptions

The relationship between the two Prescriptions and the two Management Plan alternatives is demonstrated in Figure 1. Prescription A or B is to be implemented in the majority of circumstances. Where Prescription A or B significantly affect Net Harvest Area an appropriate alternative Management Plan may be implemented whenever a National Parks and Wildlife Service and State Forests of NSW agreed plan can be developed. The Species Specific and Site Specific Management Plans are to be developed by the National Parks and Wildlife Service and State Forests of NSW in consultation with mutually agreed independent experts. Recovery Plans and Threat Abatement Plans should be taken into account where appropriate.

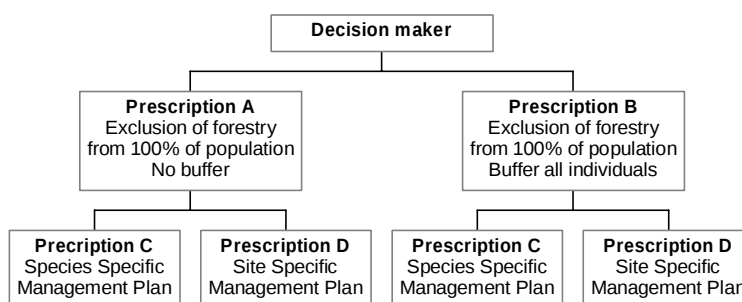


FIGURE 1: HIERACHICAL RELATIONSHIP BETWEEN PRESCRIPTIONS

3.2.6 Allocation of flora species to specific prescriptions

The Expert Panel identified the prescription to be applied to each taxon. To identify if a species occurs in a State forest or known to occur in the Net Harvest Area of productive forest the Expert Panel responded by:

- Y signifying 'yes' this species is known to occur;
- P signifying that this species is 'potentially' or likely to occur, or;
- N signifying 'no' this species is not known to occur State forests or the Net Harevest Area of productive forest.

Clarification of responses made by the Expert Panel is recorded in the Comments section of the summary.

TABLE 1: ALLOCATION OF SPECIES TO PRESCRIPTIONS

Family	Species	Prescription	Known to occur in State forest?	Known to occur in the NHA of productive forest?	Comment
Fabaceae (Mimosoideae)	<i>Acacia phasmoides</i>	B	Y	N	
Asteraceae	<i>Ammobium craspediodes</i>	B	Y	N	
Orchidaceae	<i>Caladenia concolor</i>	B	P	P	
Orchidaceae	<i>Caladenia tessellata</i>		P	P	Currently vulnerable
Cupressaceae	<i>Callitris oblonga ssp. corangensis</i>	B	N	N	
Asteraceae	<i>Calotis glandulosa</i>	B	N	N	
Rutaceae	<i>Correa baeuerlenii</i>	A	Y	Y	
Orchidaceae	<i>Cryptostylis hunteriana</i>	B	P	P	
Asclepiadaceae	<i>Cynanchum elegans</i>	B	N	N	
Monimiaceae	<i>Daphnandra sp C (sp 1 Illawarra)</i>	B	N	N	
Fabaceae (Faboideae)	<i>Dillwynia glauca</i>	B	P	P	
Rhamnaceae	<i>Discaria nitida</i>	B	N	N	
Orchidaceae	<i>Diuris aequalis</i>	B	P	N	
Myrtaceae	<i>Eucalyptus aquatica</i>	B	Y	N	
Myrtaceae	<i>Eucalyptus kartzoffiana</i>	A	P	P	
Myrtaceae	<i>Eucalyptus langleyi</i>	B	Y	N	
Myrtaceae	<i>Eucalyptus parvula</i>	B	Y	N	
Myrtaceae	<i>Eucalyptus pulverulenta</i>	B	P	N	
Myrtaceae	<i>Eucalyptus recurva</i>	B	N	N	
Myrtaceae	<i>Eucalyptus saxatilis</i>	B	N	N	
Myrtaceae	<i>Eucalyptus sturgissiana</i>	B	N	N	
Orchidaceae	<i>Genoplesium plumosum</i>	B	P	N	
Orchidaceae	<i>Genoplesium vernalis</i>	B	Y	Y	
Proteaceae	<i>Grevillea iaspicula</i>	B	N	N	
Proteaceae	<i>Grevillea molyneuxii</i>	B	Y	N	
Proteaceae	<i>Grevillea rivularis</i>	B	N	N	
Proteaceae	<i>Grevillea wilkinsonii</i>	B	N	N	
Haloragaceae	<i>Haloragis exalata ssp exalata var exalata</i>	B	P	N	

Family	Species	Prescription	Known to occur in State forest?	Known to occur in the NHA of productive forest?	Comment
Brassicaceae	<i>Irenepharsus magicus</i>	A	P	P	
Brassicaceae	<i>Irenepharsus trypherus</i>	A	P	P	
Myrtaceae	<i>Kunzea cabbagei</i>	B	P	N	
Myrtaceae	<i>Leptospermum thompsonii</i>	B	Y	N	
Myrtaceae	<i>Melaleuca biconvexa</i>	B	P	N	
Euphorbiaceae	<i>Monotaxis macrophylla</i>	A	P	P	
Epacridaceae	<i>Monotoca rotundifolia</i>	B	P	N	
Proteaceae	<i>Persoonia glaucescens</i>	A	P	P	
Fabaceae (Faboideae)	<i>Phyllota humifusa</i>	B	Y	N	
Poaceae	<i>Plinthanthesis rodwayi</i>	B	P	N	
Rhamnaceae	<i>Pomaderris cotoneaster</i>	B	P	P	
Rhamnaceae	<i>Pomaderris gilmourii</i> var <i>cana</i>	B	N	N	
Rhamnaceae	<i>Pomaderris pallida</i>	B	P	P	
Rhamnaceae	<i>Pomaderris parrisiae</i>	B	Y	Y	
Rhamnaceae	<i>Pomaderris sericea</i>	B	P	P	
Orchidaceae	<i>Prasophyllum affine</i>	B	N	N	
Orchidaceae	<i>Prasophyllum petilum</i>	B	P	P	
Lamiaceae	<i>Prostanthera densa</i>	A	P	N	
Orchidaceae	<i>Pterostylis gibbosa</i>	B	Y	Y	
Restionaceae	<i>Restio longipes</i>	B	Y	N	
Sterculiaceae	<i>Rulingia prostrata</i>	B	Y	N	
Asteraceae	<i>Rutidosia leirolepis</i>	B	N	N	
Asteraceae	<i>Rutidosia leptorrhynchoides</i>	B	N	N	
Myrtaceae	<i>Syzygium paniculatum</i>	B	P	N	
Santalaceae	<i>Thesium australe</i>	B	P	P	
Myrtaceae	<i>Triplarina nowraensis</i>	B	Y	N	
Rutaceae	<i>Zieria adenophora</i>	B	P	N	
Rutaceae	<i>Zieria baeuerlenii</i>	B	P	P	
Rutaceae	<i>Zieria citriodora</i>	B	P	N	
Rutaceae	<i>Zieria granulata</i>	B	N	N	
Rutaceae	<i>Zieria murphyi</i>	B	Y	P	
Rutaceae	<i>Zieria tuberculata</i>	B	Y	N	
Gentianaceae	<i>Gentiana wingecarribiensis</i>	B	Y	N	
Fabaceae (Mimosoideae)	<i>Acacia bynoeana</i>	B	P	P	
Fabaceae (Mimosoideae)	<i>Acacia clunies-rossiae</i>	B	N	N	Little is known about this species.
Fabaceae (Mimosoideae)	<i>Acacia flocktoniae</i>	B	P	P	
Poaceae	<i>Amphibromus fluitans</i>	B	P	N	
Fabaceae (Faboideae)	<i>Bossiaea oligosperma</i>	B	P	N	Little is known about this species.

Family	Species	Prescription	Known to occur in State forest?	Known to occur in the NHA of productive forest?	Comment
Myrtaceae	<i>Eucalyptus robertsonii</i> ssp <i>hemisphaerica</i>	A	P	P	
Proteaceae	<i>Hakea</i> sp B (Kowmung River)	B	N	N	
Marsileaceae	<i>Pilularia novaehollandiae</i>	B	P	P	
Thymelaeaceae	<i>Pimelea spicata</i>	B	N	N	
Orchidaceae	<i>Prasophyllum fuscum</i>	B	N	N	
Fabaceae (Faboideae)	<i>Pultenaea parrisiae</i> ssp <i>elusa</i>	B	P	N	
Fabaceae (Faboideae)	<i>Pultenaea parrisiae</i> ssp <i>parrisiae</i>	B	P	N	
Lamiaceae	<i>Westringia kydrensis</i>	B	N	N	
Fabaceae (Mimosoideae)	<i>Acacia lucasii</i>	B	P	P	
Gentianaceae	<i>Chionogentias sylvicola</i>	B	P	P	
Lamiaceae	<i>Prostanthera rugosa</i>	B	Y	Y	
Proteaceae	<i>Grevillea oxyantha</i> ssp <i>ecarinata</i>	B	Y	P	
Orchidaceae	<i>Prasophyllum canaliculatum</i>	B	P	N	
Orchidaceae	<i>Pterostylis hians</i>	B	Y	P	

3.3 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR FLORA

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-reading surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desktop review.
- Pre-logging and pre-reading Compartment Traverse.
- Pre-logging and pre-reading targeted fauna surveys.

A suitably experienced surveyor trained in the appropriate field must conduct surveys. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications are preferred.

3.3.1 Pre-logging and pre-reading compartment traverse

The purpose of the Compartment Traverse is to search for threatened flora species and certain threatened fauna features within the net logging area and within 50 m of the boundary of the net logging area. Only the search features relating to threatened flora species are described and reviewed in this section of the report.

The Upper and Lower North East Broad Area Licence states:

A suitably experienced person (defined in section 1.4 of the Threatened Species protocol pre-logging and pre-roading survey design) must conduct the threatened flora component of this survey. Species that are unfamiliar to the surveyor must be collected and identified or verified by a relevant herbarium.

- *For the threatened flora component of the Compartment Traverse, a “random meander” search must be conducted along the proposed route identified in the desktop component. The traverse should be conducted within the net logging area and within 50m of the boundary of the net logging area.*
- *A minimum of 6 hours of flora survey must be conducted along the traverse. Threatened flora species requiring species specific prescription within known or potential habitat must be searched for continuously along the traverse.*
- *If habitats not previously identified in the desktop component are encountered while sampling along the pre-determined traverse, a proportion of the sampling time should be used to sample these habitats.*
- *The timing of the threatened flora surveys should take into account flowering periods of the threatened flora species being surveyed (this is particularly relevant to orchids and annual species).*
- *Where individuals of threatened plants requiring prescriptions are found, the individual or population boundary must be flagged (eg. with flagging tape) by the person conducting the flora survey. The location of the individual or population must also be marked on the Harvesting Plan map to assist the Supervising Forestry Officer in finding the flagged plant(s) during compartment mark up.*

The Expert Panel suggested several recommendations to optimise detection of threatened flora in the Compartment Traverse:

- The Compartment Traverse should be refocussed for the reasons stated below, the initial point should be rewritten as:

For the threatened flora component of the Compartment Traverse, a ‘random meander’ search must be conducted along the proposed route identified in the desktop component. The traverse should be focused on the net logging area but if possible the survey should also include sampling of all other habitats in the compartment.

The detection of Threatened Species occurrences in the habitat exclusion zones will assist in better documenting the distribution of Threatened Species on a regional/landscape basis and will provide basic information on occurrences of such populations in these zones. This information could at some stage then be used for selecting populations for monitoring the effectiveness of the protocols in protecting these species in a forestry operations landscape. Such surveys are currently being conducted in State forests in the South Coast Region.

- The second dot point considered in the Compartment Traverse should be rewritten as:

A minimum of 6 person hours per 200 ha of flora survey must be conducted along the traverse. Threatened flora species requiring species specific prescription within known or potential habitat must be searched for continuously along the traverse.

- Survey transects should traverse all available habitats across a contiguous block of compartments, not merely the Net Harevest Area. This method also allows flora communities and occurrence of Threatened Species within State forests to be mapped for future monitoring.
- Species lists from Compartment Traverses should be compiled, where possible, during the traverse. Though potentially not complete, such lists could be important for long term monitoring of all plant taxa. Lists are currently compiled by surveyors in south coast State forests and it was recommended that this be continued and possibly extended statewide.
- Surveys/traverses must only be conducted by competent field botanists and surveyors approved by the State Forests of NSW Regional Ecologist and the National Parks and Wildlife Service Regional Threatened Species Unit.
- Monitoring the efficacy of the Conservation Protocols should be implemented. This is a critical step towards demonstrating ecologically sustainable forest management. Simple comparative (Before/After, Control/Impact) experiments should be undertaken by State Forests of New South Wales in conjunction with the National Parks and Wildlife Service. Additionally a simple, efficient and effective methodology for continually monitoring targeted flora species should be devised by these two agencies.
- Seasonality was identified as an important factor to consider when surveying for ephemeral, annual, geophyte or otherwise cryptic species. The timing of the threatened flora surveys should take into account flowering periods of the threatened flora species likely to be encountered, this is particularly relevant to orchids and annual species.

3.3.2 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area License states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features/species unfamiliar to him/her.

The features/species to be searched for during pre-logging mark up relevant to Threatened flora are:

- *Threatened flora species requiring species-specific prescriptions.*

The Expert Panel agreed that pre-logging mark up survey design was adequate to detect threatened flora species. They noted that any *Threatened Species Conservation Act 1995* listed Endangered Ecological Community or Endangered Population will require a Specific Management Plan similar to the Species Specific Management Plans.

4. GROUND MAMMALS

4.1 REVIEW OF CURRENT GROUND MAMMAL PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the eight ground mammal species reviewed by the Expert Panel. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 2: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BROAD-TOOTHED RAT *MASTACOMYS FUSCUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fuel management burns remove the dense cover utilised by these animals.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	Broad-toothed rats will use rock outcrops along streams and in heath habitats.
	Protection of rocky outcrops and cliffs	Y	To maintain suitable habitat for this species grazing management plans need to be developed, particularly in the western areas of the Southern CRA.
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	Cats and foxes prey directly on broad-toothed rats.
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The broad-toothed rat is likely to persist in the landscape. Direct and indirect effects of predation are the main processes threatening the broad-toothed rat, feral predator control plans are likely to contribute most to their persistence.			

TABLE 3: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SMOKY MOUSE *PSEUDOMYS FUMEUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Infrequent, high intensity burns promote regeneration of the understorey habitat used by smoky mice.
	Fuel management burns; negative effect	Y	Frequent, low intensity burns will adversely alter understorey habitat.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		Any logging regime will encourage the growth of saplings rather than dense understorey.
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	P	This species will use any forest type with a dense understorey.
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning		As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended increased predator control, exclusion of all disturbances from known localities and the development of a smoky mouse management plan to connect the small, disjunct populations.
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.		
	Survey and subsequent control of feral predators where necessary.	Y	Predators are an important threat to smoky mice.
	Fallen logs > 40cm with hollows retained.		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Without cross tenure introduced predator control this species is unlikely to persist in the landscape.			

TABLE 4: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BRUSH-TAILED ROCK WALLABY *PETROGALE PENICILLATA*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	P	Records of the brush-tailed rock wallaby in the Southern CRA Region are on Private land. It is not known if this species is in the reserve system.
Pollution Control Licence	Filter strips		
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning		
	Fuel management burns; positive effect	Y	Fuel management burns promote the regeneration of grasses consumed by this species.
	Fuel management burns; negative effect	Y	Fuel management burns remove cover providing shelter and protection from predators.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers		
	Retention of habitat corridors		
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	Additionally feral herbivores, such as rabbits, compete with the brush-tailed rock wallaby for food and shelter.
	Hazard reduction burning		
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.		
	Machinery excluded in 20m buffer zone around rainforest.		
	Survey and subsequent control of feral predators where necessary.		
	Fallen logs > 40cm with hollows retained.		
	Non-target prescriptions		The brush-tailed rock wallaby has similar habitat requirements to the broad-headed snake and large pied bat.
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
This species is not known to occur in State forest. The Expert Panel were unwilling to comment on the likelihood of the brush-tailed rock wallabies persistence in the landscape. They emphasised the need for Private land management to conserve this species habitat. Feral predator control and food supplementation may increase population densities and encourage individuals onto Public land.			

TABLE 5: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LONG-NOSED BANDICOOT *PERAMELES NASUTA*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns at appropriate intervals may benefit this species.
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.	Y	
	Survey and subsequent control of feral predators where necessary.	Y	Bandicoots are at risk from direct predation by introduced feral predators as well as non-target effects of fox baiting.
	Fallen logs > 40cm with hollows retained.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure this species persists in the landscape.			

TABLE 6: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SOUTHERN BROWN BANDICOOT *ISOODON OBESULUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	P	
	Buffer strips	P	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns at appropriate intervals may benefit this species.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	P	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		Due to the lack of records for the southern brown bandicoot in this CRA Region the Expert Panel recommends site-specific management plans be developed when recorded.
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.		
	Survey and subsequent control of feral predators where necessary.	Y	Bandicoots are at risk from direct predation by introduced feral predators as well as the non-target effects of fox baiting.
	Fallen logs > 40cm with hollows retained.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is unlikely to persist in the landscape. The reasons for the decline of the southern brown bandicoot are unknown.			

TABLE 7: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LONG-NOSED POTOROO *POTOROUS TRIDACTYLUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns at appropriate intervals may benefit this species.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		The Expert Panel recommended species specific prescriptions should be developed for the retention of understorey cover.
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.	Y	
	Survey and subsequent control of feral predators where necessary.	Y	
	Fallen logs > 40cm with hollows retained.	Y	
	6 retained trees per ha, buffered by a 5 m zone excluding harvesting and burning.	Y	To provide cover for potoroos, trees need to be retained adjacent to the riparian zone.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Inappropriate fire regimes, roading and logging have removed forest understorey forcing potoroos to inhabit more open areas where they are further at risk from predation. If these threats are not alleviated potoroos are unlikely to persist in the landscape.			

TABLE 8: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE WHITE-FOOTED DUNNART *SMINTHOPSIS LEUCOPUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	White-footed dunnarts inhabit recently burnt areas.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	P	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection	Y	Fallen timber provides shelter and cover from predation.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.		
	Survey and subsequent control of feral predators where necessary.	Y	This species is highly vulnerable to predation.
	Fallen logs > 40cm with hollows retained.	Y	White-footed dunnarts prefer smaller hollows in logs.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is likely to persist in the landscape.			

TABLE 9: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE TIGER QUOLL *DASYURUS MACULATUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	STS favours greater gliders an important prey species for tiger quolls.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	Hollows provide habitat for quolls and their prey.
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	Eucalypts provide habitat for prey species.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	P	Quolls have been recorded foraging in wetlands.
	Protection of heath and scrub	P	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	
	Firewood collection	Y	Quolls use fallen timber for denning.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.	Y	
	Survey and subsequent control of feral predators where necessary.	Y	Quolls compete with feral predators for prey and are at risk from baits used to control these species. Quolls are also susceptible to secondary poisoning through consumption of bait-poisoned rabbits.
	12 ha exclusion of suitable configuration with a link to riparian zones for maternal den site, similarly 3.5 ha for permanent dens and 12 ha for latrine sites.	Y	Den and maternity sites are rarely located. The Expert Panel suggested prescriptions be developed to conserve potential sites such as hollow logs.
	Fallen logs > 40cm with hollows retained.	Y	
	Non-target prescriptions		
	Greater glider prescriptions	Y	
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel identified reduced prey abundance, loss of den habitat and non-target effects of feral predator control as the major reasons for declines in tiger quoll populations. Unless these threats are mitigated the tiger quoll is unlikely to persist in the landscape.			

4.1.1 Ground mammal summary

The Expert Panel identified 38% (three species) of ground mammals reviewed as likely to persist in the landscape given their recommendations are applied; 50% (four species) were unlikely to persist and for 12% (one species) of the species the Expert Panel were unwilling to comment.

The Expert Panel was concerned about the adverse affects of fire on the ground mammal species reviewed. Prescriptions for fuel management burns, hazard reduction burns and suppression of wildlife aids the conservation of some species but are detrimental to others. Appropriate fire regimes with guidelines for intensity, intervals and seasons for burning should be developed for Threatened Species.

A second issue raised by the Expert Panel was the impacts of introduced feral predators on native fauna. Foxes and cats play a key role in the direct decline of ground mammals. To mitigate these effects long-term control strategies must be implemented across tenures.

Although benefiting some species, the methods used to control introduced predators can adversely affect other native fauna, particularly those with a similar diet and/or foraging habit to introduced predators. The Expert Panel highlighted the need to investigate various predator control techniques to optimise the benefits of control and minimise any detrimental impacts on native species.

4.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR GROUND MAMMALS

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-logging surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desktop review.
- Pre-logging and pre-logging Compartment Traverse.
- Pre-logging and pre-logging targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

4.2.1 Pre-logging and pre-logging compartment traverse

The purpose of the Compartment Traverse is to search for threatened flora species and fauna features within the net logging area and within 50 m of the boundary of the net logging area. The threatened features component of this survey is to be conducted by a person with suitable training in the identification of these features. Only the features relating to threatened ground mammals are described and reviewed in this section of the report.

Threatened ground mammal features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to ground mammals are:

- *Distinctive scats (eg. tiger quoll, brush-tailed rock wallaby).*
- *Latrine and den sites of the tiger quoll.*
- *Conical diggings made by potoroos and bandicoots are to be searched for in the south of the state to assist in the positioning hair tubes.*

The Expert Panel was satisfied with the current design of Compartment Traverse. To optimise the detection of these features they recommended:

- Introduced feral predator scats be included in distinctive scat searches.
- Distinctive scats be collected and analysed for content. Threatened Species identified within scats should be counted as records.
- Remove tiger quoll den sites as a search feature as they are extremely cryptic and can not be located by sight.
- Record any incidental observations of Threatened Species.

4.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to ground mammals are described and reviewed in this section.

Spotlight survey

Spotlighting is used to survey for a variety of Threatened Species. In the Southern CRA Region spotlight surveys target the following ground mammal species: brush-tailed rock wallaby, long-nosed potoroo and tiger quoll.

The Upper and Lower North East Broad Area Licence states:

- *1 x 2km transect (or 2 x 1km transects) per 200ha of net logging area.*
- *This/these transects are to be spotlighted twice on two separate nights. On one night, the spotlighting transect(s) can be conducted from a vehicle. On the other night, the transect(s) must be spotlighted on foot. Preferably both transects should be done on foot.*
- *During vehicle spotlight, vehicle speed is not to exceed 5km/hr. Vehicle spotlight to be minimum 1 hour duration.*
- *During walk spotlight, observers are to walk at approximately 1km/hr. Walk spotlight to be minimum 1 hour duration.*
- *Survey to involve two observers using 100 watt spotlight and 50 watt spotlights for walk spotlight.*
- *Windy, cold and rainy conditions to be avoided.*
- *Records for tiger quoll will trigger surveys for den, maternal den and latrine sites.*

Suggested Design Criterion: Walking spotlight survey transects can be established along roads/tracks, or where potential habitat exists from roads, SFNSW can opt to establish an off-road survey.

To optimise survey design the Expert Panel recommended:

- Removing tiger quolls and long-nosed potoroos as target species. Spotlighting is an ineffective census technique for these taxa.
- Recording opportunistic sightings of any Threatened Species. These records should trigger appropriate species-specific surveys.
- Including auditory as well as visual records of species.
- Walking, rather than driving, along all transects.
- Forest maps should be used to design an appropriate transect which may incorporate areas beyond the compartment boundaries to survey a full suite of forest types and ages within an area.
- Surveys to be undertaken on nights of low moonlight.

Hairtubes

Hairtubes are used to target the following ground mammal species in the Southern CRA Region: long-nosed potoroo, southern brown bandicoot and tiger quoll.

The Upper and Lower North East Broad Area Licence states:

- *20 hairtubes are to be set along 2 x 1km transects per 200ha of net logging area.*
- *One transect is to run along or near gully lines and the other the midslope. Transects to run along the contour.*
- *Along each 1km transect, 10 hairtubes are to be set approximately 20m apart.*
- *Hairtubes to be baited alternately with a meat bait and a 'vegetarian' bait.*
- *Records of tiger quolls will trigger a targeted survey for den, maternal den and latrine sites.*

Collection and analysis:

- *All hairtubes to remain set for 10 nights. During collection of hair samples, any tapes with hairs attached should be removed on site to avoid contamination. All hair samples must be forwarded to a person suitably experienced in hair analysis.*
- *A result of 'definite' or 'probable' will be counted as a record where it referred to a Threatened Species listed on Schedule 1 of the TSC Act. A result of 'definite' will be counted as a record where it refers to a Threatened Species listed on Schedule 2 of the TSC Act.*

The Expert Panel was concerned by the use of hairtubes to detect target species. Adhesive tapes in hairtubes are ineffective in moist habitats or following rainfall when animal fur is wet. Further, analysis of hair can be subjective and expensive. However, it was acknowledged that preferred census techniques such as track/sand plots or cage traps are financially and logistically inappropriate for the purpose of these surveys.

To optimise the effectiveness of hairtubes the Expert Panel recommended:

- Increasing the spacing between hairtubes.
- Targeting habitats with specific hairtubes to maximise the probability of detection. For example the current design only provides five hairtubes suitable for tiger quolls, as they are only likely to use hairtubes with meat bait located in gullies. The Expert Panel suggested that placing more of the large hairtubes with meat baits in gullies would increase the chance of detecting tiger quolls if they are present.

- Investigating the effect of seasons on hairtube success.

Scat and track survey

Scat and track surveys are used to target the following ground mammal species in the Southern CRA Region: long-nosed potoroo and tiger quoll.

The Upper and Lower North East Broad Area Licence states:

- *One 1km road transects per 200ha of net logging area.*
- *Scat and track survey to consist of a slow walk along 1km road transects.*
- *One or two people should walk slowly along the edge of the road looking for scats in open areas, under bushes and on large logs by the side of the road. Observers should also look out for fresh tracks along the road.*
- *All predator scats are to be collected for analysis. Scats must be forwarded to a person suitably experienced in scat analysis. A result of 'definite' or 'probable' will be counted as a record where it refers to a Threatened Species listed on Schedule 1 of the TSC Act. A result of 'definite' will be counted as a record where it refers to a Threatened Species listed on Schedule 2 of the TSC Act.*
- *Non-predator scats may be able to be identified by field staff using standard texts (the latest edition of Scats and Tracks by Barbara Triggs is suggested). However, if staff are unsure of identification, scats must be sent to a suitably experienced person for verification.*
- *Distinctive, readily identifiable tracks (eg. of tiger quoll) should be able to be identified by field staff using standard texts.*

The Expert Panel highlighted the fact that the analysis of predator scats may be a more reliable and efficient method of detecting Critical Weight Range fauna than other targeted survey methods. To enhance scat or track detection the Expert Panel recommended the following:

- Preferably two people complete surveys, one person on either side of the 1km road transect. Alternatively, one person should traverse one side of the road for 1km and return to survey the opposite side of the road.
- Roads within the Net Harvest Area that are infrequently used should be surveyed where possible.

Small mammal survey

The Upper and Lower North East Broad Area Licence states:

a) Broad-toothed rat

- *75 Elliott traps baited with peanut butter mix, spaced at 10m intervals, running through potential habitat.*
- *Traps to be set for 4 nights.*

The Expert Panel agreed trapping should be conducted in modelled broad-toothed rat habitat and where possible traps should be placed in small mammal runways.

The Upper and Lower North East Broad Area Licence states:

b) Smoky mouse

- 75 Elliott traps baited with peanut butter mix, spaced at 10m intervals, running through potential habitat.
- Traps to be set for 4 nights.

The Expert Panel indicated that small mammal surveys for the broad-toothed rat and the smoky mouse are likely to detect the target species if present. However, to further increase efficiency it was recommended that:

- Trapping should be conducted in summer through to winter.
- Traps should be placed between five and 10 m apart.
- Traps should be set for three nights in the Southern CRA Region. Low over night temperatures may be fatal for non-target fauna trapped on consecutive nights.

4.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to ground mammals are described and discussed in this section:

- *Latrine and den site of the tiger quoll.*
- *Distinctive, readily identifiable tracks (eg. tiger quoll).*
- *Distinctive scats (eg. tiger quoll, brush-tailed rock wallaby scats).*
- *Threatened fauna species requiring species-specific prescriptions.*

The Expert Panel was satisfied with the current design of pre-logging mark up, to optimise detection of these features it was recommended:

- Distinctive scats include introduced feral predators.
- Distinctive scats should be collected and analysed.
- Removing tiger quoll den sites as a search feature as they are extremely cryptic and can not be located by sight.

5. ARBOREAL MAMMALS

5.1 REVIEW OF CURRENT ARBOREAL MAMMAL PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the six arboreal mammal species reviewed by the Expert Panel. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 10: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE EASTERN PYGMY POSSUM *CERCARTETUS NANUS*

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
Pollution Control Licence	Reserve system	Y	
	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the flowering of understorey species essential for feeding.
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will adversely alter understorey habitat.
	Wild fire suppression		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection	P	Fallen timber may provide shelter for this species.
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure this species persists in the landscape.			

**TABLE 11: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE KOALA
PHASCOLARCTOS CINEREUS.**

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns minimise the risk of wildfire, detrimental to the koala.
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	The retention of hollow bearing trees provides structural complexity within the forest.
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management Plans		
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is likely to persist in the landscape. It was emphasised that the current prescriptions were sufficient to conserve koalas on Public land, however Private land management is required to maintain adequate koala habitat across the landscape.			

TABLE 12: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BRUSH-TAILED PHASCOGALE *PHASCOGALE TAPOATAFA*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	P	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns at appropriate intervals may benefit this species.
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will adversely affect this species habitat.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	Large trees provide habitat for this species prey.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning		As for fuel management burning.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection	Y	Phascogale use fallen timber for shelter and foraging.
	Retention of ground habitat	Y	Though arboreal this species can spend up to 10% of its time on the ground.
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.		
	Machinery excluded in 20m buffer zone around rainforest.		
	Survey and subsequent control of feral predators where necessary.	Y	
	50 ha of potential habitat retained within 3km of record (subject to review if > 10 sites separated by 3km prescribed over 2 years)	Y	
	Fallen logs > 40cm with hollows retained.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Due to the lack of brush-tailed phascogale records in the Southern CRA Region the Expert Panel were unwilling to predict the likelihood of it's persistence in the landscape.			

TABLE 13: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE GREATER GLIDER *PETAUROIDES VOLANS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will destroy hollow bearing trees and prevent their recruitment.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	STS is the less intense, and therefore preferable silvicultural practise.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Non-target prescriptions		
	Powerful owl prescriptions	Y	
	Tiger quoll prescriptions	Y	
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel emphasised that the number of hollow bearing and recruitment trees retained are insufficient for greater glider populations to persist in the Net Harvest and regrowth areas. However this species is abundant across the landscape and is therefore likely to persist.			

TABLE 14: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SQUIRREL GLIDER *PETAURUS NORFOLCENSIS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the regrowth and flowering of feed trees, such as <i>Xanthorrhoea sp.</i>
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will destroy hollow bearing trees and prevent their recruitment.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea sp.</i>	Y	
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	P	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Logging exclusion over an 8 ha area centred on records found during pre-logging surveys. This area should cover where possible, the toposequence (subject to review by NPWS when 10 or more sites separated by 2km or more within a 2 yr period).	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel, although concerned about the perpetuation of hollow bearing trees, indicated that with the current prescriptions the squirrel glider is likely to persist east of the Great Dividing Range in the Southern CRA Region. West of the Great Dividing Range the squirrel glider is threatened by illegal pole cutting of Iron Bark trees and grazing that prevents tree recruitment. Without Private land management and possibly the erection of nest boxes, across tenures, this species is unlikely to persist in the western areas of the Southern CRA Region.			

TABLE 15: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE YELLOW-BELLIED GLIDER *PETAURUS AUSTRALIS*

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the regrowth of feed trees.
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will destroy hollow bearing trees and prevent their recruitment.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	P	Yellow-bellied gliders utilise these forest types in other regions.
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning		As for fuel management burning.
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	V-notched feed trees and an additional 15 trees within 100m retained.	Y	All v-notch trees should be retained in selectively harvested areas. The number of additional trees retained could be reduced.
	Logging exclusion within 50m of den sites.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

5.1.1 Summary of arboreal mammals

The Expert Panel identified 50 % (three species) of targeted arboreal mammal species as likely to persist in the landscape given their recommendations are applied, 33 % (two species) would persist in selected areas and for 17 % (one species) of the species the Expert Panel were unwilling to comment. The main concern highlighted when discussing the prescriptions applicable to these taxa was the persistence of hollow bearing trees in the Net Harvest and regrowth areas. The Expert Panel emphasised the need to review prescriptions regarding the ratio of hollow bearing to recruitment trees and the selection procedure for trees.

The Expert Panel stressed that arboreal mammals are an intrinsic link in the forest food web, providing a prey source to threatened predators, such as the tiger quoll and powerful owl. Subsequently, maintenance of their critical resources is essential for the persistence of forest biodiversity.

5.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR ARBOREAL MAMMALS

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-logging surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desktop review.
- Pre-logging and pre-logging Compartment Traverse.

- Pre-logging and pre-roading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

5.2.1 Pre-logging and pre-roading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The threatened features component of this survey is to be conducted by a person with suitable training in the identification of these features.

Only the features relating to arboreal mammals are described and reviewed in this section of the report.

Threatened arboreal mammal features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to arboreal mammals are:

- *Threatened hollow-dependent fauna nests and dens (eg. Squirrel glider, yellow-bellied glider, brush-tailed phascogale)*
- *Yellow-bellied glider “v-notch” trees and trees with other incisions made by this glider.*
- *Distinctive scats (eg. Koala)*

The Expert Panel was satisfied with the current design of the Compartment Traverse, they recommended:

- Any hollows with evidence of use must be marked for retention.
- Any incidental observations of Threatened Species must be recorded.
- Distinctive scats should be collected for analysis.

5.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to arboreal mammals are described and reviewed in this section.

Spotlight survey

Spotlighting is used to survey for a variety of Threatened Species. In the Southern CRA Region spotlight surveys target the following arboreal mammal species: squirrel glider, yellow-bellied glider and greater glider. This method is to be conducted in conjunction with call playback surveys.

The Upper and Lower North East Broad Area Licence states:

- *1 x 2km transect (or 2 x 1km transects) per 200ha of net logging area.*
- *This/these transects are to be spotlighted twice on two separate nights. On one night, the spotlighting transect(s) can be conducted from a vehicle. On the other night, the transect(s) must be spotlighted on foot. Preferably both transects should be done on foot.*
- *During vehicle spotlight, vehicle speed is not to exceed 5km/hr. Vehicle spotlight to be minimum 1 hour duration.*
- *During walk spotlight, observers are to walk at approximately 1km/hr. Walk spotlight to be minimum 1 hour duration.*
- *Survey to involve two observers using 100 watt spotlight and 50 watt spotlights for walk spotlight.*
- *Windy, cold and rainy conditions to be avoided.*

Suggested Design Criterion: *Walking spotlight survey transects can be established along roads/tracks, or potential habitat exists from roads, SFNSW can opt to establish an off-road survey.*

To optimise survey design the Expert Panel recommended:

- Recording opportunistic sightings of any Threatened Species. These records should trigger appropriate species-specific surveys.
- Including auditory as well as visual records of species.
- Walking, rather than driving, along all transects.
- Forest maps should be used to design an appropriate transect which may incorporate areas beyond the compartment boundaries to survey a full suite of forest types and ages within an area.
- Surveys to be undertaken on nights of low moonlight.

Nocturnal call playback

Nocturnal call playback is used to survey for a variety of Threatened Species. In the Southern CRA Region nocturnal call playback targets the following arboreal mammal species: squirrel glider and yellow-bellied glider.

The Upper and Lower North East Broad Area Licence states:

- *Two call playback sites per 200ha of net logging area. The location of the playback sites should optimise response. Playback sites must be more than 1km apart.*

- *The following calls are to be played where potential habitat exists for the species: Yellow-bellied glider and squirrel glider.*
- *An initial listening period of 10 minutes should be undertaken, then each call to be played for 5 minutes followed by at least a 2 minute listening period. After the last call at least 10 minutes should be spent listening. Calls to be played from a good quality Walkman and amplifies through a nine volt megaphone.*
- *The playback session is to be conducted twice, on two separate nights. Where a species is recorded on the first night of survey, it is not a requirement of the pre-logging/pre-roading surveys that the call of this species be played again on the second night of survey.*
- *Windy and rainy conditions to be avoided.*

Suggested Design Criterion: *Where 1 x 2km transect is established for spotlighting: call playback may be conducted at the beginning and end of each 2km transect. Where 2 x 1km transects are established for spotlighting: call playback may be conducted at the beginning or end of each 1km transect.*

Survey season: *Spring-summer.*

The Expert Panel agreed that although the optimal time for call playback is spring and summer, call playback surveys could detect target species, with the exception of koalas, in any season.

Hairtubes

Hairtubes are used to target the following arboreal mammal in the Southern CRA Region: brush-tailed phascogale.

The Upper an Lower North East Broad Area Licence states:

- *20 hairtubes are to be set along 2 x 1km transects per 200ha of net logging area.*
- *One transect is to run along or near gully lines and the other the midslope. Transects to run along the contour.*
- *Along each 1km transect, 10 hairtubes are to be set approximately 20m apart.*
- *Hairtubes to be baited alternately with a meat bait and a 'vegetarian' bait.*
- *Records of tiger quolls will trigger a targeted survey for den, maternal den and latrine sites.*

Collection and analysis:

- *All hairtubes to remain set for 10 nights. During collection of hair samples, any tapes with hairs attached should be removed on site to avoid contamination. All hair samples must be forwarded to a person suitably experienced in hair analysis.*
- *A result of 'definite' or 'probable' will be counted as a record where it referred to a Threatened Species listed on Schedule 1 of the TSC Act. A result of 'definite' will be counted as a record where it refers to a Threatened Species listed on Schedule 2 of the TSC Act.*

The Expert Panel was concerned with the use of hairtubes to detect target species. Adhesive tapes in hairtubes are ineffective in moist habitats or following rainfall when animal fur is wet. Further, analysis of hair can be subjective and expensive. However, it was acknowledged that preferred census techniques such as track/sand plots or cage traps are financially and logistically inappropriate for the purpose of these surveys.

To optimise the effectiveness of hairtubes the Panel recommended:

- Increasing the spacing between hairtubes.
- Targeting habitats with specific hairtubes to maximise the probability of detection.
- Investigating the effect of seasons on hairtube success.

Scat and track survey

Scat track surveys are used to target the following arboreal mammal in the Southern CRA Region: brush-tailed phascogale.

The Upper and Lower North East Broad Area Licence states:

- *One 1km road transect per 200ha of net logging area.*
- *Scat and track survey to consist of a slow walk along 1km road transect.*
- *One or two people should walk slowly along the edge of the road looking for scats in open areas, under bushes and on large logs by the side of the road. Observers should also look out for fresh tracks along the road.*
- *All predator scats are to be collected for analysis. Scats must be forwarded to a person suitably experienced in scat analysis. A result of 'definite' or 'probable' will be counted as a record where it refers to a Threatened Species listed on Schedule 1 of the TSC Act. A result of 'definite' will be counted as a record where it refers to a Threatened Species listed on Schedule 2 of the TSC Act.*
- *Non-predator scats may be able to be identified by field staff using standard texts (the latest edition of Scats and Tracks by Barbara Triggs is suggested). However, if staff are unsure of identification, scats must be sent to a suitably experienced person for verification.*
- *Distinctive, readily identifiable tracks (eg. of tiger quoll) should be able to be identified by field staff using standard texts.*

The Expert Panel highlighted that the analysis of predator scats may be a more reliable and efficient method of detecting brush-tailed phascogale than other targeted survey methods. To improve the likelihood of scat or track detection the Expert Panel recommended the following:

- Preferably two people complete surveys, one person on either side of the 1km road transect. Alternatively, one person should traverse one side of the road for 1km and return to survey the opposite side of the road.
- Roads within the Net Harvest Area that are infrequently used should be surveyed where possible.

5.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to arboreal mammals are described and discussed in this section.

- *Threatened hollow-dependent fauna nests and dens (eg. yellow-bellied glider, squirrel glider, brush-tailed phascogale).*
- *Yellow-bellied glider ‘V-notch’ trees and trees with other incisions made by yellow-bellied gliders.*
- *Distinctive scats (eg. Koala).*
- *Threatened fauna species requiring species-specific prescriptions.*

The Expert Panel was satisfied with the current design of the pre-logging mark up. In addition to the features currently listed the Expert Panel recommended:

- Any hollows with evidence of use must be marked for retention.
- Distinctive scats should be collected for analysis.

5.3 ADDITIONAL SPECIES

Prescriptions and survey requirements for the Koala are currently being discussed between National Parks and Wildlife Service and State Forests of NSW. The pre-logging and pre-roading survey requirements for this species are under development and are to be incorporated into the survey methods as and when they are finalised. Until this time the Expert Panel recommended passive playback in nocturnal call playback surveys be used to detect Koalas. Surveys should be conducted in spring/winter and responses should trigger a species specific ground survey.

6. BATS

6.1 REVIEW OF CURRENT BAT PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the 12 bat species reviewed by the Expert Panel. Though listed on the priority fauna species list the unnamed Broad-nosed bat (*Scotorepens sp.*), was not considered further by the Expert Panel as it's range only slightly extends into the Southern CRA Region and there are very few records. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 16: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE EASTERN HORSESHOE BAT *RHINOLOPHUS MEGAPHYLLUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	The Reserve system has records of roost sites; all recorded maternity sites are on State forest and Private land.
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	The eastern horseshoe bat forages on slopes.
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Wildfire should be minimised where possible.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	This species avoids the open areas created by GTS.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	P	The eastern horseshoe bat is likely to use these forest types.
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	This species will not fly through open spaces.
	Protection of wetlands	P	Eastern horseshoe bats prefer moist microclimates such as those around wetlands.
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Habitat clearing and loss or disturbance of maternity and other roost sites (mines/caves) is causing the			

decline of this species. Unless these threatening processes are removed the eastern horseshoe bat is unlikely to persist in the landscape.

TABLE 17: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE EASTERN FALSE PIPISTRELLE *FALSISTRELLUS TASMANIENSIS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	GTS causes thick regrowth which impedes foraging
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	P	Invertebrates that feed on winter flowering eucalypts are attracted to these trees.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management Plans	Y	Grazing modifies the understorey where the eastern false pipistrelle forages.
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The eastern false pipistrelle requires hollows, as maternity and roost sites, in a variety of topographical areas and habitat types. To accommodate for this the Expert Panel suggested increasing the number of hollow bearing and recruitment trees retained in the Net Harvested Area. The number could be flexible and determined by site quality. If hollows are maintained across the landscape this species is likely to survive.			

TABLE 18: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE GREY HEADED FLYING-FOX *PTEROPUS POLIOCEPHALUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	Hollow bearing and recruitment trees are a food source for this species.
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	<i>Banksia</i> provide foraging habitat and food.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	P	
	Protection of heath and scrub	Y	The grey headed flying-fox utilises tall heath.
	Protection of rocky outcrops and cliffs		
	Grazing management Plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		
	Firewood collection		
	Retention of ground habitat		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas		
	50 m exclusion zone around known roost camps	Y	The Expert Panel recommended a wider exclusion zone around known roost camps to accommodate roost site movement.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Provided the above recommendation is implemented and the number of retained mature eucalypts, specifically spotted gum, is increased, this species is likely to survive on Public land. However without the management of roosting camps and feeding sites on Private land the grey headed flying-fox is unlikely to persist in the landscape.			

TABLE 19: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LITTLE RED FLYING-FOX *PTEROPUS SCAPULATUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	Hollow bearing and recruitment trees are a food source for this species.
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	<i>Banksia</i> species provide foraging habitat and food.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	P	
	Protection of heath and scrub	Y	The little red flying-fox utilises tall heath.
	Protection of rocky outcrops and cliffs		
	Grazing management Plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		
	Firewood collection		
	Retention of ground habitat		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas		
	50 m exclusion zone around known roost camps	Y	The Expert Panel recommended a wider exclusion zone around known roost camps to accommodate roost site movement.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the recommendation to increase exclusion zones around camp sites is implemented this species is likely to persist in the landscape.			

TABLE 20: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE YELLOW-BELLIED SHEATHTAIL BAT *SACCOLAIMUS FLAVIVENTRIS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	Yellow-bellied sheathtail bats roost in emergent trees up slope, possibly retained in corridors.
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	50m exclusion zone around roosting sites harbouring > 3 individuals	Y	This species often roosts solitarily, the Expert Panel recommended that a 50 m exclusion zone be placed around any known roost site.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Very little is known about the yellow-bellied sheath-tail bat, but it appears to be widespread and exists in a range of habitats. The Expert Panel agreed that given the above recommendations are implemented this species is likely to persist in the landscape.			

TABLE 21: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE GREATER BROAD-NOSED BAT *SCOTANAX RUEPPELLII*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	GTS	The linear edges of forest created by GTS provide foraging habitat for the greater broad-nosed bat.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management Plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	50m exclusion zone around roosting sites harbouring > 3 individuals	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The greater broad-nosed bat is unaffected by low level disturbance and has a strong association with riparian zones which were considered to be adequately protected. As long as large hollow-bearing trees are maintained within the landscape the Expert Panel agreed that this species is likely to persist.			

**TABLE 22: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LARGE
PIED BAT *CHALINOLOBUS DWYERI*.**

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	P	Large pied bats infrequently forage in riparian habitats.
	Buffer strips	P	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	P	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	50m exclusion zone around entry to major subterranean roosting sites.	Y	
	Non-target prescriptions		
	50 m buffer zone around maternity and hibernation sites, excluding specified forestry activities. Within 50 to 100 m of the site a maximum of 50% canopy reduction can occur.	Y	
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Current prescriptions will maintain the large pied bat's roosting habitat yet little is known of its broader habitat requirements. Other <i>Chalinolobus</i> species are habitat generalists. If the large pied bat conforms to this trend, these prescriptions should adequately protect its habitat. The Expert Panel agreed that this species is likely to persist in the landscape.			

TABLE 23: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE GOLDEN-TIPPED BAT *KERIVOULA PAPUENSIS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	P	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	40 m exclusion zone each side of creeks, 200m up and down stream of known sites	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Experts were divided as to whether this species would persist in the landscape. Some believed protection of riparian areas was adequate to ensure the golden-tipped bats survival. Others stressed that current prescriptions would not maintain the specific microclimate and resources required by the golden-tipped bat, and recommended an increase in the width of exclusion zones around streams in compartments with records of this species. The Expert Panel could not agree on the status of this species in the landscape.			

TABLE 24: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LARGE (COMMON) BENTWING BAT *MINIOPTERUS SCHREIBERSII*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	All known maternity sites in the Southern CRA Region are on Reserve.
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	Although not a critical resource this species may use rainforest habitats.
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	Eucalypts provide habitat for essential invertebrate food sources.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Grazing management plans	Y	Grazing management plans are required to maintain habitat for prey.
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	Non-target prescriptions		
	50 m buffer zone around maternity and hibernation sites, excluding specified forestry activities. Within 50 to 100 m of the site a maximum of 50% canopy reduction can occur.	Y	The Expert Panel emphasised the need for protection of entrances to all roost sites and recommended increasing the buffer zone around maternity and hibernation sites.
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Maintenance of the microclimate within caves and mines used as maternity and hibernation sites is critical for this species. Given the above recommendations maintain these specific microclimates the Expert Panel agreed that the large (common) bent-wing bat is likely to persist in the landscape.			

TABLE 25: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE LARGE-FOOTED MYOTIS *MYOTIS MACROPUS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns that do not penetrate riparian areas could benefit large-footed myotis.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	This species forages in riparian zones. Dense regrowth following GTS modifies the hydrology of a compartment altering the riparian strip.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors		
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans	Y	Trout could potentially prey on this species.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning		
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	40 m exclusion zone on each side of permanent streams and around natural water bodies.	Y	The Expert Panel recommended that where there is a record in a compartment or 100 m beyond its boundary this prescription should be triggered.
	Non-target prescriptions		
	50 m buffer zone around maternity and hibernation sites, excluding specified forestry activities. Within 50 to 100 m of the site a maximum of 50% canopy reduction can occur.	Y	
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the above prescriptions are implemented, this species is likely to persist in the landscape. It was additionally noted that the large-footed myotis often uses wooden bridges as maternity and roost sites. The conversion of these bridges to concrete could be a threat to this species.			

TABLE 26: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE EASTERN LITTLE MASTIFF BAT *MORMOPTERUS NORFOLKENSIS*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	GTS promotes dense regrowth, which impedes the foraging activities of the eastern little mastiff bat.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	P	Eucalypts provide habitat for invertebrate food source.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	As this species forages in riparian areas, it is likely to use wetlands.
	Protection of heath and scrub	P	
	Protection of rocky outcrops and cliffs		
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	50 m exclusion zone around known roost sites with > 3 individuals	Y	The Expert Panel noted that roost sites are extremely difficult to detect.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure this species persists in the landscape.			

TABLE 27: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO UNNAMED MASTIFF BAT *MORMOPTERUS SP. 1*.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	GTS promotes dense regrowth, which impedes the foraging activities of the unnamed mastiff bat.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	P	Eucalypts provide habitat for invertebrate food sources.
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	As this species forages in riparian areas, it is likely to uses wetlands.
	Protection of heath and scrub	P	
	Protection of rocky outcrops and cliffs		
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Burning excluded from reserved areas and at least 25% of post harvest areas	Y	
	50 m exclusion zone around known roost sites with > 3 individuals	Y	The Expert Panel noted that roost sites are extremely difficult to detect.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

6.1.1 Summary of bats

The Expert Panel identified 75% (nine species) of bat species reviewed as likely to persist in the landscape given their recommendations are applied, 17% (two species) were unlikely to persist and 8% (one species) would persist in selected areas. The Expert Panel raised several issues concerning the prescriptions applicable to bats, these included:

- Roost sites for many bat species are cryptic, prescriptions may be adequate to conserve these features but locating sites to trigger prescriptions is problematic.
- Investigation into the type and number of hollow bearing trees required for roost and maternity sites is required to optimise current prescriptions.
- General prescriptions largely benefit species with broad distributions. Prescriptions for species with reduced ranges should be developed.
- A landscape approach, similar to that proposed for owl species in the Upper North East and Lower North East CRA Regions, should be considered for the eastern horseshoe bat (*Rhinolophus megaphyllus*) and the large (common) bentwing bat (*Miniopterus schreibersii*) in the Southern CRA Region.

6.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR BATS

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-logging surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desk top review.

- Pre-logging and pre-roading Compartment Traverse.
- Pre-logging and pre-roading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

6.2.1 Pre-logging and pre-roading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The threatened features component of this survey are to be conducted by a person with suitable training in the identification of these features.

Only the features relating to threatened bats are described and reviewed in this section of the report.

Threatened bat features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to bats are:

- *Caves, mines and disused mineshafts (for further targeted survey work).*

The Expert Panel was satisfied that the current design of the Compartment Traverse would adequately detect these features.

6.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to bats are described and reviewed in this section.

Microchiropteran bat surveys

The Upper and Lower North East Broad Area Licence states:

a) Microchiropteran bat cave, tunnel and disused mineshaft roost surveys

- *All caves, mines and disused mineshafts (except open pits of less than 3m in depth) are to be surveyed. A cave is defined as a hollow in the earth especially one opening more or less horizontally into a hill, mountain etc.*
- *Survey to consist of an ultrasonic call recording of 30 minutes duration conducted at dusk. Call detection units to be placed at the entrances of likely cave roosts that lie within the net logging area or within 50m of the net logging area.*

OR

- *A person experienced in bat survey work may physically inspect any potential cave roost sites. The first option is the most preferred as bats can be critically affected if roost sites are disturbed at inappropriate times of the year. For this reason a person with extensive knowledge and experience with bat survey work is essential if this option is chosen.*
- *Windy, cold and rainy weather conditions to be avoided.*
- *If a call analysis is undertaken, results of 'definite' and 'probable' will count as records, while 'possible' results will be discounted.*

Survey season: *October to late March.*

The Expert Panel believed that current surveys are unlikely to locate all threatened bat species. Alternative survey designs were discussed, the Expert Panel recommended:

- *Harp trapping surveys on a large scale, such as regional or cross compartment, should be implemented. Single compartment surveys limit trap placement, reducing the probability of trap success. For example 400 to 600 ha covered by a series of harp traps for two non-consecutive nights.*
- *Guidelines should be determined for the length of time a regional survey is valid. For example the minimum time lapse for re-surveying compartments within a 'region' prior to harvesting.*
- *Moon illumination can decrease the trappability of bats by 30 to 40%. Surveys should be conducted six days before or six days after the rise of the 'new' moon, where possible. Alternatively traps should be placed in shaded forest to minimise moonlight effects.*
- *Ultrasonic call detection, possibly with time delay switches, should be used in all surveys. This is a time saving census technique and call analysis packages are now available to State Forests of NSW to analyse a variety of calls.*
- *Some species such as *Miniopterus* spp., may be easier to detect during winter.*

The Upper and Lower North East Broad Area Licence states:

*b) Golden-tipped bat *Kerivoula papuensis* and large-footed myotis *Myotis macropus**

- *In potential habitat, 2 harp traps per 200ha of net logging area both set for a minimum of 2 consecutive nights (ie 4 trap nights).*
- *Harp traps must be set well before dark.*
- *Harp traps to be set in potential *Kerivoula papuensis* or *Myotis macropus* habitat across creeks and pools.*
- *Harp traps are to be set across creeks in appropriate flyways to increase the chance of trap success with supplementary screening used where necessary.*

- *In potential Myotis macropus habitat, conduct bat detection recording for 30 minutes commencing at dusk. Anabat surveys should focus on large permanent bodies of water.*
- *Windy, cold and rainy weather conditions to be avoided.*

To optimise detection of these two species the Expert Panel recommended:

- Increasing the number of Harp traps per night. This is preferable to increasing the number of trap nights which is unlikely to enhance detection.
- Habitats should be assessed to target trap placement. For example, in addition to trapping on creeks and gullies, tightly strung harp traps on ridge tops will net *Kerivoula papuensis*.

6.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to bats are described and discussed in this section.

- *Caves, tunnels and disused mineshafts (except open pits less than 3m depth).*
- *Accessible basal hollows in likely bat roost trees (> 100cm dbh dead stags or large trees with accessible base hollow) should be inspected prior to operations commencing within 100m of such trees. SFO should look (and smell) for the presence of bat droppings inside the base of the tree.*
- *Threatened fauna species requiring species-specific prescriptions.*

Bats may roost in stags of varying size depending on forest type and site quality. The Expert Panel recommended leaving the depth at breast height (dbh) of stags unspecified.

8. NOCTURNAL BIRDS

8.1 REVIEW OF CURRENT NOCTURNAL BIRD PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the five nocturnal bird species reviewed by the Expert Panel. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 28: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE POWERFUL OWL *NINOX STRENUA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Burns of the appropriate frequency promote vegetation regeneration providing habitat for prey, such as ringtail possums.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Fuel management burns; negative effect	Y	Prey is reduced immediately following fire and inappropriate fire regimes can adversely modify prey habitat reducing local abundance.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	STS is preferred for greater gliders, the preferred prey species of the powerful owl.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	Powerful owls can roost in <i>Allocasuarina</i> stands, which also provide habitat for prey.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors		
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	Powerful owls will utilise these areas when located adjacent to moist forest.
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	Feral predators compete with powerful owls for prey.
	Hazard reduction burning		As for fuel management burns.
	Firewood collection	Y	Firewood collection removes prey habitat, this is particularly important in the western forests of the Southern CRA Region.
	Retention of ground habitat	Y	Ground habitat needs to be maintained for prey species.
	Targeted species-specific prescriptions		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Logging exclusion within 50 m of nest and 30 m of permanent roost sites. Where available 300 ha of potential habitat retained within a 2km radius.	Y	Nests and permanent roost sites are rarely located. The Expert Panel recommended an increase in the exclusion zone around nest sites.
	Where information indicates one greater glider per ha or more, eight habitat trees per ha should be retained.	Y	To provide adequate abundance of prey species the Expert Panel recommended an increase in the number of trees with a specified minimum basal area retained per ha.
	Non-target prescriptions		
	Greater Glider prescriptions	Y	
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Given that harvesting is scheduled during non-breeding seasons, and the above recommendations are implemented the Expert Panel agreed that powerful owls are likely to persist in the landscape.			

TABLE 29: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SOOTY OWL *TYTO TENEBRICOSA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	<i>Allocasuarina</i> stands and <i>Banksia</i> sp. provides habitat for prey species.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	Sooty owls will use these areas when adjacent to moist forest or waterfalls.
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	Feral predators compete with sooty owls for prey.
	Hazard reduction burning	Y	
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	Ground habitat needs to be maintained for prey species.
	Targeted species-specific prescriptions		
	Logging exclusion within 50 m of nest and 30 m of permanent roost sites.	Y	These features are rarely located. The Expert Panel recommended an increase in the exclusion zone around nest sites.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that if the above recommendations are implemented, sooty owls are likely to persist in the landscape.			

TABLE 30: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE MASKED OWL *TYTO NOVAEHOLLANDIAE*

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Appropriate fire regimes are required to maintain a mosaic of open and closed habitat for masked owls.
	Fuel management burns; negative effect		
	Wild fire suppression	Y	Dense regrowth impedes foraging movements of this species.
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	STS maintains a mosaic of open and closed habitat.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	Masked owls can roost at the edges of rainforest.
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	<i>Allocasuarina</i> stands provide habitat for prey species.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	P	This species may forage on the edges of heath and scrub habitats.
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Weed control plans		
	Feral predator control plans	Y	Feral predators compete with masked owls for prey.
	Hazard reduction burning	Y	
	Firewood collection	Y	Firewood collection removes prey habitat.
	Retention of ground habitat	P	
	Targeted species-specific prescriptions		
	Logging exclusion within 50 m of nest site. Logging exclusion within 30 m of permanent roost.	Y	These features are rarely located. The Expert Panel recommended an increase in the exclusion zone around nest sites. As a guide, the Panel suggested that an exclusion zone of twice the average tree height be applied.
	Fire regime to maintain open foraging habitat.	Y	The Expert Panel noted the lack of scientific evidence for this species-specific prescription.
	Where available 300 ha of potential habitat must be retained within a 2km radius.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed, the masked owl is likely to persist in the landscape, given the above recommendations and the implementation of feral predator management.			

TABLE 31: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BARKING OWL *Ninox connivens*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	This species is poorly represented in the reserve system.
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	This species is poorly represented in State forests.
	Fuel management burns; positive effect	Y	Fuel management burns maintain reduced understorey, the preferred foraging habitat for the barking owl.
	Fuel management burns; negative effect		
	Wild fire suppression	P	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	Stags provide habitat for prey species.
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	<i>Allocasuarina</i> stands provide habitat for prey species.
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Grazing management plans	Y	Heavy grazing reduces habitat for potential prey species.
	Weed control plans		
	Feral predator control plans	Y	Feral predators directly prey on juvenile and adult barking owls and compete with them for food.
	Hazard reduction burning	Y	
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommends a 100 m exclusion zone around nest sites and 30 m exclusion zone around permanent roosts. Additional prescriptions should be developed to retain thickets and control feral predators.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel emphasised that the current regulations and recommendations are likely to conserve the barking owl on Public land. However, without off-reserve management this species is unlikely to persist in the landscape.			

TABLE 32: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BUSH STONE-CURLEW *BURHINUS GRALLARIUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		This species inhabits flat country.
State Forests of New South Wales	Forest management zoning		
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fuel management burns remove ground cover, essential foraging and sheltering habitat for the bush stone-curlew.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers		
	Retention of habitat corridors		
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans		
	Weed control plans	Y	
	Feral predator control plans		
	Hazard reduction burning	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection	Y	
	Retention of ground habitat		
	Targeted species-specific prescriptions		The Expert Panel recommended that firewood collection be prohibited and introduced feral predator management plans be implemented in areas where this species is recorded.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel emphasised that the current regulations and recommendations are likely to conserve the bush stone-curlew on Public land. Without off-reserve management it is unlikely that this species will persist in the landscape.			

8.1.1 Summary of nocturnal birds

The Expert Panel identified 60% (three species) of nocturnal bird species reviewed as likely to persist in the landscape given their recommendations are applied and 40% (two species) were unlikely to persist. The Expert Panel raised several issues concerning the prescriptions applicable to nocturnal birds, these included:

- Owls are top order predators, the maintenance of sufficient prey is critical to the survival of these taxa.
- Integrated cross-tenure management is required to maintain important foraging and nesting habitat for the nocturnal bird species reviewed.
- A landscape approach, similar to that proposed for owl species in the Upper North East and Lower North East CRA Regions should be considered for the owl species reviewed in the ESFM workshops for Southern CRA Region.

8.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR NOCTURNAL BIRDS

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-logging surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desk top review.
- Pre-logging and pre-logging Compartment Traverse.

- Pre-logging and pre-roading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

8.2.1 Pre-logging and pre-roading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The threatened features component of this survey are to be conducted by a person with suitable training in the identification of these features.

Only the features relating to nocturnal birds are described and reviewed in this section of the report.

Threatened nocturnal bird features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to nocturnal birds are:

- Owl nest and roost sites.
- Owl pellets.

The Expert Panel was satisfied with the current design of the Compartment Traverse. To optimise information gained from these surveys they recommended:

- Owl nest and roost sites or pellets should trigger further targeted survey work.
- Owl pellets should be collected for analysis of content.
- Remains of arboreal mammals, particularly tails, indicate the presence of owl roosts and should be listed as a search feature.

8.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to nocturnal birds are described and reviewed in this section.

Spotlight survey

Spotlighting is used to survey for a variety of Threatened Species. In the Southern CRA Region spotlight surveys target the following nocturnal bird species: powerful owl, sooty owl and masked owl. This method is to be conducted in conjunction with call playback surveys.

The Upper and Lower North East Broad Area Licence states:

- *1 x 2km transect (or 2 x 1km transects) per 200ha of net logging area.*
- *This/these transects are to be spotlighted twice on two separate nights. On one night, the spotlighting transect(s) can be conducted from a vehicle. On the other night, the transect(s) must be spotlighted on foot. Preferably both transects should be done on foot.*
- *During vehicle spotlight, vehicle speed is not to exceed 5km/hr. Vehicle spotlight to be minimum 1 hour duration.*
- *During walk spotlight, observers are to walk at approximately 1km/hr. Walk spotlight to be minimum 1 hour duration.*
- *Survey to involve two observers using 100 watt spotlight and 50 watt spotlights for walk spotlight.*
- *Windy, cold and rainy conditions to be avoided.*

Suggested Design Criterion: *Walking spotlight survey transects can be established along roads/tracks, or potential habitat exists from roads, SFNSW can opt to establish an off-road survey.*

The Expert Panel recommended including the barking owl on the list of species to be targeted by spotlight surveys. To optimise survey design the following recommendations were made:

- Recording opportunistic sightings of any Threatened Species. These records should trigger appropriate species-specific surveys.
- Including auditory as well as visual records of species.
- Walking, rather than driving along all transects.
- Forest maps should be used to design an appropriate transect which may incorporate areas beyond the compartment boundaries to survey a full suite of forest types and ages within an area.
- Surveys to be undertaken on nights of low moonlight.

Nocturnal call playback

Nocturnal call playback is used to survey for a variety of Threatened Species. In the Southern CRA Region nocturnal call playback targets the following nocturnal bird taxa: masked owl, powerful owl, and sooty owl. State Forests of NSW can choose to play Bush stone-curlew calls where appropriate.

The Upper and Lower North East Broad Area Licence states:

- *Two call playback sites per 200ha of net logging area. The location of the playback sites should optimise response. Playback sites must be more than 1km apart.*

- *An initial listening period of 10 minutes should be undertaken, then each call to be played for 5 minutes followed by at least a 2 minute listening period. After the last call at least 10 minutes should be spent listening. Calls to be played from a good quality Walkman and amplifies through a nine volt megaphone.*
- *The playback session is to be conducted twice, on two separate nights. Where a species is recorded on the first night of survey, it is not a requirement of the pre-logging/pre-roading surveys that the call of this species be played again on the second night of survey.*
- *Windy and rainy conditions to be avoided.*

Suggested Design Criterion: *Where 1 x 2km transect is established for spotlighting: call playback may be conducted at the beginning and end of each 2km transect. Where 2 x 1km transects are established for spotlighting: call playback may be conducted at the beginning or ends of each 1km transect.*

Survey season: *Spring-summer.*

The Expert Panel recommended including the barking owl on the list of species to be targeted by nocturnal call playback surveys. Additionally they agreed that although optimal in spring-summer call playback surveys could detect target species in any season.

8.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to nocturnal birds are described and discussed in this section.

- *Owl nest and roost sites.*
- *Owl pellets.*
- *Threatened fauna species requiring species-specific prescriptions.*
- *Distinctive bird calls.*
- *Nests of bush stone-curlew.*

The Expert Panel were satisfied with the current design of the pre-logging mark up, they recommended:

- *Owl nest and roost sites or pellets should trigger further targeted survey work.*
- *Owl pellets should be collected for analysis of content.*
- *Remains of arboreal mammals, particularly tails, indicate the presence of owl roosts and should be listed as a search feature.*

9. DIURNAL BIRDS

9.1 REVIEW OF CURRENT DIURNAL BIRD PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the 18 diurnal bird species reviewed by the Expert Panel. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 33: REVIEW OF PROTECTIVE MEASURES APPLICABLE TO THE REGENT HONEYEATER *XANTHOMYZA PHRYGIA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression		Wildfire needs to be suppressed on Private land to maintain important regent honeyeater habitat.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	Regent honeyeaters breed in <i>Casuarina</i> stands in the western areas of this CRA Region.
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	To allow for the recruitment of feed trees, grazing needs to be minimised.
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		The Expert Panel recommended a 20 m buffer around nest sites and sites where a regent honeyeater is observed feeding, all feed trees must be retained.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The above recommendations should protect this species on Public land. However, clearing on Private land, particularly in the west of the Southern CRA Region, is removing critical regent honeyeater habitat. Without Private land management this species is unlikely to persist in the landscape.			

TABLE 34: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BLACK-CHINNED HONEYEATER *MELITHREPTUS GULARIUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	P	There is only one record of the black-chinned honeyeater on reserve in this region.
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the regeneration of trees used by this species.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors		
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The black-chinned honeyeater is at the edge of its distribution in the Southern CRA Region. The Expert Panel agreed this species is likely to persist in this Region, however Private land management, to minimise the effects of clearing and grazing, may be required to conserve the black-chinned honeyeater throughout its range.			

TABLE 35: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE YELLOW-THROATED SCRUB WREN *SERICORNIS CITREOGULARIS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	Fire need only be suppressed if it encroaches on wetter habitats critical to this species.
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	Corridors facilitate migration of the yellow-throated scrub wren between riparian habitats.
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	Scrub wrens forage in ground habitat.
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 36: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SUPERB PARROT *POLYTELIS SWAINSONII*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	This species is poorly reserved.
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	Superb parrots are likely to inhabit old growth forest if it occurs within their range.
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors		
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	
	Feral predator control plans	Y	
	Hazard reduction burning		
	Firewood collection	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		To develop appropriate prescriptions the Expert Panel recommended referring to Webster, R. and Ohern, M. (1992). Prescriptions should include management of grain spills leading to superb parrot road kills.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the above recommendations are implemented the superb parrot is likely to persist on Public land. Private land management is required if this species is to persist in the landscape.			

**TABLE 37: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE
TURQUOISE PARROT *NEOPHEMA PULCHELLA*.**

	General prescription	Does the prescription help conserve this species?	Comments
	Reserve system	Y	The turquoise parrot is poorly reserved.
Pollution Control Licence	Filter strips		
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers		
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	
	Feral predator control plans	Y	Turquoise parrots nest and forage close to, and on, the ground making them vulnerable to predators.
	Hazard reduction burning	Y	
	Firewood collection	Y	

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended the development of introduced predator control strategies and possibly site specific management where the turquoise parrot is recorded.
	Minimum of 20m radius exclusion around nest sites.	Y	The radius of exclusion around nest sites should be increased.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the above recommendations are implemented the turquoise parrot is likely to persist Public land. However, without Private land management this species is unlikely to persist in the landscape.			

TABLE 38: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SWIFT PARROT *LATHAMUS DISCOLOR*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	P	
	Retention of Eucalypt feed trees	Y	
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	Swift parrots utilise tall trees on the margins of wetlands.
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	Grazing prevents the recruitment of woodland trees used by the swift parrot for nesting, shelter and foraging.
	Weed control plans		
	Feral predator control plans		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning		
	Firewood collection	Y	Mature trees are removed for firewood or cut for poles, particularly in the west of this CRA Region.
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Temporary exclusion of harvest from flowering eucalypts when detected.	Y	The Expert Panel recommended referring to the Action (Act Government, 1997) and Recovery Plan (Gaffney and Brown, 1992) for the swift parrot to develop additional species specific prescriptions.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that the above recommendations are adequate to conserve swift parrots on Public land. This species is unlikely to persist in the landscape without the conservation of feed trees on Private land, particularly in the west of this CRA Region, and breeding habitat in Tasmania.			

TABLE 39: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE PINK ROBIN *PETROICA RODINOASTER*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the regeneration of habitat used by the pink robin.
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will encroach on, and alter the hydrology, of riparian areas, critical for the pink robin.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Pink robins are ground foragers making them vulnerable to predation.
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	20 m machinery exclusion around rainforest.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 40: REVIEW OF THE PROTECTOVE MEASURES APPLICABLE TO THE HOODED ROBIN *MELANODRYAS CUCULLATA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips		
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning		
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	Wildlife removes litter, logs and ground cover used by the hooded robin for foraging and shelter.
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	P	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors		
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	Hooded robin's forage close to, or on, the ground making them vulnerable to predators.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning	Y	
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
Habitats used by the hooded robin are predominantly reserved in the Southern CRA Region, yet populations on Private land are declining. The Expert Panel agreed that this species is likely to persist in the landscape.			

TABLE 41: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE OLIVE WHISTLER *PACHYCEPHALA OLIVACEA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns promote the regeneration of habitat used by the olive whistler.
	Fuel management burns; negative effect	Y	Inappropriate fire regimes will encroach on, and alter the hydrology of, riparian areas critical for the olive whistler.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Olive whistlers are ground foragers making them vulnerable to predation.
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	20 m machinery exclusion around rainforest.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 42: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE EASTERN BRISTLEBIRD *DASYORNIS BRACHYPTERUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips		
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect	Y	Too frequent burns will adversely affect ground habitat used by the eastern bristlebird.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	P	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers		
	Retention of habitat corridors		
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	The eastern bristlebird is a ground dweller making it vulnerable to predation.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Grazing managed and associated burning limited to < 75% of any forest compartment.	Y	
	Machinery excluded in 20m buffer zone around rainforest.	Y	
	Fallen logs > 40cm with hollows retained.	Y	
	Survey and subsequent control of feral predators where necessary.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The eastern bristlebird is primarily located within the reserve system and is likely to persist given the appropriate fire and predator management strategies are implemented.			

TABLE 43: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE DOLLARBIRD *EURYSTOMUS ORIENTALIS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Frequent fuel management burns prevent the recruitment of hollow bearing trees used for nesting and shelter.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	Dollarbirds often perch on stags.
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	Grazing prevents the recruitment of woodland trees used by the dollarbird for nesting and shelter.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection	Y	Critical hollow bearing trees are often removed for firewood.
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 44: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE CRESTED SHRIKE-TIT *FALCUNCULUS FRONTATUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	P	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning		
	Firewood collection		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 45: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SQUARE-TAILED KITE *LOPHOICTINIA ISURA*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	P	The benefit of fuel management burns are dependent on how fire effects square-tailed kite prey.
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	P	<i>Banksia</i> sp. provides habitat for this species prey.
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	P	Square-tailed kites forage at the edges of wetlands.
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning	Y	As for fuel management burns.
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		The Expert Panel recommended 100 m radius exclusion around nest sites, during nesting.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the above recommendations are implemented this species is likely to persist in the landscape.			

TABLE 46: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BROWN TREECREEPER *CLIMACTERIS PICUMNUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Frequent fire removes the forest understorey and fallen timber; prime foraging habitat for the brown treecreeper.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	
	Feral predator control plans	Y	Introduced birds and bees compete with the brown treecreeper for tree hollows.
	Hazard reduction burning		As for fuel management burning

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended species specific prescriptions be developed to prohibit firewood collection and manage grazing and fire in areas where there are known records of the brown treecreeper.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that given the above recommendations are implemented the brown treecreeper will be conserved on Public land. However, without Private land management this species is unlikely to persist in the landscape.			

TABLE 47: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE RED-BROWED TREECREEPER *CLIMACTERIS ERYTHROPS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection		
	Retention of ground habitat		

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		
	Temporary exclusion of harvest from flowering eucalypts when detected.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 48: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SPOTTED QUAIL-THRUSH *CINCLOSOMA PUNCTATUM*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips		
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns maintain the open understorey preferred by this species.
	Fuel management burns; negative effect	Y	Frequent fires could remove habitat used by spotted quail-thrush.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers		
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	Spotted quail-thrush nest and forage on the ground making them vulnerable to predators.
	Hazard reduction burning		As for fuel management burns.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 49: REVIEW OF THE PROTECTIVE MEASURES THAT ARE APPLICABLE TO THE GLOSSY BLACK COCKATOO *CALYPTORHYNCHUS LATHAMI*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management fires promote growth of food trees for glossy black cockatoos.
	Fuel management burns; negative effect	Y	Fire at inappropriate intervals and intensity can remove this species habitat.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	P	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	P	Glossy black cockatoos will use these habitats if they are in association with <i>Allocasuarina</i> stands.
	Grazing management plans	P	Grazing may remove and prevent the recruitment of <i>Allocasuarina</i> trees.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	As for fuel management burns.
	Firewood collection	Y	Hollow bearing trees used for nesting and shelter are often removed for firewood, particularly in the western areas of the Southern CRA Region.
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Nest sites protected by 50 m radius exclusion (subject to review if > 10 nests recorded in management area).	Y	
	Non-target prescriptions		
	Stands where <i>Allocasuarina</i> sp. dominates the canopy should be protected from forestry activities. Where > 30 crushed cones found beneath individuals of <i>Allocasuarina</i> sp., indicating intensive use by glossy black cockatoos, the tree must be protected.	Y	The Expert Panel noted that <i>Allocasuarina</i> sp. are understorey trees, rarely dominating the canopy of a forest.
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is likely to persist in the landscape. The main threat to the glossy black cockatoo is urban development causing habitat fragmentation. At present populations do not appear to be in decline yet this species is long-lived and there may be a lag between disturbance events and perceived impacts on populations.			

TABLE 50: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE YELLOW-TAILED BLACK COCKATOO *CALYPTORHYNCHUS FUNEREUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	The current fire regimes implemented by State Forests of NSW are adequate for this species.
	Fuel management burns; negative effect	Y	Fires at short intervals will remove yellow-tailed black cockatoo habitat.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	Yellow-tailed black cockatoos forage on <i>Banksia</i> sp.
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	As for fuel management burns.

	General regulatory requirements	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Firewood collection		
	Retention of ground habitat		
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

9.1.1 Summary of diurnal birds

The Expert Panel identified 72% (thirteen species) of diurnal bird species reviewed as likely to persist in the landscape given their recommendations are applied and 28% (five species) were unlikely to persist. For the latter group the Expert Panel identified loss of nesting and foraging habitat on Private lands as the key process causing population declines. Cross tenure conservation strategies are required to protect these species.

9.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR DIRUNAL BIRDS

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-reading surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desk top review.
- Pre-logging and pre-reading Compartment Traverse.
- Pre-logging and pre-reading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

9.2.1 Pre-logging and pre-reading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The

threatened features component of this survey are to be conducted by a person with suitable training in the identification of these features.

Only the features relating to diurnal birds are described and reviewed in this section of the report.

Threatened nocturnal bird features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to diurnal birds are:

- *Threatened hollow-dependent fauna nests and dens (eg. glossy black cockatoo)*
- *Raptor nests and roosts (eg. square-tailed kite)*

The Expert Panel was satisfied with the current design of the Compartment Traverse, they recommended:

- Any hollows with evidence of use must be marked for retention.
- Recording any incidental observations of Threatened Species.
- Search for crushed cones at the base of all *Allocasuarina* stands within the compartment (for further targeted survey work).

9.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to diurnal birds are described and reviewed in this section.

Diurnal birds

The Upper and Lower North East Broad Area Licence states:

a) Bush stone-curlew

- *Call playback to be conducted at 500m intervals within areas of potential habitat during the breeding season (July to January). Playback to be conducted at dusk and concentrated within the net logging area.*
- *At each 500m interval playback call for a minimum of 5 minutes followed by a 10 minutes listening period.*
- *Playback survey to be combined with a slow walk to flush the birds.*

- *Nest searches are to be conducted in conjunction with playback walk.*

To optimise detection of this species the Expert Panel recommended:

- Nest searches, combined with flushing, should be conducted during the daytime Compartment Traverse and pre-logging and pre-roading mark-up surveys.
- Call playback should be conducted at the same time as nocturnal call playback for other Threatened Species.
- Bush stone-curlews should be a target species for spotlight surveys.
- Species specific prescriptions and surveys for the bush stone-curlew would be more appropriately expressed in the nocturnal birds section.

b) Olive whistler

- *Call playback to be conducted in potential habitat within the net logging, and within 50m of the boundary of the net logging area, during the breeding season - September to January.*
- *Call playback survey to be conducted on at least two non-consecutive days.*

The Expert Panel was satisfied that this survey design would detect the olive whistler if it were present.

c) Eastern bristlebird

- *Call playback techniques in potential habitat within the net logging area and within 50m of the boundary of the net logging area. Call to be played for 5 minutes followed by a 10 minute listening period.*
- *Target survey of species to be conducted in conjunction with call playback and be a minimum 30 minutes.*
- *Care should be taken to avoid playing calls too frequently or too loud during the breeding season.*
- *Each potential site should be surveyed a number of times as birds may not be detected in the first survey.*

The Expert Panel suggested guidelines be developed to define an appropriate regularity and volume for eastern bristlebird call playback surveys.

d) Other diurnal birds

A minium of 1 hour per 200ha must be spent specifically searching for the following species in the early morning: regent honeyeater, pink robin, superb parrot, turquoise parrot and swift parrot. Specific survey requirements:

i) Regent honeyeater: Target surveys where recent (ie. records within 5 years) records exist within 5km of the compartment boundary. Focus on any permanent water bodies, dams, flowering eucalypts. Call playback is also to be conducted for this species in areas of potential habitat.

The Expert Panel recommended adapting the Regent Honeyeater Draft Recovery Plan survey design (NPWS in prep) to pre-roading and pre-logging surveys.

ii) *Pink robin*: Particular attention to be given to rainforest and sclerophyll ecotone. Surveys best conducted October to January.

In addition to rainforest and sclerophyll ecotone habitats, the Expert Panel suggested deep gullies and moist areas also be targeted for survey.

iii) *Superb parrot*: Nest surveys to concentrate on mature trees up to 300m from water. A nest tree can be identified by a pair of birds seen entering a hollow, a male seen to enter a hollow alone, or a male observed feeding a female at a hollow entrance. Surveys should concentrate on searching winter flowering eucalypts and other species. Superb parrot surveys are best conducted during the breeding season (September to December).

The Expert Panel recommended:

- Nest site searches should also include areas greater than 300 m from water.
- Trees identified as nest trees should be monitored to demonstrate continued use.

iv) *Turquoise parrot and swift parrot*: Surveys should concentrate on searching winter flowering eucalypts and other species. Particular attention to be paid to searching for nests of the turquoise parrot which are seldom more than a metre above the ground in hollows in small trees, dead eucalypts or in holes or stumps, or logs lying on the ground. Swift parrot surveys are best conducted during winter months. Turquoise parrot surveys are best conducted during the breeding season (August to December).

To optimise surveys the Expert Panel recommended:

- Adapting the Swift Parrot Recovery Plan (Gaffney and Brown, 1992) survey design.
- Surveys for the turquoise parrot should target woodlands with native grasses and ecotone habitats within 100 m of woodlands.

9.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area License states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to diurnal birds are described and discussed in this section.

- *Allocasuarina* spp. with > 30 crushed cones beneath.
- Threatened hollow-dependent fauna nests and dens (eg. Glossy black cockatoo).
- Raptor nests and roosts (eg. Square-tailed kite).
- Nests of Glossy black cockatoo and bush stone-curlew.
- Distinctive bird calls.
- Threatened flora and fauna species requiring species-specific prescriptions.

The Expert Panel was satisfied with the current design of the Compartment Traverse, they recommended:

- Any hollows with evidence of use must be marked for retention.
- The distinctive call of the olive whistler should be a specific search feature.

9.3 ADDITIONAL SPECIES

Prescriptions for the Square-tailed kite were not resolved during Conservation Protocol negotiations. The pre-logging and pre-roading survey requirements for this species are under development and are to be incorporated into the survey methods as and when they are finalised.

10. FROGS

10.1 REVIEW OF CURRENT FROG PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the seven frog species reviewed by the Expert Panel. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 51: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BOOROOLONG FROG *LITORIA BOOROOLONGENSIS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips		
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fire, removing vegetation cover, changes compartment hydrology altering the microclimate in riparian zones.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	P	This species may use moist habitat within corridors.
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	Booroolong frogs suffer direct predation from trout.
	Hazard reduction burning		As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	P	Maintenance of ground habitat prevents siltation and soil erosion, therefore conserving stream habitat.
	Targeted species-specific prescriptions		
	10 m buffer zone around dams and ponds.		
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.	Y	
	Grazing and associated burning excluded from swamps and ephemeral wetlands.		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			

The Expert Panel agreed these prescriptions and other requirements are likely to ensure that this species persists in the landscape. The reasons for booroolong frog declines are unknown, although diseases transmitted by people and/or vehicles through forest may be a contributing factor.

TABLE 52: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BROWN TOADLET *PSEUDOPHYRNE BIBRONII*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	Brown toadlets often breed in first order streams.
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fire, removing vegetation cover, changes compartment hydrology altering the microclimate in riparian zones.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover minimises changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	Weed invasions alter wetland habitats used by toadlets.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Though not predators feral species, such as pigs and horses, destroy stream banks.
	Hazard reduction burning		
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	10 m buffer zone around dams and ponds.	Y	
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.		
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The reasons for brown toadlet declines across the landscape are unknown. The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 53: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE RED-CROWNED TOADLET *PSEUDOPHYRNE AUSTRALIS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fire, removing vegetation cover, changes compartment hydrology altering the microclimate in riparian zones.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	Weeds such as blackberry engulf water bodies altering frog habitat.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans		
	Hazard reduction burning		As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	10 m buffer zone around dams and ponds.		
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.		
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Protect sandstone habitat from bush rock collection	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 54: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE GIANT BURROWING FROG *HELEIOPOROUS AUSTRALIACUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fuel management burns threaten burrowing individuals and reduce prey densities for remaining frogs.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover minimises changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning		As for fuel management burning.
	Firewood collection	Y	

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	10 m buffer zone around dams and ponds.	Y	
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.	Y	Male giant burrowing frogs are rarely found in densities of ten per ha. The Expert Panel recommended this prescription be triggered for single records.
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The reasons for giant burrowing frog declines across the landscape are unknown. The Expert Panel agreed that given these recommendations are implemented these regulatory requirements are likely to ensure this species persists in the landscape.			

**TABLE 55: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE
HIGHLANDS TREE FROG *LITORIA LITTLEJOHNI*.**

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	This species is highly sensitive to disturbance.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover minimises changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	Undisturbed forest types are important habitat for this species.
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	
	Hazard reduction burning		As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		The Expert Panel recommended an exclusion zone of at least 100 m around known sites or site specific negotiations on a case by case basis.
	10 m buffer zone around dams and ponds.	Y	
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.	Y	Male highlands tree frogs are rarely found in densities of ten per ha. The Expert Panel recommended this prescription be triggered for single records.
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The highlands tree frog is extremely rare and causes for its decline are unknown. The Expert Panel agreed that the regulatory requirements and recommendations are likely to conserve this species on Public land yet it is unlikely to persist in the landscape.			

TABLE 56: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE NORTHERN CORROBOREE FROG *PSEUDOPHRYNE PENGILLEYI*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fire, removing vegetation cover, changes compartment hydrology altering the riparian zones.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover minimises changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans	Y	Weeds such as blackberry engulf water bodies altering frog habitat.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Though not predators feral species, such as pigs and horses, destroy stream banks used by the northern corroboree frog.
	Hazard reduction burning		As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	10 m buffer zone around dams and ponds.	Y	
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.		
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The reasons for northern corroboree frog declines across the landscape are unknown. The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 57: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE STUTTERING BARRED FROG *MIXOPHYES BALBUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	P	All recent records are on State forests.
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fire, removing vegetation cover, changes compartment hydrology altering the microclimate in riparian zones.
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover minimises changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management plans	Y	
	Weed control plans		
	Feral predator control plans	Y	

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Hazard reduction burning		As for fuel management burning.
	Firewood collection		
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended site specific negotiations on a site by site basis when a stuttering barred frog is recorded.
	10 m buffer zone around dams and ponds.	Y	The Expert Panel recommended increasing this width of this buffer zone to at least 50 m.
	Where > 10 males per ha, stream crossings within 500 m should be constructed by methods that do not alter stream flow.		Male stuttering barred frogs are rarely found in densities of ten per ha. The Expert Panel recommended this prescription be triggered for single records.
	Grazing and associated burning excluded from swamps and ephemeral wetlands.	Y	
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The reasons for the rarity of the stuttering barred frog are unknown. The Expert Panel agreed that the amended prescriptions were likely to be adequate to conserve this species on Public land, yet it is unlikely to persist in the landscape.			

10.1.1 Summary of frogs

The Expert Panel identified 71% (five species) of frog species reviewed as likely to persist in the landscape given the revised and/or current conservation measures and 29% (two species) were unlikely to persist. For the majority of the taxa reviewed the causes for population declines were unknown. For this reason the Expert Panel found it difficult to assess or amend current prescriptions. They identified removal of vegetation cover altering compartment hydrology and riparian habitats as one of the key threat to frog survival.

10.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR FROGS

As specified in the Threatened Species Protocol (TSP) of November 1996, pre-logging and pre-reading surveys are required for certain Threatened Species. These threatened flora and fauna are those that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desk top review.
- Pre-logging and pre-roading Compartment Traverse.
- Pre-logging and pre-roading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat; familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

10.2.1 Pre-logging and pre-roading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The threatened features component of this survey are to be conducted by a person with suitable training in the identification of these features.

Only the features relating to frogs are described and reviewed in this section of the report.

Threatened frog features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to frogs are:

- *Permanent soaks and seepages (for further targeted survey work).*

The Expert Panel was satisfied that the current design of the Compartment Traverse would detect these features.

10.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to frogs are described and reviewed in this section.

Frog surveys

The Upper and Lower North East Broad Area Licence states:

It would be most effective to undertake a local to regional scale frog survey at the most appropriate time of year and under the best weather conditions. Such a survey could cover breeding sites within or immediately adjacent to compartments scheduled to be logged over the following year.

The Expert Panel recommended this be rewritten to:

Local and regional scale frog surveys should be undertaken at the most appropriate time of the year and under the best weather conditions. Such a survey could cover breeding sites within or immediately adjacent to compartments scheduled to be logged over the following year.

a) Riparian frog survey

Riparian frog surveys are used to target the following species in the Southern CRA Region: *Heleioporous australiacus*, *Pseudophyrne australis* and *Mixophyes balbus*.

The Upper and Lower North East Broad Area Licence states:

- Surveys to be a minimum of 1 person hour duration per 200ha of net logging area. If more than one stream is surveyed, a minimum of 10 minutes must be spent at each separate site.
- Three call playback sessions per 1 hour search. After an initial 2 minutes listening period, calls of threatened frog species likely to occur in the search area are to be played for 2 minutes followed by at least 5 minutes listening period. Calls played to be dictated by potential habitat. When an observer is unsure of a species' identification, the call responses should be taped to allow verification by a suitably experienced frog expert.
- Survey to be conducted twice, on two separate nights.
- Surveys must not be conducted in cold, windy conditions. All attempts should be made to survey just after rain, during very light showers, or when showers are intermittent.
- Surveys to focus on searching in macrohabitat and microhabitat.

Survey season: *Pseudophyrne australis*: spring-summer after rain and *Mixophyes balbus*: September to March.

To increase the probability of detecting riparian frog species the Expert Panel recommended:

- At least 100 m of the stream, where practicable, should be traversed when searching for threatened frogs.
- Dip-netting could be used to detect tadpoles of targeted species. Tadpoles are often more persistent in the environment and less cryptic than adult frogs. Dip-netting would be particularly useful for detecting species that respond inconsistently to call playback such as *Heleioporous australiacus*. Live specimens can be identified in the field with the use of a hand lens and field guide (M. Anstis in preparation). The dip-net technique involves one to two minutes of random netting per pool, with a minimum of three dips at each site and follows that outlined in by Heyer *et al.* (1994).
- The target species list should be amended to include *Litoria boorologensis* and *Pseudophyrne pengillyi*.

b) Non-riparian frog search

Non-riparian frog surveys are used to target the following species in the Southern CRA Region: *Heleioporus australiacis* and *Pseudophyrne australis*.

The Upper and Lower North East Broad Area Licence states:

- Surveys to adequately search soaks, seepages and bogs within the net logging area. Where soaks, seepages or bogs occur, a minimum of 30 minutes to a maximum of 2 hours per 200ha of net logging area depending on the number and extent of soaks, seepages and bogs. A minimum of 10 minutes must be spent at each separate soak, seepage or bog.
- Call playback to consist of 2 minutes call playback followed by 5 minutes of listening. This should be conducted at each soak, seepage or bog. When an observer is unsure of a species' identification, the call responses should be taped to allow verification by a suitably experienced frog expert.
- Surveys must not be conducted in cold, windy conditions. All attempts should be made to survey just after rain, during very light showers, or when showers are intermittent.

Survey season: *Pseudophyrne australis*: Spring - Summer after rain.

The Expert Panel recommended amending the target species list to include *Pseudophyrne pengilli*. Specialised survey techniques are required to detect *Pseudophyrne pengilli*. Potential breeding sites (seepages and bogs) are to be surveyed during daylight hours by standing at the edge of the pool or seepage and shouting loudly. Following a response the surveyor must search for the calling male to certify it is *Pseudophyrne australis* as related species, such as *P. bibroni* and *P. denty*, may also respond to vocalisations. Recommended survey season is the first three weeks of February. For further information refer to the National Parks and Wildlife Service Draft Recovery Plan for *Pseudophyrne pengilli* (NPWS in prep).

c) *Litoria aurea* and *Litoria raniformis* survey

The Upper and Lower North East Broad Area Licence states:

Many frog experts disagree on the most appropriate techniques for surveying *Litoria aurea* and the success of different techniques varies between locations. As such, the following survey methodology is provided as a guide. Any variation in this survey technique must be clearly documented in the survey report.

- Permanent swamps or ponds of greater than 1ha surface area are to be surveyed for a minimum of 1 hour, both day and night. For large swamps or ponds, survey effort should be proportional to this effort. For smaller swamps and ponds a minimum of 30 minutes survey, both day and night.
- Night survey to be conducted twice on two non-consecutive nights.
- Call playback to be conducted at 50 - 100m intervals around swamp/pond perimeter with call played for 2 minutes followed by a 5 minute listening period. When an observer is unsure of a species' identification, the call responses should be taped to allow verification by a suitably experienced frog expert.

Surveys must not be conducted in cold, windy conditions. All attempts should be made to survey immediately prior to significant rainfall, just after rain, during very light shower, or when showers are intermittent.

Survey season: September to January.

Call playback surveys will not reliably detect these species as they will only call following rainfall. The generally accepted survey technique for *Litoria aurea* and *L. raniformis* is

spotlighting. Surveys should be conducted for approximately one hour with a strong headlamp, rather than a hand held torch. Eye shine from these species is distinctive and can be detected during wet or dry conditions. Surveys should be conducted after September, during warmer months. Additionally, dip-netting could be used to detect tadpoles.

e) *Heleioporus australiacus* survey

The Upper and Lower North East Broad Area Licence states:

- *A road-based night survey is to be conducted for Heleioporus australiacus.*
- *A minimum of 2km of road-based survey per 200ha of net logging area to be conducted.*
- *Surveyor to drive along roads in or adjacent to compartments at a speed of < 1-15 km/hr.*
- *Call playback to be conducted at 3 points along the road survey. Species call to be played for 3 minutes followed by a 10 minutes listening period. When an observer is unsure of a species' identification, the call responses should be taped to allow verification by a suitably experienced frog expert.*
- *Surveys are best conducted on warm, still nights during rain.*

Survey season: *Spring and autumn probably best (very wet and warm conditions needed).*

The Expert Panel agreed that road-based night surveys would only locate this species during or following heavy rainfall. To optimise detection of *Heleioporus australiacus* it was recommend:

- Surveys be conducted for an hour.
- Surveys routes should cover a minimum of 2 km, during this time surveyors may travel outside the compartment or may repeat traverses.
- Stops should be made at gullies or creek crossings for a minimum of one minute to listen for calls.
- The time used for call playback surveys would be more effectively spent on road surveys.

10.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer (SFO) prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only the features relating to frogs are described and discussed in this section.

- *Permanent soaks and seepages.*
- *Threatened flora and fauna species requiring species-specific prescriptions.*

The Expert Panel was satisfied that the pre-logging mark up would detect these features.

11. REPTILES

11.1 REVIEW OF CURRENT REPTILE PRESCRIPTIONS

The Proforma used in the ESFM workshop (Appendix D) has been summarised to present the outcomes of the review of the conservation measures outlined by the Pollution Control Licence, management system of State Forests of NSW and the Conservation Protocols. A synopsis is provided for each of the six reptile species reviewed by the Expert Panel. The unnamed reptile *Drysdalia rhodogaster* was not considered further by the Expert Panel as it is not a forest dependent species. To indicate the applicability of a prescription to a species the Expert Panel responded by:

- Y signifying 'yes' this prescription helped to conserve the species;
- P signifying that this prescription 'potentially' helped to conserve this species, or;
- blank if the prescription did not help to conserve, or was not applicable to, the species.

Clarification of responses made by the Expert Panel or recommendations to amend prescriptions has been recorded in the Comments section of the summaries.

TABLE 58: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE BROAD-HEADED SNAKE *HOPLOCEPHALUS BUNGAROIDES*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	
	Fuel management burns; negative effect		
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs	Y	
	Grazing management plans		
	Weed control plans		
	Feral predator control plans	Y	Though ont a predator feral goats degrade broad-headed snake habitat on escarpments.
	Hazard reduction burning	Y	
	Firewood collection	P	These snakes may use fallen timber during migration.
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended the development of a targeted plan for the conservation of the broad-headed snake including site specific management around known records and identification and retention of preferred trees.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed, given the above recommendations are implemented, the broad-headed snake is likely to be conserved on Public land. However, unless the effects of bush rock collection and the pet traders are alleviated, this species is unlikely to persist in the landscape.			

TABLE 59: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE DIAMOND PYTHON *MORELIA SPILOTA SPILOTA*.

	General prescription	Does the prescription help conserve this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Fuel management burns remove ground litter and logs required for shelter. This is particularly important in the western areas of the Southern CRA Region where little natural ground cover remains.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	These forests provide sheltering hollows for diamond pythons, particularly in the western areas.
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.	Y	Though not a critical habitat, pythons will perch in <i>Allocasuarina</i> stands.
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans	Y	
	Weed control plans		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Predation is the main cause for decline of this species in the western areas of this CRA Region.
	Hazard reduction burning		As for fuel management burning.
	Firewood collection	Y	The collection of fallen timber, particularly in the west, removes important habitat for the diamond python.
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that the diamond python is likely to persist in the eastern areas of the Southern CRA Region. However, unless shelter sites are protected, feral predators controlled and burning regimes managed this species is unlikely to persist in the western areas of this CRA Region.			

TABLE 60: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE COMMON DEATH ADDER *ACANTHOPHIS ANTARCTICUS*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Death adders use leaf litter and ground cover for shelter.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	STS retains a greater level of ground cover that is used for shelter.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans	Y	
	Weed control plans		
	Feral predator control plans		
	Hazard reduction burning	Y	
	Firewood collection	Y	
	Retention of ground habitat	Y	

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Targeted species-specific prescriptions		The Expert Panel recommended that sites be conserved where found.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is unlikely to persist in the landscape. The reasons for the death adders' decline are unknown, inappropriate fire regimes or processes resulting in removal of leaf litter are probably contributing factors.			

TABLE 61: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE HEATH MONITOR *VARANUS ROSENBERGII*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Fuel management burns encourage heath regeneration; an important habitat for this species.
	Fuel management burns; negative effect		
	Wild fire suppression		
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest		
	Protection of Rainforest		
	Protection of Rare non-commercial forest types	Y	
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	Y	
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans	Y	Heath monitors shelter and nest in termite mounds. Grazing reduces ground cover required for termites to build mounds.
	Weed control plans		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Introduced feral predators prey on eggs and juvenile monitors, while adults may be at risk from the non-target effects of fox baiting.
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		The Expert Panel recommended prescriptions be developed to protect termite mounds.
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel identified two disjunct populations of heath monitors; northern monitors occurring on Sydney sandstone rocky outcrops and escarpments, and southern populations found in woodlands on poor, infertile soils. Northern populations are likely to persevere as much of their potential range is already Reserved. The above recommendations are likely to conserve Southern monitor populations on Public land, but off-reserve land management is required to ensure this species persists in the landscape.			

TABLE 62: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE SPENCER'S SKINK *PSEUDEMOIA SPENCERI*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees	Y	
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect	Y	Spencer's skink abundance will decrease when regeneration becomes dense.
	Fuel management burns; negative effect	Y	Frequent management burns reduce ground cover and logs required by this species for shelter.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)		
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest		
	Protection of Rare non-commercial forest types		
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)	Y	Skinks use branches on large trees to gain access to sunlight.
	Stag retention	Y	
	Retention of <i>Allocasuarina</i> stands, flowering/fruited <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands		
	Protection of heath and scrub	P	Populations at high altitudes may require heath.
	Protection of rocky outcrops and cliffs	Y	
	Grazing management Plans		
	Weed control plans		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans		
	Hazard reduction burning	Y	As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that these prescriptions and other requirements are likely to ensure that this species persists in the landscape.			

TABLE 63: REVIEW OF THE PROTECTIVE MEASURES APPLICABLE TO THE MACCOY'S SKINK *NANNOSCINCUS MACCOYI*.

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Reserve system	Y	
Pollution Control Licence	Filter strips	Y	
	Buffer strips	Y	
	Forestry activities prevented on slopes greater than 30 degrees		
State Forests of New South Wales	Forest management zoning	Y	
	Fuel management burns; positive effect		
	Fuel management burns; negative effect	Y	Maccoy's skink requires moist microclimates. Fire removes vegetation cover, altering the hydrology and thus microclimate of the riparian zone.
	Wild fire suppression	Y	
	Preferable silvicultural regime; single tree selection (STS) or Group Tree Selection (GTS)	STS	A mosaic of tree cover will minimise changes to the compartment hydrology.
Conservation Protocols	Protection of High Conservation Old Growth Forest	Y	
	Protection of Rainforest	Y	
	Protection of Rare non-commercial forest types	P	This species probably inhabits moist rare non-commercial forest types.
	Hollow-bearing and recruitment tree retention (regrowth and non-regrowth areas)		
	Stag retention		
	Retention of <i>Allocasuarina</i> stands, flowering/fruiting <i>Banksia</i> or <i>Xanthorrhoea</i> sp.		
	Retention of Eucalypt feed trees		
	Retention of riparian buffers	Y	
	Retention of habitat corridors	Y	
	Protection of wetlands	Y	
	Protection of heath and scrub		
	Protection of rocky outcrops and cliffs		
	Grazing management Plans		
	Weed control plans		

	General Regulatory Requirement	Does this regulatory requirement contribute towards the conservation of this species?	Comments
	Feral predator control plans	Y	Though not a predator the foraging activities of feral pigs disturb the soil, altering moisture content.
	Hazard reduction burning		As for fuel management burning.
	Firewood collection	Y	
	Retention of ground habitat	Y	
	Targeted species-specific prescriptions		
	Non-target prescriptions		
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape?			
The Expert Panel agreed that this species is likely to persist in the landscape. However, the taxonomy of Maccoy's skink is to be reviewed, so these prescriptions should be reconsidered for any 'new' species.			

11.1.1 General discussion of the prescriptions related to reptile species

The Expert Panel identified 33% (two species) of reptile species reviewed as likely to persist in the landscape given their recommendations are applied, 33% (two species) were unlikely to persist and 33% (two species) would persist in selected areas.

Reptile taxonomy is currently in a state of flux. The Expert Panel highlighted the need to revise prescriptions in accordance with taxonomic changes. The Expert Panel also stressed the need for cross tenure management to conserve sufficient habitat for broad ranging species such as the heath monitor (*Varanus rosenbergii*).

11.2 REVIEW OF THE THREATENED SPECIES PROTOCOL PRE-LOGGING AND PRE-ROADING SURVEY DESIGN FOR REPTILES

The Threatened Species Protocol (TSP) of November 1996 specifies that pre-logging and pre-reading surveys are required for threatened flora and fauna that require species-specific prescriptions or site-specific prescriptions under the TSP. The surveys set out below are designed to specifically target these species. Surveys are comprised of four components:

- Desktop review of the compartment(s), involving the collation of information on the compartment and Threatened Species within it.
- Incidental threatened flora and fauna records collected subsequent to the desk top review.
- Pre-logging and pre-reading Compartment Traverse.
- Pre-logging and pre-reading targeted fauna surveys.

Surveys must be conducted by a suitably experienced surveyor trained in the appropriate field. The definition of suitable experience and training includes experience with flora/fauna survey work; extensive experience with identification of flora/fauna species and their habitat;

familiarisation with herbarium/museum specimens of listed threatened taxa and tertiary botanical/fauna or ecological qualifications is preferred.

11.2.1 Pre-logging and pre-roading compartment traverse

The Upper and Lower North East Broad Area Licence states:

The purpose of the Compartment Traverse is to search for threatened flora and fauna features within the net logging area and within 50m of the boundary of the net logging area. The threatened features component of this survey are to be conducted by a person with suitable training in the identification of these features.

Only the features relating to threatened reptiles are described and reviewed in this section of the report.

Threatened reptile features components

The Upper and Lower North East Broad Area Licence states:

For the threatened fauna features component of the Compartment Traverse, a minimum 4 hours per 200ha must be spent searching for the specified features continuously along the traverse.

The features relating to reptiles are:

- *Suitable Varanus rosenbergi microhabitat (inspection of burrows and underneath rocks and fallen logs) when in potential habitat within their geographic range.*

In addition to suitable microhabitat the Expert Panel recommended searching for termite mounds, in appropriate seasons, during the Compartment Traverse. Mounds used by *V. rosenbergi* are characterised by holes of a specific shape and size dug at their base by adults entering the mound and hatched juveniles exiting the mound.

11.2.2 Pre-logging and pre-roading targeted fauna surveys

The Upper and Lower North East Broad Area Licence states:

Pre-logging and pre-roading targeted fauna surveys are required for threatened fauna requiring species-specific or site-specific prescriptions. All Targeted Fauna Surveys are to be conducted within known or potential habitat in the net logging area and within 50m of the boundary of the net logging area. The Targeted Fauna Survey requirements are based on a minimum survey effort for a standard 200ha of net logging area.

Only those surveys relating to reptiles are described and reviewed in this section.

Reptile survey methods

The Upper and Lower North East Broad Area Licence states:

Varanus rosenbergi survey

The principles to optimise detection of this species are:

- *SFNSW staff conducting surveys, planning and general operations within the geographic distribution of *Varanus rosenbergi* should be familiarised with their recognition.*
- *SFNSW staff should examine road kill goannas within the distribution of this species.*

The Expert Panel was satisfied with this survey design.

11.2.3 Features to be searched for during the pre-logging mark up

The Upper and Lower North East Broad Area Licence states:

The following features require application of a prescription under the Threatened Species Protocol. These features are to be searched for and marked in the field, where appropriate, by the Marking Foreman/Supervising Forestry Officer prior to the commencement of harvesting operations. Marking must be conducted at least 100m in advance of logging operations. The SFO must receive specific training in the identification of any features unfamiliar to him/her.

Only those features relating to reptiles are described and discussed in this section.

- *Threatened fauna species requiring species-specific prescriptions.*

The Expert Panel was satisfied that the pre-logging mark up would detect these species.

11.3 ADDITIONAL SPECIES

Prescriptions for the broad-headed snake have not been resolved. The pre-logging and pre-roading survey requirements for this species are under development and are to be incorporated into the survey methods as and when they are finalised.

The broad-headed snake inhabits relatively localised areas that could be modelled to develop appropriate survey plans for this species. The Expert Panel recommended referring to Shine *et al.* (1995) and the recent publications by Jonathon Webb describing the ecology of the broad-headed snake to further refine prescriptions and surveys plans.

12. FLORA AND TERRESTRIAL FAUNA

GENERAL RECOMMENDATIONS

Throughout the flora and terrestrial fauna workshops the Expert Panel identified several issues of concern. Following the completion of species and survey reviews an open discussion allowed these concerns to be debated and possible solutions and future directions suggested.

Fire

The Expert Panel agreed that fuel management burns, hazard reduction burns and suppression of wildlife aids the conservation of some species but are detrimental to others. Although the potential advantages or disadvantages of fire where noted for each species reviewed, the Expert Panel agreed that an appropriate fire regime should be determined for Threatened Species. A fire management strategy should include guidelines for appropriate fire frequency, spatial configuration, intensity and season of burns. Similarly a default regime should be developed for non-Threatened Species. It was noted that species occupying the same localities may have different fire tolerances and requirements, so fire management should occur at a community or ecosystem level. For these prescriptions, the forest types in which burning is inappropriate require definition and the development of suitable protocols.

Hollows

The Expert Panel stressed that the persistence and perpetuation of hollow bearing trees is imperative for the survival of forest fauna. A discussion of the conservation measures in place to maintain these hollow bearing trees highlighted the following points:

- Tree mortality is high; the ratio of one recruit tree to one hollow bearing tree is unlikely to maintain the targeted number of hollow bearing trees in Net Harvest Areas in the mid to long term. This is particularly the case in the regrowth zones. Modelling is required to define a more appropriate ratio of recruits to hollow bearing trees.
- The rotation time between harvesting events within a compartment requires revision. Current rotation intervals are too short to allow recruitment trees to form hollows. Additionally, hollow bearing trees retained from the previous harvesting event are not permanently marked therefore could be removed in the next rotation.

- Guidelines or criteria should be developed for the selection of recruitment and hollow bearing trees. Trees with the potential to develop a broad range of hollow types should be targeted for selection. Suppressed trees should not be selected as recruit trees.
- Prescriptions for the retention and recruitment of hollow bearing trees in the Net Harvest Area should be rewritten to emphasise not only maintaining these features during a single cutting cycle but managing them to **persist** in the landscape.
- Specific prescriptions should be developed for hotspots, defined as areas of high species richness. A sliding scale, where incremental increases in species diversity are matched by increases in prescription strength, was suggested. However the Expert Panel agreed that consistently identifying and defining hotspots could be problematic.

Private land management

For many species the Expert Panel indicated that current forest management protective measures would conserve species on Public land. This was particularly the case for species distributed across a wide geographic area in the Southern CRA Region. However, the Expert Panel considered that many of these species are unlikely to persist in the landscape without Private land management. The Expert Panel highlighted the need to implement cross tenure management to ensure the survival of a number of regionally significant faunal species.

Introduced species

To successfully mitigate the impacts of introduced species the Expert Panel stressed that long term strategies across all tenures are required. On Public land it was recommended that prior to control of any introduced species the following should be considered:

- The impact of introduced species and the advantages to be gained from control must be investigated. Perceived benefits should be weighed against the disadvantages of control activities, for example the eradication of Blackberry aids frog and native plant species but removes habitat used by bandicoots.
- Selection of the most appropriate method of control. Control techniques must be species specific and should not endanger native non-target fauna. For example quolls, bandicoots and potoroos can incidentally consume aerial baits used to control foxes. Where these species occur, alternative methods of control, such as soft jaw trapping, may be more appropriate.
- Monitoring before, during and after control operations is required to measure immediate and long-term success. Long term control is preferable to single control events.
- Prescriptions and management plans should be developed to mitigate the impacts of feral herbivores such as horses, goats, deer and rabbits on threatened flora. This is particularly important in sub-alpine environments and rocky outcrop habitats where Threatened Species are likely to persist.
- The impacts of introduced weeds, such as Blackberry in the montane areas, tablelands, and western slopes; bitou bush in coastal areas; and aquatic and marsh weeds, require investigation and, where appropriate, implementation of management strategies.
- The role mechanical disturbance plays in the spread of weeds needs to be identified.

Monitoring and research

The Expert Panel identified monitoring and research as integral components of successful management. The current Conservation Protocols remain untested, and their effectiveness is

largely unknown. The Expert Panel suggested monitoring techniques be incorporated into existing survey protocols. For example pre-logging or pre-roading compartment surveys trigger prescriptions to protect specific features, such as habitat trees, these can be monitored during and after the harvesting event to ascertain whether the prescriptions achieve their purpose. The information obtained from these processes should be collated and published in independently reviewed scientific journals. Monitoring and research can be used to provide the basis for which optimal prescriptions are developed.

The Expert Panel agreed that monitoring of forest management protective measures should be linked with existing research into ESFM. Currently various separate agencies and institutions conduct this research. To formalise a partnership between these disjunct organisations the Expert Panel suggested establishing a Corporate Research Centre (CRC). A CRC would address cross tenure conservation and management questions affecting forest herpetofauna, bats, invertebrates and flora currently overlooked in much research focused on ESFM. Additionally a forest management CRC could link with existing CRCs such as vertebrate pest, marsupial, soil and water and catchment hydrology to deal with broader landscape questions.

13. AQUATIC WORKSHOP

13.1 OUTCOMES OF THE AQUATIC WORKSHOP

The Expert Panel discussed the protective measures outlined in the Pollution Control Licence, management system of State Forests of NSW, the Conservation Protocols and proposed NSW Fisheries Licence Conditions for the six aquatic species listed for the Southern CRA Region. The Expert Panel provided the following comments and recommendations:

- As previously noted, river/stream habitats are largely fragmented by obstructions such as crossings. These obstructions may protect threatened aquatic species by preventing the spread of introduced salmonoid up-stream. The National Parks and Wildlife Services and/or State Forests of NSW should conduct surveys above and below stream obstructions prior to their modification or removal. If survey results indicate that Threatened Species occur on one side of the obstruction and introduced salmonoids on the other then obstructions must not be removed.
- Old established bridges might be critical habitat for some threatened aquatic species. Surveys and subsequent environmental impact statements must be conducted prior to the removal or replacement of these features.
- Channel obstructions, such as crossings, fragment the stream/river system limiting the ability of species to recolonise after disturbance.
- One of the most significant disturbance events is fire. Fires can be detrimental to species sensitive to increases in the level of sediment flow into water bodies, such as the Australian grayling and Macquarie perch. Guidelines should be established for burning regimes to minimise impacts to these species.
- Grazing appears to have minimal impacts on threatened aquatic species, however grazers such as feral horses and pigs, disturb the edges of water bodies. Management plans should be developed to limit the impact of introduced hard hooved animals.
- Management plans should be developed to mitigate the impacts of introduced weeds such as willows and blackberries on water bodies critical to threatened aquatic species.
- Construction and maintenance of roads increase the level of suspended and bed load sediment within water bodies. Evidence suggests that bed load deposits pose a greater threat to aquatic fauna than particles in suspension, strategies should be developed to minimise the increase of bed load sedimentation resulting from roading activities.
- Pine plantations alter the hydrology of a catchment. Management plans should be developed to minimise the changes to catchments resulting from plantations. Management plans should include the use of stream/water body buffer strips.
- Changes to water temperatures are largely mitigated by filter strip buffers.

- Quarries could threaten aquatic fauna, particularly galaxid species and spiny crayfish. Impacts appear to be site dependent and may require site specific management plans.

The Expert Panel agreed that the current protective measures are adequate to protect the Macquarie perch and Trout cod. However the introduction and invasion of exotic species and the lack of management of large regulated rivers mean that these species are unlikely to persist in the landscape. The Expert Panel were unwilling to comment on the probability of the Australian grayling, silver perch, lamprey and Murray river crayfish would or would not persist in the landscape due to lack of information.

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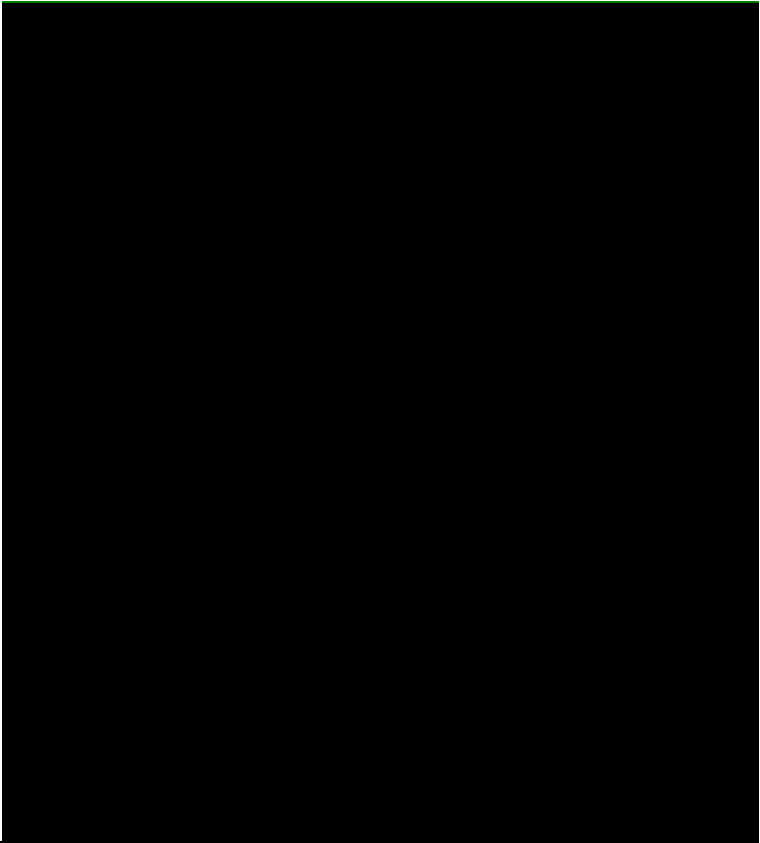
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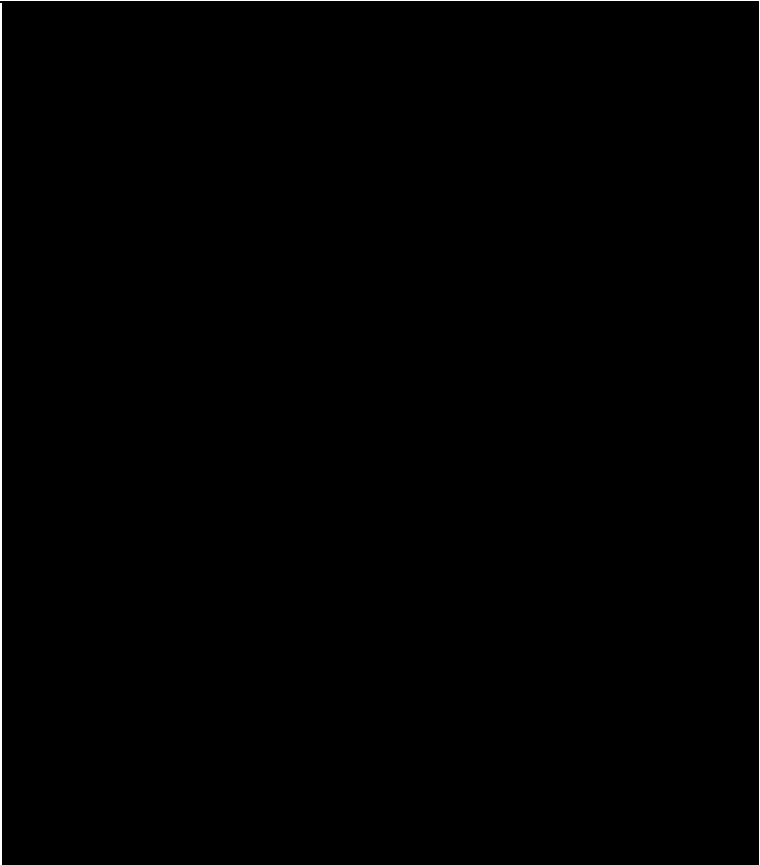
15. ACRONYMS

CRA	Comprehensive Regional Assessment
CRC	Corporate Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBH	Depth at Breat Height
EHTC	Environment and Heritage Technical committee
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
ESFM	Ecologically Sustainable Forest Management
GTS	Group Tree Selection
JANIS	Joint Commonwealth-State sub-committee responsible for assisting in the implementation of the National Forest Policy Statement and reporting to the relevant ministerial councils.
NPWS	National Parks and Wildlife Service
SFNSW	State Forests of New South Wales
NSW	New South Wales
NHA	Net Harvest Area
RFA	Regional Forest Agreement
SFO	Supervising Forestry Officer
SIS	Species Impact Statement
STS	Single Tree Selection
TSC	Threatened Species Conservation
TSP	Threatened Species Protocol



Review of protective measures and forest practices – biodiversity workshop

Appendices
Southern Region



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APPENDIX A

THE EXPERT PANEL

The Expert Panel attending the ESFM workshops at Queanbeyan June 1999.

Independent scientific experts

Area of expertise	Name	Affiliation
Flora	Doug Benson	Botanic Gardens
Flora	Phil Gilmore	
General fauna	Peter Catling	CSIRO Division of Wildlife and Ecology
Ground mammals	Chris Belcher	Ecosystems Environmental Consultants
Arboreal mammals	Phil Gibbons	CRES Australian National University
Bats	Doug Mills	Consultant
Birds	Penny Olsen	Division of Botany and Zoology, Australian National University
Frogs	Will Osborne	Faculty of Applied Sciences, University of Canberra
Reptiles	Ross Saddler	Australian Museum
Aquatic fauna	Mark Lintermans	ACT Parks & Conservation Service
Aquatic fauna	Alan Lugg	NSW Fisheries

State Forests of NSW Experts

Area of expertise	Name
Fauna	Tim Clancy
Ground and Arboreal mammals	Jim Shields
Bats	Brad Law
Nocturnal birds	Rod Kavanagh
Diurnal birds and flora	Mike Crowley
Frogs and reptiles	Frank Lemckert
Aquatic fauna	Wayne Erskine

National Parks and Wildlife Experts

Area of expertise	Name
Flora	John Briggs
Flora	Keith McDougall
Ground mammals	Linda Broome
Bats	Andy Spate
Frogs and reptiles	Warrick Smith
Modelling	Lesley Forward
Modelling	Michael Pennay

APPENDIX B

EXPERT'S PACKAGE – LETTER OF INVITATION

Dear «Salutation»,

The Ecologically Sustainable Forest Management (ESFM) Group would like to extend to you an invitation to attend a Flora and Fauna Workshop, to be held in Canberra on 29 June - 2 July 1998. This workshop is an important part of an ESFM project designed to assess and review protective measures and forest practices employed in the Southern Region to protect biodiversity. The Southern Region is shown in Annexure "A".

The project is part of the Comprehensive Regional Assessment (CRA) of New South Wales forests which will provide a scientific basis for Regional Forest Agreements in New South Wales.

Your engagement for the peer review will be on a "fee for service" basis covered by this letter of offer. It is understood that this offer involves you, as the contractor, accepting the following terms and conditions. In signing this letter of offer, you agree:

- To accept all responsibility for affecting all necessary insurances and superannuation arrangements.
- To release from and indemnify the Department against all liability which may result directly or indirectly from any negligent or wrongful act of the contractor.
- To not disclose, without first obtaining written approval, any information or material required or produced by the contractor during the performance of the services provided under this offer.
- That the property and copyright of all material produced in reports to the Department by the contractor will vest in the Department.

To ensure that there is no conflict of interest, you must inform me on receipt of this offer, by signing the end of this letter and sending a copy to me.

Background

The National Forest Policy Statement (NFPS) commits the Commonwealth and State Governments to the ecologically sustainable management of Australia's forests. It sets out the process for undertaking joint Commonwealth/State regional assessments of environmental, heritage, economic and social values of forests.

These Comprehensive Regional Assessments (CRAs) will enable the Commonwealth and the States to make long term land use decisions about areas to be set aside in perpetuity for conservation purposes and areas to be made available for wood production. They will also enable decisions to be made on measures to improve both on-reserve and off-reserve management. The land use and land management recommendations will form the basis for the negotiation of Regional Forest Agreements (RFAs) between the Commonwealth and NSW Governments.

Ecologically Sustainable Forest Management

The Ecologically Sustainable Forest Management (ESFM) Group is one of four committees responsible for the CRAs in NSW, along with the Environment and Heritage Technical Committee, the Economic and Social Technical Committee and the Forest Resource and Management Systems (FRAMES).

The ESFM Group have identified a number of forest values needing consideration as part of Ecologically Sustainable Forest Management across the NSW native forest estate. The

intention is to work towards setting the level at which the values are to be maintained or increased. The range of values includes:

- Biological diversity.
- Productive capacity and sustainability of forest ecosystems.
- Forest ecosystem health and vitality.
- Soil and water.
- Positive contribution to global geochemical cycles.
- Long-term social and economic benefits.
- Natural and cultural heritage.

To ensure biological diversity is protected, this Workshop will review several mechanisms used by agencies to ensure flora and fauna species persistent in the landscape. Landscape is intended to mean catchments in the Southern CRA/RFA Region and includes public (NPWS, SFNSW and Crown land) and private land. An illustration of what land is reserved across the landscape will be provided at the field day and introductory talk.

ESFM Project Area 4/2: Review of protective measures and forest practices – Flora and Fauna Workshop

This project will assess and review the most important forest management protective measures and forest practices employed in the Southern Region to protect biodiversity. In this context the Flora and Fauna Workshop is being held to provide a forum for experts to comment on:

- The conservation protocols.
- Sections of the EPA Pollution Control Licence that benefit biodiversity.
- Forest practices and protective measures undertaken by SFNSW which affect biodiversity.

An agenda including the required outcomes is attached in Annexure “B” and Annexure “C” illustrates how the Response to Disturbance Workshop is linked to the Flora and Fauna Workshop. Lunches, morning and afternoon tea will be provided.

The venue for the workshop the field trip will be:

- Canberra, 29 June – 2 July 1998 NPWS Queanbeyan Office 6 Rutledge St Queanbeyan (enter through the NPWS shop)

We will also meet at this location for the field trip at 9am on Tuesday 29 June 1999. After a short talk we will then proceed to see forestry operations and biodiversity protective measures in the field.

A substantial amount of written material is being provided as essential background reading for this workshop. Background material in this package includes:

1. Explanation of Fauna Proformas.
2. An example of Proforma 1: Requirements for species X (This draft has been prepared prior to the Response to Disturbance Workshop. The information on this Proforma will be filled out by the ESFM Group by distilling the species information obtained during the Response to Disturbance Workshop and therefore it may change depending on exactly what information is provided.)
3. An example of Proforma 2; Identified threats, and their ranks of perceived importance.
4. An example of Proforma 3: Summary of protective measures applicable for species X.
5. List of Flora and Fauna species to be considered at the R2D and Flora and Fauna ESFM Workshop

6. Summary of the outcomes of the previous review undertaken for the Upper and Lower North East in relation to of flora sections of the protective mechanisms.
7. Conservation protocols.
8. Discussion of Environment Protection Authority (EPA) Pollution Control Licence issued to State Forest of NSW (SFNSW).
9. Summary of EPA Pollution Control Licence issued to SFNSW.
10. Summary of SFNSW protective measures that affect biodiversity including an explanation of silviculture and harvesting practices in the Southern Region.

It is expected that experts will have read this material and use it to inform their contribution to the workshop. In light of this, up to one day reading time for each expert has been budgeted into the project.

As indicated in the agenda, the 29 June will be a field trip and talk which is intending to illustrate the protection measures, how they operate in the field and the different layers of protection (i.e reserve system, riparian buffers, wildlife corridors etc).

Conclusion

Payment of sitting fees for this workshop, together with one day for reading, will be made on receipt of an invoice. Reasonable costs associated with attendance at this workshop (such as dinner, taxi travel, etc) will also be covered if documented by receipts and included in the invoice. As agreed on the telephone we will pay. Payment will occur on presentation of an invoice and be made payable to whom you instruct.

Please address your invoice to:

Michael Davis
ESFM Project Area 4/2
Dept Urban Affairs & Planning
GPO Box 3927
SYDNEY NSW 2001

If you have any questions or require any further information, please contact me directly and I will deal with them directly. Contact details are Michael Davis on: telephone: 02-9391-2049, fax: 02-9228-4967, or e-mail: michael.davis@racd.duap.nsw.gov.au.

Your assistance is appreciated, and I look forward to receiving your acceptance of this offer.

Yours sincerely

Rex Bowen
Executive Director RACD

The above terms and conditions are agreed to and:

«Name» confirms that at the date of accepting this engagement there is no conflict of interest arising from the peer review Of “ESFM Project: Water Quality And Quantity For The Upper And Lower North East, Southern RFA Regions”. «Name» undertakes to notify the Department

of Urban Affairs and Planning within 7 days of becoming aware of any conflict of interest arising during the term of the engagement.

Signature Date
.....

Name of Company

Annexure “B”**Agenda - Flora and Fauna Workshop****Canberra, 29 June - 2 July 1998****NPWS Queanbeyan Office 6 Rutledge St Queanbeyan
(enter through the NPWS shop)****PURPOSE AND OUTCOMES:****Fauna Workshop:**

Determine if the current regulatory regime that applies to biodiversity management can ensure fauna species will persist in the Southern RFA/CRA Region?

- * Given the outcomes of the R2D workshops (critical resource requirements of each of the identified species shown on Proforma 1 and threats on Proforma 2), are the regulatory requirements currently in place (shown on Proforma 3) adequate to ensure the species persists in the landscape?
- * Explain what resource requirements are not met, or what is over provided (and could be reduced) for each identified species.
- * Answers are to be directional not quantitative.

Flora Workshop

Identify "functional groups" of plant species, describe rule sets for the allocation of species into functional groups and recommend management strategies for the protection of functional groups across the landscape, given the regulatory requirements currently in place.

Proposed agenda for the PA4 workshop

- * Identify "functional groups" of plant species
- * Describe rule sets for the allocation of species into functional groups
- * Recommend management strategies for the protection of functional groups across the landscape, given the regulatory requirements currently in place (eg riparian buffers, rainforest protection etc).
- * If there is time - begin allocating species to the functional groups

1.1.1 Fauna and Flora Workshop

Determine if the survey design and requirements are adequate to detect the presence of the species given time and monetary constraints.

1.1.2 Workshop	1.1.3 Tuesday 29 June Lunch 1-2pm	1.1.4 Wednesday 30 June Lunch 1-2pm	1.1.5 Thursday 1 July Lunch 1-2pm	1.1.6 Friday 2 July Lunch 1-2pm
Flora	9am-5.30pm Field trip and introductory talk	9-9.30 Discuss approach* 9.30am-1pm - Identify functional groups 2-5.30pm - Identify rule sets for the allocation of species to functional groups	9am-1pm - Management recommendations for functional groups 2-5.30pm - Preliminary allocation of species (testing of rule sets)	Unable to attend.

* The approach outlined in the agenda assumes that we are considering functional groups but other approaches may be considered.

Annexure “B”**Continued**

Worksh op	Tuesday 29 June Lunch 1-2pm	Wednesday 30 June Lunch 1-2pm	Thursday 1 July Lunch 1-2pm	Friday 2 July Lunch 1-2pm
Fauna	9am-5.30pm Field Trip and introductory talk	9-11.30am - Bats (13 species) 11.30am-1pm - Arboreal mammals (6 species) 2-4pm - Terrestrial mammals (8 species) 4-5.30pm - Frogs (7 frogs)	9-10.30am - Reptiles (7 species) 10.30am-12pm - Nocturnal birds (5 species) 12-5.30pm - Diurnal birds (18 species)	Combined Workshop - Survey design and requirements

Annexure "C"

Plan for linking PA4 and Response to Disturbance expert workshops.

WORKSHOP 1		WORKSHOP 2
Part 1	Part 2	
R2D - non-spatial data	Flora and Fauna Workshop	R2D - spatial data
Aims: Identify for each fauna species: - habitat requirements - critical resources for different life-stages - vulnerability to disturbances	Aims: Review the regulatory requirements under which forestry operations are conducted including Conservation Protocols (including survey requirements) and other government requirements that benefit biodiversity (eg. Pollution Control Licence)	Aims: Review outputs from modelling
Inputs:	Inputs: • Prior to workshop: - copy of the Conservation Protocols document and other government requirements that benefit the management of biodiversity and output from flora review in the North East. • Introduction to workshop: - introductory talk explaining pre-logging survey requirements, application of the Conservation Protocols and other government requirements, logging and silvicultural practices and calculation of strike rates. Also discuss the formal and informal reserve system (NPWS and SFNSW) and its contribution to managing biodiversity. - PA4/2/2 maps for part of the region which provide in the landscape an expression of the conservation protocols and other government requirements. - field trip to demonstrate onground application of requirements i.e buffer zones etc. • Workshop: - Proforma 1: R2D Part 1 outputs for each species. - Proforma 2: Identified threats and ranking of importance. - Proforma 3: For each species it lists the prescriptions and requirements applying to that species (including those derived from the Conservation Protocols, the Pollution Control Licence and other regulations).	Inputs:
Outputs: Proforma 1: For	Outputs: For each <u>fauna species</u> , ask the question "Are these	Outputs:

each fauna species it lists critical resource requirements for each life-stage. Proforma 2: For each species list vulnerability ranking for each identified disturbance type.	<i>prescriptions and other requirements adequate to ensure this species persists in the landscape?" Is answered Likely/Unlikely.</i> - if Likely "<i>Can the prescription and requirements be reduced? (Why?)</i>" -if Unlikely "<i>What needs to be added? (Why?)</i>" Answers should be directional (i.e. more/less hollow bearing trees are required) rather than specific (i.e. requires 200m buffer). For each <u>flora species</u>: Identify "functional groups" of plant species, describe rule sets for the allocation of species into functional groups and recommend management strategies for the protection of functional groups across the landscape, given the regulatory requirements currently in place.	
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APPENDIX C

**EXPERT'S PACKAGE – SUMMARY OF THE ENVIRONMENT
PROTECTION AUTHORITIES POLLUTION CONTROL LICENCE**

STATE FORESTS POLLUTION CONTROL LICENCE

1. Introduction and Overview of the State Forests Pollution Control Licence

1.1 Introduction

Soil erosion and sedimentation associated with forestry activities need to be controlled by careful management of the logging and roading activities that cause soil disturbance, and restrictions placed on both the areas and times during which logging activities may occur. Logging and roading activities have the potential to result in diffuse (or non-point) source water pollution, and the management of these activities is an essential part of sound forest management.

State Forests has applied for, and has been issued with, a pollution control licence from the Environment Protection Authority (EPA). This licence is different from other licences issued by the EPA due to the diffuse nature of the pollution resulting from logging operations. The EPA is not able to place an effluent limit on specified discharge points for a logging or roading operation, because pollution may enter different sections of the drainage system at many varying points. This has been addressed by the development of a best management practice (BMP) licence, which seeks to implement management practices and strategies that are designed to mitigate the impacts of logging operations on the aquatic environment. This approach has been incorporated into State Forests' pollution control licence since April 1995.

The pollution control licence issued to State Forests is designed to ensure that '*effective and practical measures*' are taken to protect the aquatic environment from water pollution caused by logging operations, by either preventing the generation of sediment, or by trapping them as close to the source as possible. Operations covered by the licence include the harvesting of pulplogs and sawlogs, and any roading or burning activities associated with this harvesting.

Where State Forests seeks coverage under the pollution control licence, its logging and roading operations must be conducted in accordance with the licence. The licence addresses the following areas:

- Site-specific pre-operational planning;
- Site and soil assessments;
- Determining the inherent soil erosion and water pollution hazard (including mass movement, soil dispersibility and seasonality assessments);
- Developing site-specific techniques and management practices in accordance with the performance objectives and conditions for harvesting, roading and burning operations;
- Carrying out water quality monitoring to determine if logging operations are having an effect on water quality and the aquatic environment;
- Maintaining both an operational register, and a complaints register; and
- Developing and implementing a strategy to train State Forests and industry staff in soil and water management.

1.2. Recent Strategic Review & Improvement of the Licence

In 1996/97, the EPA undertook a strategic review of the pollution control licence held by State Forests. The purpose of the review was to ensure that the licence remains current in a changing regulatory and operational environment, and that the community remains confident that the protection of soil and water values are key components of forest management in New South Wales.

The licence issued to State Forests in March 1998 is the result of approximately 18 months of development and negotiation between State Forests and the EPA. This review and analysis of the pollution control licence examined all the key components, including:

- Site-specific planning and assessment protocols;
- Soil erosion and water pollution hazard assessment;
- Management practices for the General Harvest Area (GHA);
- Management practices for roads and drainage feature crossings; and
- Administration requirements and protocols.

Technical review of the forestry best management practices and strategies has formed an integral part of the licence revision process, particularly the development of a new system for assessing the inherent soil erosion and water pollution hazard and the best management practices that underpin the licence.

The development of the revised licence was undertaken by a technical working group with officers from the EPA, State Forests, and the Department of Land and Water Conservation (DLWC). During development and review of the licence, the EPA undertook a comprehensive review of the available technical and scientific literature relating to the impacts of logging operation on water quality, and the management practices that can be implemented to mitigate these impacts. Where required, the EPA sought independent technical advice from land management specialists.

The EPA also held briefing sessions involving other forestry stakeholders. In August 1997 the EPA briefed conservation groups, industry and union representatives on the development of the hazard assessment model in Sydney. A second briefing was provided to conservation groups in Coffs Harbour in January 1998. The purpose of this second briefing session was to advise conservation stakeholders of the process for and development of the revised licence.

1.3. Objectives of the Pollution Control Licence

The primary objective of the licence is to require that *practical measures* be taken to protect the aquatic environment from water pollution caused by logging operations.

In formulating the licence, the environmental goals that have been adopted by the EPA for all forests in NSW are protection of *aquatic ecosystems and primary contact recreation*. These goals are defined in the “*Australian Water Quality Guidelines for Fresh and Marine Waters*” (Australian and New Zealand Environment and Conservation Council, 1992). The goals were identified as applying to all forested

catchments in Australia by the *Joint Australian and New Zealand Environment and Conservation Council – Ministerial Council for Forestry Fisheries and Aquaculture National Forest Policy Statement Implementation Sub-Committee*.

For areas where the quality of water extracted for agricultural water supply or drinking water supply may be affected by logging operations upstream, the EPA has adopted these environmental values as additional goals for protection.

The second objective of the licence is to ensure monitoring of the effectiveness of the licence conditions in achieving the relevant environmental goals.

1.4. Audit Program

The EPA is committed to conducting an active audit program of State Forests' logging operations. This audit program will provide a strategic compliance approach to ensure that State Forests is taking the required practical measures to protect the aquatic environment.

The audit and enforcement program will be carried out in an integrated and planned manner, with pre-determined audit objectives and outcomes. The aims of the EPA's audit and enforcement program are to:

- Assess State Forests compliance with the relevant environmental legislation and instruments;
- Review the usefulness of existing statutory instruments in terms of their:
 - Appropriateness to the site or operation type;
 - Consistency of interpretation and implementation by State Forests;
 - Legal enforceability; and
 - Environmental effectiveness.
- Ensure that the monitoring and enforcement activities of the EPA Forestry Unit are open and accessible to forest stakeholders; and
- Provide a feedback mechanism for the continued development and improvement of the licence.

In addition to auditing State Forests' compliance with licence conditions, the EPA will also be examining logging operations where State Forests has not sought coverage under the pollution control licence to ensure that such operations are not resulting in breaches of the *Clean Waters Act 1970*.

An effective audit strategy will allow the EPA to demonstrate to forestry stakeholders that the licence is operating effectively, and that State Forests is adhering to the conditions of the licence and is operating in accordance with the *Clean Waters Act 1970*.

2. COMPONENTS OF STATE FORESTS' POLLUTION CONTROL LICENCE

The pollution control licence sets the administrative, legislative, planning and operational context in which State Forests must operate when under the coverage of the licence. The key management procedures and measures specified in the licence are:

- Site-specific planning and assessment protocols (Schedule 2);

- Soil erosion and water pollution hazard assessments (Schedule 3);
- Management practices for the General Harvest Area (Schedule 4); and
- Management Practices for roads and drainage feature crossings (Schedule 5).

2.1. Site-specific planning and assessment protocols (Schedule 2)

2.1.1. Schedule 2 (Part A)

Appropriate pre-operational planning and assessment must support effective implementation of a BMP licence. In accordance with the licence, State Forests must develop site-specific management prescriptions to mitigate against water pollution resulting from logging operations. The development of these site-specific management prescriptions, including the factors considered in the planning process, must be documented and recorded by State Forests. The environmental and operational factors that must be considered are described below.

Environmental Features

The environmental features to be considered (where applicable) by State Forests during pre-operational planning are grouped into the following categories:

- Climate;
- Geology;
- Soil regolith;
- Landform;
- Hydrology; and
- Vegetation and ground cover management.

Operational Systems

The operational systems to be considered (where applicable) by State Forests during pre-operational planning are grouped into the following categories:

- **New Road Construction:** includes planning information relevant to new road construction, such as the length of new road to be constructed, width of the road, ground slope and grade of the road, batter heights, sediment trapping or soil erosion and sediment control devices to be used, stabilisation techniques, stabilisation assessment interval, etc.
- **Existing Roads:** includes the length of roading to be used in the operation, an assessment of past or present erosion, road width and clearing, road drainage structures, batter heights, etc.
- **Construction of New Drainage Feature Crossings:** including crossing type, location, techniques to prevent the deposition of spoil material into the drainage feature, stabilisation techniques, soil erosion and sediment control techniques, etc. Specific planning requirements are specified for culverts, bridges and causeways.
- **Existing Drainage Feature Crossings:** includes crossing type, location, approach reforming and location of drainage structures, soil erosion and sediment control techniques, etc. Specific planning requirements are specified for existing culverts, bridges and causeways.
- **Borrow Pits & Gravel Pits:** includes location, stabilising, proximity to drainage features and techniques to drain the pits.
- **Harvesting Factors:** includes basic operational planning data, such as timber removal rate (volume/ha), gross, net and harvestable area of the compartment,

canopy retention rates, method of felling and extraction, exclusion areas and seasonal restrictions.

-
- **Log Dumps & Log Landings:** location and loading method.
- **Post-logging Burning:** seasonal timing and method of ignition of the burn.

Based on this information, State Forests must develop site-specific conditions to mitigate soil erosion and water pollution associated with the proposed operation. These site-specific conditions must deal with issues such as crossing of drainage features, road construction, upgrading, maintenance and drainage, filter strips and buffer strips, log dumps and log extraction, and soil stability, soil erosion and sediment controls, etc.

2.2. Schedule 2 (Part B)

Determination of Stream Order for Drainage Feature Protection

This section describes the process by which stream order is to be determined within the area of the proposed logging operations. Determination of stream order is an essential step in setting the level of filter strip protection around drainage lines and watercourses. The method for assigning stream order is based on the system proposed by Strahler (1964). This method of stream order determination is the same system required by the National Parks and Wildlife Service (NPWS) under the conservation protocols.

2.3. Schedule 2 (Part C)

Design Methods for Crossings and Drainage Structures

The pollution control licence requires that State Forests design roads, drainage feature crossings and drainage structures to be stable and effective for the peak discharge for a specified recurrence interval. The design specifications required in the licence are consistent with those required in the Standard Erosion and Mitigation Guidelines for Logging (Department of Conservation and Land Management, 1993).

- **Design of Bridges, Culverts and Causeways:** specifies the method for determining the design calculation for bridge, culvert and causeway crossings.
- **Design of Road and Snig Track Drainage Structures:** specifies the method for determining the design calculations and equations to be used for determining the capacity of road and snig track drainage structures.

2.4. Soil erosion and water pollution hazard assessments (SCHEDULE 3).

This schedule specifies the methods to be used by State Forests for assessing the soil erosion and water pollution hazard associated with logging operations. The methods and procedures contained in this schedule include the data requirements, data sources, and the method of calculating soil erosion and water pollution hazard. The four assessment modules contained in this schedule are:

- Inherent soil erosion and water pollution assessment;

- Mass movement assessment;
- Dispersibility assessment, and
- Seasonality.

All four modules must be applied by State Forests prior to the commencement of logging operations. State Forests must take an environmentally conservative approach when undertaking these assessments. This schedule also includes the updating procedure to be used for operations approved under previous versions of this licence.

2.5. Management practices for the General Harvest Area (SCHEDULE 4).

This schedule specifies the operating conditions for logging operations. The schedule is structured to provide environmental outcomes that State Forests must achieve, and site-specific techniques that must be developed and applied by State Forests to ensure that the environmental outcomes are achieved. The operating conditions are grouped into the following eight sections:

- **Site-specific Conditions:** prior to the commencement of logging operations, State Forests must develop site-specific conditions to achieve the environmental outcomes specified in this schedule. These site-specific conditions must be changed if, during logging operations, it becomes apparent that the environmental outcomes specified in this schedule are not being achieved.
- **Maximum Slope Limits:** specifies the maximum slope limits for harvesting, and for machinery entry into harvest areas.
- **Seasonality Restrictions:** specifies the periods during which logging is not permitted in areas that have seasonally high rainfall erosivities.
- **Protection of Drainage Features:** specifies the minimum filter strip widths that must be retained along all drainage lines, swamps, wetlands, prescribed streams and watercourses, and the minimum buffer strip width for drainage depressions.
- **Operations within Native Forest Filter Strips:** specifies the operations that must be excluded from filter strips. This includes the prohibition of felling trees in or into filter strips and the exclusion of harvesting machinery unless for the construction and use of a drainage feature crossing.
- **Operations within Native Plantation Filter Strips:** specifies the operations that may occur in filter strips. This includes canopy retention of 50% within the filter strip, and thinning of plantation in the filter strip. Trees must not be felled into filter strips, and machinery must not enter except for the construction or use of a drainage feature crossing.
- **Operations within Softwood Plantation Filter Strips:** specifies the operations that may occur in softwood plantation filter strips, including felling trees within filter strips. State Forests must act to prevent felling of trees into drainage features, and remove substantial debris from watercourses.
- **Operations within Buffer Strips for Native Forests, Native Plantation & Softwood Plantations:** specifies the requirements for earthworks and machinery operating in the buffer strips.
- **Borrow Pits and Gravel Pits:** specifies the management and location of the pits.
- **Log Dumps:** specifies the management of surface runoff from the dumps, together with the locating of log dumps in relation to drainage features etc, debris management around log dumps, and restrictions on the use of log dumps during wet weather.

- **Burning:** criteria for appropriate timing of post-harvest burning.
- **Snig Tracks and Extraction Tracks:** specifies the management of extraction tracks, including the placement of spoil, crossing of drainage features, and soil and gravel management around bridges, culverts and causeways. Temporary crossings, drainage of extraction tracks, management of dispersible soils, wet weather restrictions and downhill snigging are also covered.
- **Storage and Handling of Hazardous Substances and Waste:** specifies the management of wastes other than logging slash generated during logging operations.

2.6. Management practices for the Roads and Crossings (SCHEDULE 5).

This schedule sets out the operating conditions for roads associated with logging operations. In a similar manner to Schedule 4, this schedule is structured to provide environmental outcomes that State Forests must achieve, and site-specific techniques that must be developed and applied by State Forests to ensure that the environmental outcomes are achieved. The operating conditions are grouped into the following eight sections:

- **Site-specific Conditions:** prior to the commencement of logging operations, State Forests must develop site-specific conditions to achieve the environmental outcomes specified in this schedule.
- **Roads:** considers various physical parameters of road planning, including the location of roads, maximum grade, clearing either side, and the management of debris associated with road construction.
- **Road Drainage:** includes the minimum capacity for drainage structures, maximum distance of water flow along road surfaces and table drains, minimum routine inspection periods, and documentation of remedial action. Guidance notes are provided.
- **Wet Weather Restrictions:** haulage must cease where there is runoff from the road.
- **Blading Off Roads:** specifies conditions for carrying out blading off of roads.
- **Maximum Slopes for Roads:** specifies the maximum ground slopes for roads.
- **Mass Movement Hazard:** specifies additional management techniques that must be followed where road construction is proposed in an area identified in Schedule 3 as having a mass movement hazard.
- **Road Batters:** specifies the stabilisation of road batters, and management of batters that intrude into filter strips. Guidance notes are given.
- **Road Crossings within 30 Metres of Drainage Features:** specifies the management of road drainage between 5 and 30m from the crossing. Guidance notes are given.
- **Drainage Feature Crossings:** specifies the minimum design capacity and types of crossings is given, together with the management of disturbed areas around crossings, spoil disposal, soil stabilisation, and maximum times to complete stabilisation work. Additional management techniques are given for bridges, culverts and causeways.

3. CONCLUSION

The pollution control licence represents a significant shift from detailed prescriptive licensing towards a more performance based licence. This approach provides the basis

of an environmental management regime within which State Forests has greater accountability and responsibility for the planning and implementation of its logging operations.

The main advantages of this shift is that it allows State Forests to focus its resources on the implementation of BMPs in the field and for the EPA to focus on auditing State Forests' performance.

The EPA is committed to reviewing the key components as specified in the licence including the hazard assessment model, the water monitoring program and the BMP conditions to ensure that practical measures are being undertaken to protect the aquatic environment from water pollution caused by logging operations.

STATE FORESTS' POLLUTION CONTROL LICENCE **– SUMMARY OF PROTECTIVE MEASURES**

GENERAL HARVEST AREA AND ROAD MANAGEMENT

Soil erosion and sedimentation associated with forestry activities need to be controlled by careful management of the logging and roading activities that cause soil disturbance, and restrictions placed on both the areas and times during which logging activities may occur. Logging and roading activities have the potential to result in diffuse (or non-point) source water pollution, and the management of these activities is an essential part of sound forest management.

The licence provides State Forests with performance standards to minimise soil erosion associated with logging and roading operations. The EPA's approach has been to manage diffuse source pollution by encouraging pollution control at the source. This is achieved through the adoption of "*best management practices*" (BMPs). State Forests licence is designed to ensure that effective and practical measures are taken to protect the aquatic environment from pollution caused by logging operations by preventing the generation of pollutants and trapping any that were generated as close to the source as possible.

FILTER STRIPS

Filter strip means a strip of vegetation or groundcover along each side of a watercourse or drainage line retained for the purposes of:

- a) retarding the lateral flow of runoff and facilitating its infiltration into the soil, thereby causing deposition and filtration of transported material, and reducing sediment movement into the stream; and
- b) retarding sediment movement into the stream by minimising ground disturbance which may reduce infiltration and concentrate water; and
- c) reducing the risk of erosion of the channel and bank.

The licence ensures that undisturbed filter strips are retained along all drainage lines, prescribed streams, watercourses as well as wetlands and swamps. The width of filter strips beside drainage lines, prescribed streams and watercourses is determined by stream order and an assessment of the inherent soil erosion and water pollution hazard in accordance with the licence (Table 1). The width of filter strips around wetlands and swamps is based on the total area of the wetland or swamp (Table 2).

Inherent soil erosion and water pollution hazard means the potential for soil erosion and water pollution to occur in an area as a result of forestry activities, and takes into account rainfall erosivity, soil erodibility (and dispersibility), slope, mass movement, existing erosion, groundcover and intensity of forestry activities. Inherent soil erosion and water pollution hazard is determined in accordance with Schedule 3 of the Pollution Control Licence.

Table 1: Minimum filter strip width for mapped and unmapped drainage lines, prescribed streams and watercourses in native forests, native plantations and softwood plantations (metres - measured along the ground surface).

Stream Order	Inherent Hazard Level 1	Inherent Hazard Level 2	Inherent Hazard Level 3
Unmapped	10	10	15
1st order	10	15	20
2nd order	15	20	25
3rd order or greater	20	25	30

Table 2: Minimum filter strip width for mapped and unmapped wetlands and swamps in native forests, native plantations and softwood plantations (metres - measures along the ground surface).

Total Area of Wetlands or Swamps (ha)		
	0.01 - 0.5 ha	Greater than 0.5 ha
Wetlands or Swamps	10	40

BUFFER STRIPS

Buffer strip means a strip along each side of a drainage depression in which soil disturbance during forestry activities must be prevented to the greatest extent practicable.

The licence also ensures that buffer strips with a minimum width of five metres are retained along all drainage depressions. Machinery may operate in buffer strips under certain conditions which ensure that soil disturbance is minimised.

SLOPES

Ground based harvesting is not permitted on slopes greater than 30°. On sites of high Inherent hazard (above), this gradient may be reduced.

APPENDIX D

EXPERT'S PACKAGE – EXAMPLES OF WORKSHOP PROFORMAS

Example of Proforma 1

Requirements of species X. The information on this proforma was to be distilled from the Response to Disturbance workshop and used as background information for the ESFM workshop.

Species: Bird species X						
Habitat	General	Breeding	Juvenile	Feeding	Shelter	Dispersal
Woodlands						
Open forest						
Dry forest						
Wet forest						
Rainforest						
Riparian strips						
Ecotone						
Thickets						
Hollows						
Drainage lines						
Gullies						
Logs						
Mature trees						
Large branches						
Woody debris						
Flat/ridgy soils						
Sparse cover						
Dense understorey						
Dense cover						
Comments						

Example of Proforma 2

Identification of threats and ranks awarded to them. The information on this proforma was to be distilled from the Response to Disturbance workshop and used as background information for the ESFM workshop.

Species X	Threat	Ranked threats	Comments
1080 baiting			
Apiary – competition for hollows			
Barbed Wire Fences			
Bridge removal (bats)			
Bush rock collection			
Clearing – for agriculture			
Clearing – fragmentation			
Clearing – loss of habitat			
Clearing – partial for grazing			
Clearing – riparian vegetation			
Climate change			
Direct disturbances to roosts/camps			
Disease			
Drainage of swamps			
Fire – changed regimes			
Fire – frequency			
Fire – hazard reduction/prescribed			
Fire – reduction of prey species			
Fire – wild			
Firewood collection			
Grazing – associated fire			
Grazing – eutrophication			
Grazing – reduction of understorey			
Grazing – trampling			
Habitat modification			
Human – hunting/killing/shooting			
Human – illegal trapping			
Human – interference/disturbance			
Hydrology - change			
Introduced species - competition			
Introduced species - habitat destruction			
Introduced species - predation			
Introduced species - weed invasion			
Logging – increase in structural density			
Logging – loss of foraging habitat			
Logging – loss of tree hollows			
Logging – loss of understorey			
Logging – reduction of age classes			
Logging – reduction of litter			
Logging – reduction of nest trees			
Logging – reduction of particular forest types			
Logging – reduction of prey species			
Logging – reduction of soil moisture			
Logging – removal of critical tree size			
Logging – siltation			
Logging – thinning			
Pasture improvement and cropping			
Pollution – chemicals (pesticides)			
Powerlines			
Roading – fragmentation			
Roading – siltation			
Roadkills			
UV radiation			

Example of Proforma 3

Example of Proforma 3: Summary of protective measures applicable to terrestrial species X. This Proforma was to be used in the ESFM terrestrial workshop.

Species: Species X
General requirements: (tick those that apply) ☐ Reserve Systems: eg National Parks, Nature Reserves and Wilderness Areas Pollution Control Licence (conditions to manage diffuse source water pollution, including): ☐ Filter strips of undisturbed vegetation along drainage lines, prescribed streams, watercourses, wetlands and swamps, where the width of the filter strip is determined by stream order and "inherent soil erosion and water pollution hazard". "Inherent soil erosion and water pollution hazard" means the potential for soil erosion and water pollution to occur in an area as a result of forestry activities, and takes into account rainfall erosivity, soil erodibility (and dispersibility), slope, mass movement, existing erosion, ground cover and intensity of forestry activities. ☐ Buffer strips of a minimum of 5m along each side of all drainage depressions in which soil disturbance during forestry activities are prevented to the greatest extent practicable. ☐ Forestry activities prevented on slopes greater than 30 degrees. SFNSW Management Practices: ☐ Forest Management Zoning - based on National Forest Reserve Criteria (JANIS). ☐ Fuel Management - by using prescribed burning to remove fine fuel and, therefore, minimise the occurrence of wildfires. There is no prescribed burning in rainforest. Prescribed burning of commercial sub-alpine forest is confined to narrow defined. ☐ Fire Suppression - in emergency situations to protect life, property, community assets and forest values. Includes establishment of fire breaks (as above) where necessary. ☐ Silviculture - single tree selection, group tree selection. Conservation Protocols: ☐ High Conservation Value Old Growth - forestry activities and harvesting machinery prohibited with HCVOG. ☐ Rainforest - harvesting excluded and existing protective prescriptions remain for Rainforest. A 20m wide buffer around all RN17 warm temperate rainforest. ☐ Rare non-commercial forest types - forestry activities (except road reopening) and harvesting machinery prohibited. ☐ Tree retention (non-regrowth zone) - Minimum of 10 hollow-bearing trees retained per 2ha of net logging area. Minimum of 10 recruitment trees retained per 2ha of net logging area. ☐ Tree retention (regrowth zone) - Minimum of 10 hollow-bearing trees retained per 2ha of net logging area where they occur (if < 10 available, retain all). Retain 1 recruitment tree for each hollow bearing tree retained. ☐ Stag retention - Must be retained in areas outside the net harvesting area and visual protection strips and elsewhere where safe to do so. ☐ <i>Allocasuarina</i> stands, and flowering or fruiting <i>Banksia</i> spp and <i>Xanthorrhoea</i> spp. - minimise damage. ☐ Eucalypt feed trees - Minimum 4 mature winter flowering trees per 2 ha (may be also counted as a hollow-bearing tree or recruitment tree). ☐ Riparian buffers - forestry activities (except roads when there is no alternative route) excluded from exclusion zones of 10m either side of 1st order streams, 20m either side of 2nd order streams, 40m either side of 80% of 3rd or higher order streams. ☐ Corridors – each 500ha of State Forest must include either 2 exclusion zones of at least 40m wide which connect 2nd order streams, OR one exclusion zone at least 80m wide which connects 3rd order streams. Forestry activities (except roads when there is no alternative route) excluded. ☐ Wetlands – forestry activities excluded from within all wetlands, and from exclusion zones of 10m around wetlands < 0.5ha, 20m around wetlands between 0.5 and 2.0ha, and 40m around all SEPP14 wetlands and other wetlands > 2.0ha. ☐ Heath and Scrub - forestry activities prohibited within, and 20m around, all areas > 0.2ha. ☐ Rocky outcrops and cliffs - forestry activities prohibited within, and 20m around, all areas > 0.1ha. ☐ Grazing management plans, Weed and Feral Predator Control Plans to be implemented. ☐ Hazard reduction burning to: consider requirements of threatened species in the area, maintain an understorey mosaic, minimise impact to large fallen logs. ☐ Firewood collection only permitted within 20m of a road or log-dump, not in exclusion zones, and must be < 40cm diameter. ☐ Ground Habitat - SFNSW must protect, as far as possible, understorey vegetation, ground cover vegetation, leaf litter and fallen timber.
Targeted species-specific prescriptions:
Non-target prescriptions:
Are these prescriptions and other requirements adequate to ensure this species persists in the landscape? (likely or unlikely?)
If "likely", what elements of the prescriptions and requirements can be reduced? If "unlikely", what elements of the prescriptions and requirements need to be added or increased?

Example of Proforma 4

Example of Proforma 4: Summary of protective measures applicable to aquatic species X. This Proforma was to be used in the ESFM aquatic workshop.

Aquatic Species

Protective measures:

___ Reserve System: eg National Parks, Nature Reserves and Wilderness Areas

Pollution Control Licence (conditions to manage diffuse source water pollution, including):

___ Filter strips of undisturbed vegetation along drainage lines, prescribed streams, watercourses, wetlands and swamps, where the width of the filter strip is determined by stream order and "inherent soil erosion and water pollution hazard".

"Inherent soil erosion and water pollution hazard" means the potential for soil erosion and water pollution to occur in an area as a result of forestry activities, and takes into account rainfall erosivity, soil erodibility (and dispersibility), slope, mass movement, existing erosion, ground cover and intensity of forestry activities.

___ Buffer strips of a minimum of 5m along each side of all drainage depressions in which soil disturbance during forestry activities are prevented to the greatest extent practicable.

___ Forestry activities prevented on slopes greater than 30 degrees.

SFNSW Management Practices:

___ Forest Management Zoning - based on National Forest Reserve Criteria (JANIS).

___ Fuel Management - by using prescribed burning to remove fine fuel and, therefore, minimise the occurrence of wildfires. There is no prescribed burning in rainforest. Prescribed burning of commercial sub-alpine forest is confined to narrow defined areas.

___ Fire Suppression - in emergency situations to protect life, property, community assets and forest values. Includes establishment of fire breaks (as above) where necessary.

___ Silviculture - single tree selection, group tree selection.

NPWS Conservation Protocols:

___ High Conservation Value Old Growth - forestry activities and harvesting machinery prohibited with HCVOG.

___ Rainforest - harvesting excluded and existing protective prescriptions remain for Rainforest. A 20m wide buffer around all RN17 warm temperate rainforest.

___ Rare non-commercial forest types - forestry activities (except road reopening) and harvesting machinery prohibited.

___ Riparian buffers - forestry activities (except roads when there is no alternative route) excluded from exclusion zones of 10m either side of 1st order streams, 20m either side of 2nd order streams, 40m either side of 80% of 3rd or higher order streams.

___ Wetlands - forestry activities excluded from within all wetlands, and from exclusion zones of 10m around wetlands < 0.5ha, 20m around wetlands between 0.5 and 2.0ha, and 40m around all SEPP14 wetlands and other wetlands >2.0ha.

___ Grazing management plans, Weed and Feral Predator Control plans to be implemented.

___ Hazard reduction burning to: consider requirements of threatened species in the area, maintain an understorey mosaic, minimise impact to large fallen logs.

___ Ground Habitat - SFNSW must protect, as far as possible, understorey vegetation, ground cover vegetation, leaf litter and fallen timber.

NSW Fisheries Licence Conditions:

___ Grazing management plans considering aquatic habitat protection.

___ Road Management plans including matters relating to ESFM, and practical measures to protect water quality, aquatic habitats, fish species, and threatened species.

___ Riparian protection - forestry activities (except roads when there is no alternative route) excluded from exclusion zones of 10m either side of 1st order streams, 20m either side of 2nd order streams, and 30m either side of 3rd or higher order streams. No machinery may enter exclusion zones, and trees accidentally felled into an exclusion zone must not be removed. An additional 20m buffer zone must be added to the outside of exclusion zones around 3rd or higher order streams. Machinery in buffer zones must not operate when the soil is saturated, and operates under restricted conditions at other times. Earthworks are prevented in buffer zones (except for roading).

___ Wetland protection - forestry activities excluded from exclusion zones of 10m around wetlands < 0.5ha, 20m around wetlands between 0.5 and 2.0ha, and 40m around all SEPP14 wetlands and other wetlands >2.0ha.

___ Other water bodies - 10m buffer zone around any pond or dam.

___ Aquatic habitat protection - 3 Classes of aquatic habitat are defined in Condition 8 of the Licence. Construction and replacement of crossings, and other in-stream activities, are restricted depending on the level of protection applied to each Class of aquatic habitat.

___ In-stream protection - in addition to the above, in-stream works must be designed and constructed in a manner which prevents habitat loss, changes in sediment transport and stream siltation, disturbance to the bed and banks of the stream and to maintain natural flow (snag management) extent practicable.

Are these prescriptions and other requirements adequate to ensure this species persists in the landscape? (likely or unlikely?)

If "likely", what elements of the prescriptions and requirements can be reduced?

If "unlikely", what elements of the prescriptions and requirements need to be added or increased?

Explanation of Fauna Proformas

There are 3 draft proformas attached to demonstrate the format and style of information that will be the output of the Response to Disturbance and Review of Protective Measures (ESFM) workshops –

1. The first proforma is a summary of the critical habitat requirement information provided in the Response to Disturbance workshops. In the ESFM workshops this summary will serve as a reminder of what was discussed the previous week, and provide a consolidation of the available information in tabulated form. The spreadsheet will be adjusted to accommodate the information presented.
2. The second proforma is a summary of identified threats, and their ranks of perceived importance.
3. The third proforma is the summary of general and species-specific conservation measures currently in place across the Southern Region. ESFM Terrestrial Workshop participants will be asked to assess if the regulatory requirements affecting each terrestrial fauna species, are enough to ensure the species persists in the landscape. This proforma is to be included in the terrestrial workshop.
4. The fourth proforma is a summary of general conservation measures currently in place across the Southern Region. ESFM Aquatic Workshop participants will be asked to assess if the regulatory requirements affecting each aquatic fauna species, are enough to ensure the species persists in the landscape. This proforma is to be included in the aquatic workshop.

APPENDIX E

**EXPERT'S PACKAGE – CONSERVATION PROTOCOLS FOR TIMBER
HARVESTING ON STATE FORSTS FOR THE DURATION OF THE IFA
DECISION**

CONSERVATION PROTOCOLS

FOR TIMBER HARVESTING ON STATE FORESTS FOR THE DURATION OF THE IFA DECISION

NPWS

SFNSW

29 November 1996

**Amendments to the Conservation Protocols (26 November 1996)
for the ESFM Project Area 4 Workshops
Queanbeyan 29 June to 2 July 1999.**

The following amendments to the Conservation Protocols are to be considered in the review of Protective Measures:

Wetlands:

- 8 Specified forestry activities are prohibited in all wetlands, irrespective of the size of the wetland.
- 9 Exclusion zones of at least 10 metres wide must be implemented around all wetlands less than 0.5 ha (approx. 70m x 70m) surface area.
- 10 Exclusion zones of at least 20 metres wide must be implemented around all wetlands between 0.5 ha (approx. 70m x 70m) and 2.0 ha (approx. 150m x 150m) surface area.
- 11 Exclusion zones of at least 40 metres wide must be implemented around all SEPP14 wetlands irrespective of size, and other wetlands greater than 2.0 ha surface area.
- 12 The area of wetlands, and exclusion zones around wetlands, must be measured from the edge of the current saturated zone or from the outer edge of where the vegetation type indicates a wetter micro-environment, whichever is larger.
- 13 Wetlands less than 0.5 ha surface area must be marked in the field for protection and recorded as accurately as possible on harvest plan operational maps.
- 14 Grazing and associated burning should be excluded from wetlands.

Heath and Scrub:

- 8 Specified forestry activities are prohibited from all areas of heath and scrub greater than 0.2 ha (approx. 45m x 45m) surface area.
- 9 Exclusion zones of at least 20 metres wide must be implemented around all heath and scrub of more than 0.2 ha surface area.
- 10 The area of heath and scrub, and exclusion zones around heath and scrub, must be measured from the outer edges of heath and scrub.

Rocky outcrops and Cliffs:

- 8 Specified forestry activities are prohibited within areas of rocky outcrops and cliffs.
- 9 In addition, exclusion zones of at least 20 m wide must be implemented around all rocky outcrops more than 0.1 ha (approx. 30m x 30m), and all cliffs.

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8 INTRODUCTION

1.1 1992 National Forest Policy Statement

The National Forest Policy Statement (1992) instigated a change in the national and state government approach to forest management. This document forms part of the interim arrangements for implementing this policy within New South Wales.

8.2 Interim Assessment

To achieve the goals of the National Forest Policy Statement, New South Wales has undertaken a process to identify areas potentially required for a reserve system. In April/May 1996 the Interim Assessment Process (IAP) identified key areas that may be required for the establishment of a reserve system, and those areas required for, and remaining available for, maintaining a sustainable native forest industry in the period leading up to the conclusion of Regional Forest Agreements. In the areas managed for sustainable production, the Government determined that a series of protocols were required to be established to protect conservation values. In particular, threatened species of flora and fauna, rare forest types, old growth forest, and rainforest were identified as key environmental values that would require explicit protocols for their management in production forests.

8.2 Forestry Decision

The NSW Government has made a decision which set aside the interim deferred forest area (IDFA) and also established a process for ensuring the conservation of rare non-commercial forest types, old growth, rainforest, and threatened species. Protocols were required to be developed for harvest planning both outside and inside the IDFA for each of these subjects by 29 November 1996. Any harvesting within IDFA compartments must be agreed to by the relevant Harvesting Advisory Board or, during the transitional period, by a committee of representatives from the NPWS, SFNSW and RACAC. The concurrent part of the decision was a commitment by Government to provide agreed levels of resources to the timber industry.

A set of principles for the development of threatened species protocols were identified as part of the Government decision. These included:

- i) prescriptions will only be applied for those species which are at risk from harvesting operations;
- ii) prescriptions will take proper and realistic account of:
 - extent of reserved habitat
 - extent of additional habitat protected by IDFA
 - whether prescriptions can be applied in an operational forest environment; and
 - the relative conservation status (ie endangered versus vulnerable) of each species.
- iii) prescriptions will be based, wherever possible, on conservation strategies built on catchment or bioregional units, rather than forestry compartments;
- iv) prescriptions will take account of habitat protected through PMPs, EPA licences conditions and the like so they do not replicate that protection;

- v) prescriptions will be derived, wherever possible, to provide benefits to more than one species rather than having a system of overlapping single-species prescriptions;
- vi) prescriptions will avoid, wherever possible, simply excluding harvesting activities within buffer zones designated around species' records;
- vii) prescriptions will provide for regional variability within a species if it is relevant;
- viii) prescription will be based on best available information.

8.2 Consultation

A draft of these protocols was completed and circulated on 12 November 1996 to representatives of State and Commonwealth Government agencies, the forest industry, the union, and conservationists. A joint meeting was held on Wednesday 19 November 1996 at which these groups had the opportunity to present and discuss any concerns they may have had with the protocols. A range of concerns were stated. A further meeting between State Forests of NSW (SFNSW), the National Parks and Wildlife Service (NPWS) and Department of Urban Affairs and Planning (DUAP) staff was convened to address those concerns to the extent possible within the principles of the Cabinet decision.

8.2 Rare Non-commercial Forest Type Protocol

The Cabinet decision required a conservation protocol to be developed to protect rare non-commercial forest types. The protocol was not to restrict access to commercial rare forest types. Rare forest types as a whole were identified, and then those that had commercial value were excluded.

8.2 Old Growth Forest Protocol

The Cabinet decision required a protocol to be developed to protect old growth forest. This protocol uses the results of the Broad Old Growth Mapping Project conducted as part of the IAP, as the primary indicator of candidate old growth. The protocol continues to utilise the previously determined field validation techniques with some minor alterations.

8.2 Rainforest Protocol

The Cabinet decision required a protocol to be developed for the protection of rainforest. The attached protocol identifies rainforest as that mapped under the Broad Old Growth Mapping Project and/or that mapped under the SFNSW Research Note 17 (RN 17) forest type mapping. Buffer zones are provided for rainforest within the IDFA areas and for warm temperate rainforest outside the IDFA areas.

8.2 Threatened Species Protocol

The *Threatened Species Conservation Act 1995* applies to harvesting in state forests. The Cabinet decision required a protocol to be developed for the protection of threatened species in state forests. It is intended that the attached protocol, which only addresses species considered at risk from forest activities, will provide the basis for licensing of forest activities in state forests by the NPWS under the *Threatened Species Conservation Act 1995*.

8.2 Implementation

It is desirable that these protocols be implemented as soon as possible. However, it is recognised there are practical problems with regard to altering harvesting plans and undertaking other actions,

such as surveys, which may be required. A series of transitional arrangements have therefore been outlined for the implementation of these protocols in section 8 of this document.

8.2 Review and Monitoring

Whilst every effort has been made to ensure these protocols meet the intent of the Cabinet decision, it is recognised that some monitoring and review of this will be required. A review date of June 30, 1999 applies to all protocols, with the opportunity for prior review should SFNSW and the NPWS jointly agree to do so. There is also a requirement for joint monitoring of the effects of these protocols to be developed by SFNSW and the NPWS.

8 RARE NON-COMMERCIAL FOREST TYPE PROTOCOL

2.1 General

This protocol protects non-commercial forest types that are rare.

8.2 Identification of Rare Non-commercial Forest Types

The identification of Northern and Central Study Areas forest types in Table 2.1 will be based on typing done to Research Note 17 standard.

The identification of Southern Study Area forest communities in Table 2.2 will be as identified on the ground by harvest planning. Where forest typing has been modelled rather than mapped according to Research Note 17, the forest types listed will be identified, mapped and protected during harvest planning.

Table 2.1: Protected Rare Non-commercial Forest Types, Northern and Central Study Areas

Forest Type Number	Forest Type Name
211	River Oak
30	Swamp Mahogany
31	Paperbark
32	Swamp Oak
33	Mangrove
42	Blackbutt-Sydney Peppermint-Smooth Barked Apple
51 *	Dunn's White Gum (Except in N1)*
52	Round-leaved Gum (Except in Central Study Area)
63	Woollybutt
64/1	Grey Gum-Stringybark (Except in Central Study Area)
66	Grey Ironbark Stringybark
82/1	Grey Box (Except in Central Study Area)
94	
96	no name (In Northern Zone Areas only)
98	Dorrigo White Gum
101	Blue Mountains Ash
103	Apple Box
104	Longleaved Box
105/1	Smoothbarked Apple
105/2	Smoothbarked Apple
107	Banksia
109	Brittle Gum
110	Brittle Gum – Peppermint

Table 2.1 continued

Forest Type Number	Forest Type Name
115	Sydney Peppermint-Stringybark (Except in Central Study Area)
119	Scribbly Gum-Bloodwood (Except in Central Study Area)
125	Red Stringybark – Scribbly/Brittle Gum
127	Stringybark – Smoothbarked Apple
129/1	Rough-barked Apple
129/2	Rough-barked Apple
130	Red Bloodwood
131	Peppermint-Mountain/Manna Gum
136	Snow Gum - Black Sallee
137	Black Sallee
141	Candlebark
162	White Ash
164	Eurabbie
171	Yellow Box
172	Yellow Box-White Box
175	White Box
176	White Box – Stringybark
178	Western Red Gums
180	Black Cypress Pine
182	Black Cypress Pine - Box
203	Western Box
204	Ironbark - Western Box
207	Silverleaved Ironbark
213	Bull Oak
214	Wattle
215	Coast Cypress Pine
225	Mallee

* For forest type 51, in N1 access is to be considered by the Harvesting Advisory Board

Table 2.2: Protected Rare Non-Commercial Forest Communities, Southern Study Area

Forest Communities
<i>Acacia glaucescens</i>
<i>Acacia sylvestris</i>
<i>Allocasuarina verticillata</i>
<i>Casuarina cunninghamiana</i>
<i>Casuarina glauca</i>
<i>E. pulverulenta</i>
<i>E. robusta</i> (Southern)
<i>E. sideroxylon</i> - <i>E. macroryncha</i>

Forest Communities
<i>E. stenostoma</i>
<i>E. paliformis</i>
<i>Eucalyptus camphora</i>
<i>Eucalyptus cinerea</i>
<i>Eucalyptus macarthurii</i> - <i>E. radiata</i>
<i>Eucalyptus perriniana</i>
<i>E. melliodora</i> - <i>E. blakelyi</i>
<i>E. albens</i>

<i>E. melliodora</i> - <i>E. microcarpa</i> – <i>Callitris glaucophylla</i>
<i>E. camaldulensis</i>
<i>E. tereticornis</i>

8.2 Protection of Rare Non-commercial Forest Types

The forest types listed in Table 2.1 will be protected from timber harvesting activities, in the Northern and Central Study Areas. The forest communities listed in Table 2.2 will be protected from timber harvesting activities in the Southern Study Area.

- Protection will be afforded by timber harvesting exclusion prescriptions documented in the harvest plan.
- Where possible roading should avoid these forest types.

8 OLD GROWTH FOREST PROTOCOL

3.1 General

This protocol replaces the one dated 18 September 1995 signed by the Chief Executive Officers of SFNSW and the NPWS.

This protocol applies to all areas other than the Eden Management Area (see explanatory notes).

8.2 Identification of Old Growth Forest

Likely Old Growth Forest is as defined in this Table 3.1 (from Table 3.10: Environmental site quality classes and allocation of API growth stage codes. BOGMP FINAL REPORT 9 August 1996).

Table 3.1: Classification of Old Growth Forest

Growth Stages Representation	Environmental Site Quality			
	High and Moderate (typical)	High/moderate (atypical)	Low	Very Low
Likely Old Growth Forest	sA, tA, tB + y if logged > 30 years ago	sA, tA, tB, tC + y if logged > 30 years ago	sA, sB, sU, tA, tB, tC, tU + y if logged > 30 years ago	uA, uB, uC*, uU, sA, sB, sC, sU, tA, tB, tC, tU + y if logged > 30 years ago

A set of maps produced from the classification system in Table 3.1 provides a basis for the identification of likely old growth forest for the purposes of this protocol.

New API would need to be carried out for areas where the BOGMP did not proceed (ie Tumut).

Forests which could be scheduled for logging are to be checked on the RACAC Broad Old Growth Mapping Project maps for the presence of candidate old growth, or for Tumut Study Area, mapped using API to identify stands greater than 25 hectares that contain likely old growth and which will be termed candidate old growth.

For areas identified as “regrowth zone” in Maps 2, 3 and 4, all forest mapped as old growth during the IAP will be considered candidate old growth, ie the 25 hectare limit will not apply. Rather a 10 hectare minimum limit will apply.

Candidate OGF as shown on BOGMP maps is to be mapped onto harvesting plan maps and disturbance criteria then applied to determine old growth for the purposes of this protocol.

For forest areas containing candidate old growth a logging disturbance test based on number of stumps per hectare is to be applied according to thresholds in Table 3.2.

If there is variation in past harvesting intensity across the candidate old growth being surveyed, sub-areas above the 10ha or 25ha minimum limit must be identified as old growth or not.

Table 3.2: Decision Rules for Disturbance Thresholds Using Cut Stump Approach

Forest Type/ Category	Time of Logging	Average Number of Stumps per Hectare	Availability for Logging
Moist	Post 1960	≤ 4	Not available for harvesting
		> 4	Available for harvesting
	Pre 1960	≤ 7	Not available for harvesting
		> 7	Available for harvesting
Dry	Post 1960	≤ 5	Not available for harvesting
		> 5	Available for harvesting
	Pre 1960	≤ 9	Not available for harvesting
		> 9	Available for harvesting

In applying the disturbance threshold the following procedures are to be followed:

Step 1. Logging History

The time of the last logging activity will be determined using compartment histories and other relevant documented information, where possible. The harvesting plan will note the source of the information on the logging history and the date(s) of previous logging. For interpreting logging history it is important to recognise the different logging events within compartments.

Step 2. Counting of Stumps

The stump assessment will tally stumps which are greater than half the diameter of the average of the three largest diameter trees within the stand.

A tally may be made of dead trees where evidence shows that their death was caused by ringbarking or poisoning, and used in the stump assessment. In addition, where evidence confirms that stumps have been burnt (presence of charcoal and stump remnants) such features may be counted as pre 1960 stumps.

Step 3. Sampling Technique

The sample will be made by selecting intersections of a randomly located 200 metre grid placed over the candidate old growth area. A 5% sample is required with a minimum of 4 samples for each area. Sampling is to be based on 0.5 ha circular plots (equivalent to 40 m radius).

The grid layout may need to be modified for irregularly shaped areas.

A stump count will be made at each plot and the area assessed as being available or not available for harvesting.

If the stump sampling indicates that parts of the area have been logged, further sampling may be required to delineate logged and unlogged areas. This is a judgement to be made at the time, and specific rules are difficult to formulate.

Step 4. Harvesting Plan Documentation

The harvesting plan should include the following information for likely old growth assessment:

- A map showing candidate old growth forest.
- If used, the location of the sampling plots and results for the sampling, with certification of the adoption of either output.
- Average diameters of 3 largest trees from plot.
- Date of assessment.
- Identification of assessor.
- Result of assessment.

8.2 **Protection of Old Growth Forest**

Harvesting must be excluded from areas identified as old growth using the rules set out in this protocol.

8.2 **Joint Trial**

The NPWS, SFNSW, DUAP, and stakeholder representatives must jointly trial the disturbance (stump count) test above, and the “point to plant” techniques by 31 March 1997.

The point to plant technique is designed to directly measure the structural characteristics of the forest and assess old growth directly based on current structural definitions.

The NPWS, SFNSW and DUAP must then jointly consider whether or not an amendment to this protocol is necessary. Any decision for amendment must be unanimous from these Agencies.

8 RAINFOREST PROTOCOL

4.1 Identification of Rainforest

The BOGMP resulted in the identification of rainforest in accordance with Table 4.1 below (from Table 3.10 Environmental site quality classes and allocations of API growth stages, BOGMP Final Report, 9 August, 1996 (NPWS))

Table 4.1: Coding of Rainforest Polygons in BOGMP

Environmental Site Quality				
	High and Moderate (typical)	High and Moderate (atypical)	Low	Very Low
Rainforest	r,ry,sAr,sAry,tAr, tAry, tBr, tBry	r,ry,sAr,sAry,tAr,tAry,iBr,tBry,tCr,tCry	r,ry,sAr,sAry,sBr,sBry,tAr,tAry,tBr,tBry,tCr,tCry	r,ry,sAr,sAry,sBr,sBry,sCr,sCry,tAr,tAry,tBr,tBry,tCr,tCry

Notes:

- The ry tagged polygons are included as rainforest where disturbance records indicate logging was carried out more than 30 years ago.
- Refer to Protocol for Old Growth Forest Conservation for explanation of environmental site quality categories.

Maps derived from the BOGMP, existing forest type maps and other source maps used in the 1981 inventory will provide basic spatial depiction of rainforest.

Compartments scheduled for logging are to be checked on maps derived from the BOGMP and other source maps used in 1981 for the presence of rainforest, excepting that in the case of the Tumut Study Area, where existing forest type maps are to be checked to identify rainforest stands, or API carried out where type maps are not available.

The status of identification of rainforest should be examined in each of three separate categories as follows:

Category A rainforest: types 1 to 26 as defined and mapped by RN17.

Category B rainforest: as defined and mapped by BOGMP as up to and including 30% crown cover of pyrophytic vegetation over rainforest.

Category C rainforest: as defined and mapped by BOGMP as over 30% and less than 50% crown cover of pyrophytic vegetation over rainforest.

8.2 Protection of Rainforest

- Harvesting exclusion and other existing protective prescriptions shall remain in force for Category A and Category B rainforest except where there is an alteration agreed by both the NPWS and SFNSW.
- All warm temperate rainforest as defined by Research Note 17 will be subject to a 20 m buffer.
- In IDFA compartments proposed for harvesting, all category A and category B rainforest or that identified by the BOGMP will be subject to a 20 m buffer from which timber harvesting is excluded.
- Areas of Category C rainforest shall be subject to the Old Growth Protocol.
- All decisions reached in following these rules must be documented on harvesting plans.

8.2 Joint Field Validation Workshop

The NPWS, SFNSW, DUAP, and stakeholder representatives must jointly hold one or more field validation workshops to resolve issues relating to on-ground identification and delineation of rainforest boundaries as defined under this Protocol.

The field validation workshops should be regionally based and must be held by 31 March 1997.

The NPWS, SFNSW and DUAP must then jointly consider whether or not an amendment to this protocol is necessary. Any decision for amendment must be unanimous from these Agencies.

8 THREATENED SPECIES PROTOCOL

5.1 General Prescriptions

Definitions and abbreviations

<u>CWR vertebrates</u>	Critical Weight Range vertebrates. In this protocol, CWR vertebrates refers to the following threatened species: Albert's Lyrebird, Bush Hen, Bush Thick-knee, Rufous Scrub-bird, Eastern Bristlebird, Black-striped Wallaby, Brush-tailed Phascogale, Common Planigale, Tiger Quoll, Southern Brown Bandicoot, Rufous Bettong, Long-footed Potoroo, Long-nosed Potoroo, Parma Wallaby, Red-legged Pademelon, Brush-tailed Rock Wallaby, Hastings River Mouse, Smoky Mouse and White-footed Dunnart.
<u>NPWS</u>	National Parks and Wildlife Service
<u>Net logging area</u>	The gross area less PMP exclusion areas, riparian buffers and connection corridors, rainforest protocol exclusions, old growth forest protocol exclusions and rare non-commercial forest type exclusions.
<u>Prescribed burning</u>	Any burning in state forests deliberately undertaken according to prescribed procedures pursuant to the <i>Bushfires Act</i> 1949
<u>SEPP 14</u>	State Environment Planning Policy No. 14 - Wetlands
<u>SFNSW</u>	State Forests of NSW
<u>Specified forestry activities</u>	Timber harvesting (including all forms of silviculture), construction and operation of log dumps, collection of firewood, cutting of posts, gravel extraction, harvesting of tea tree oil, road construction (including tracks, fire trails and snig tracks), prescribed burning that is not undertaken in accordance with the provisions of the <i>Bushfires Act</i> 1949, grazing that is not undertaken in accordance with the provisions of the <i>Bushfires Act</i> 1949 (to the extent controlled by SFNSW) and military activities to the extent controlled by SFNSW.

1. Rainforest Protocol

The Rainforest Protocol developed as part of the NSW Government Forestry Reform must be applied. This protocol will assist in the protection of threatened species.

2. Old Growth Forest Protocol

The Old Growth Forest protocol developed as part of the NSW Government Forestry Reform must be applied. This protocol will assist in the protection of threatened species.

3. Rare, Non-Commercial Forest Types Protocol

The Rare Non-Commercial Forest Types protocol developed as part of the NSW Government Forestry Reform must be applied. This protocol will assist in the protection of threatened species.

4. Tree Retention**(i) Hollow-bearing tree retention**

- a) A minimum of ten hollow-bearing trees must be retained per two hectares. Where this density is not available, ten trees must be selected from trees with diameters within the largest 30% of the stand.
- b) Retained, hollow-bearing trees must be selected from trees with diameters within the largest 30% of the stand and be live trees with good crown development.
- c) Retained hollow-bearing trees should represent the range of species that occurs in the area.
- d) Trees retained outside the net logging area must not be counted as hollow-bearing trees.
- e) Hollow-bearing trees must be scattered throughout the net logging area.
- f) Hollow-bearing trees must be marked for retention.

(ii) Recruitment tree retention

- a) A minimum of ten recruitment trees must be retained per two hectares.
- b) Retained recruitment trees must show potential for developing into hollow-bearing trees with good crown development. Trees in the mature and intermediate growth stages should be retained as recruitment trees.
- c) Retained recruitment trees should represent the range of species that occurs in the area.
- d) Trees retained outside the net logging area must not be counted as recruitment trees.
- e) Recruitment trees must be scattered throughout the net logging area.
- f) Recruitment trees must be marked for retention.

(iii) “Regrowth zone” habitat and recruitment tree retention

- a) The term “regrowth zone” used above is as mapped on Maps 2, 3 and 4 of this document.
- b) Within that area (i) and (ii) above must be applied if there are sufficient existing hollow bearing trees available.
- c) Where there are not sufficient hollow bearing trees available to comply with section 4(i)(a) above, then those hollow bearing trees present must be retained.
- d) For each hollow bearing tree retained in 4(iii)(c) above, a recruitment tree as defined in 4(ii) must be retained.
- e) In the “regrowth zone” defined on Maps 2, 3 and 4, where there are less than 10 hollow bearing trees per two hectares, there is no requirement to retain additional trees as otherwise required in section 4(i)(a).
- f) The application of section 4(iii) of this protocol must be identified as part of the Harvesting Plan. In addition, maps of the areas will be included as part of the compartment history.

(iv) Protection of hollow bearing trees, recruitment trees and dead stags

- a) Specified forestry activities and post-logging burning must aim to minimise damage to hollow-bearing trees, recruitment trees and dead stags. The potential for damage should be minimised by techniques of directional felling. Felled heads must be flattened or removed from 5m of stems retained to meet this condition.

(v) Dead stag retention

- a) Dead stags must be retained in areas outside the net harvesting area, visual protection strips, and elsewhere where it is safe to do so.
- b) Dead stags must not be counted as hollow-bearing trees or recruitment trees.

5. Significant Food Resources

- a) Stands where *Allocasuarina* spp. dominate the canopy should be protected from specified forestry activities. Where more than 30 crushed cones have been found beneath individuals of *Allocasuarina* spp., indicating intensive use by the Glossy Black Cockatoo, the tree must be protected.
- b) At least 4 mature (>40cm dbh) winter-flowering eucalypt species per two hectares must be retained where they occur. (A list of winter-flowering species can be provided at a later date). Where retained hollow-bearing or recruitment trees meet these requirements, the hollow-bearing and recruitment trees can be counted as food trees.
- c) Damage to mature banksias and *Xanthorrhoea* spp. should be avoided during forestry operations.
- d) All trees with “V-notch” incisions or other incisions made by Yellow-bellied Glider must be retained. Where retained hollow-bearing or recruitment trees meet these requirements, the hollow-bearing and recruitment trees can be counted as food trees.
- c) Specified forestry activities and post-logging burning must aim to minimise damage to retained food trees. The potential for damage should be minimised by techniques of directional felling. Felled heads must be flattened or removed from 5m of stems retained to meet this condition.

6. Riparian Buffers

- a) Riparian buffers must be at least 10m wide on each side of all first order streams, and at least 20m wide on each side of all second order streams. For at least 80% of third and higher order streams, riparian buffers must be at least 40m wide on each side of the stream. The remaining 20% will have a buffer of 20m or greater on each side.
- b) Streams are as shown on the relevant topographic map as published by the Central Mapping Authority at a scale of 1:25 000. A first order stream is defined as that part of a

stream between its point of origin and the first junction with another stream, whereupon it becomes a second or higher order stream. A third order stream commences at the junction of two second order streams.

- c) These buffers must be mapped and clearly recorded in Harvesting Plans.
- d) Specified forestry activities, with the exception of road construction and road maintenance where there is no other practical means of access, must be excluded from riparian buffers. Where threatened species occur in riparian buffers, road construction and road maintenance should avoid areas where they occur.
- d) All practical precautions should be taken to avoid felling trees into these riparian buffer zones

7. Connection corridors

- a) Each 500ha of state forest must include a minimum of two connection corridors at least 40m wide (connecting second order streams) AND/OR one connection corridor at least 80m wide (connecting third order streams), which establish links between different drainage systems. The option is to be chosen by SFNSW. These connection corridors should not be cut by roads if possible.
- b) Specified forestry activities must be excluded from connection corridors, with the exception of road construction and road maintenance where there is no other practical means of access.
- c) All practical precautions should be taken to avoid felling trees into these corridors. These connection corridors must be mapped and clearly recorded in Harvesting Plans.

8. Wetlands

- a) Wetlands are defined as areas that form a shallow waterbody when inundated cyclically, intermittently or permanently with fresh, brackish or salt water, and where the inundation determines the type and productivity of the soils and the plant and animal communities.
- b) A buffer zone at least 10m wide must be established around all wetlands and swamps more than 0.1ha and less than 0.5ha surface area.
- c) A buffer zone at least 40m wide must be established around all wetlands and swamps greater than 0.5ha surface area and all SEPP 14 wetlands.
- d) The buffer zone must be measured from the outer edge of the vegetation communities dominated by wetland species.
- e) Specified forestry activities must be excluded from wetlands and their buffers. All precautions should be taken to avoid felling trees into this buffer zone.
- e) Wetlands and wetland buffers must be mapped and clearly recorded in Harvesting Plans.

9. Heath

- a) Heath is defined as areas dominated by woody shrubs generally less than 2m tall at maturity, with xeromorphic leaves.
- b) A buffer zone at least 20m wide must be established around all heath more than 0.2ha and less than 0.5ha surface area.
- c) A buffer zone at least 40m wide must be established around all heath greater than 0.5ha surface area.
- d) Specified forestry activities must be excluded from heath and their buffers. All precautions should be taken to avoid felling trees into this buffer zone.
- f) Heath and heath buffer zones must be mapped and clearly recorded in Harvesting Plans.

10. Rocky Outcrops

- a) Rocky outcrops are defined as areas characterised by a high proportion of exposed rock or boulders relative to the surrounding area, or, areas with skeletal soils, supporting heath or shrub communities (sometimes with occasional emergent trees). These sites can occur where the geology varies from the surrounding area (eg. rhyolite outcrops).
- b) A buffer zone at least 20m wide must be established around all rocky outcrops more than 0.1ha and less than 0.5ha surface area.

- c) A buffer zone at least 40m wide must be established around all rocky outcrops greater than 0.5ha surface area.
- d) Specified forestry activities must be excluded from within the buffer. All precautions should be taken to avoid felling trees into this buffer zone.
- g) Rocky outcrops must be mapped and clearly recorded in Harvesting Plans.

11. Caves, tunnels and disused mineshafts

- a) All caves, tunnels and disused mineshafts (with the exclusion of open pits of less than 3m in depth) must be protected by a buffer zone at least 50m wide. Where the NPWS is satisfied that adequate surveys for threatened cave-dependent bats have been undertaken and no Schedule 1 or 2 cave-dependant bats or evidence of Schedule 1 or 2 cave-dependant bats have been recorded, these buffer zones may be reduced to 10m radius. Specified forestry activities must be excluded from these buffer zones.
- b) All known threatened microchiropteran bat maternity and hibernation sites must be protected by a 50m buffer zone. Specified forestry activities must not be conducted within this buffer zone. Within 50 to 100m of the site a maximum of 50% canopy reduction can occur.
- c) Cave, tunnel and disused mineshafts and their buffer zones must be mapped and clearly recorded in Harvesting Plans.

12. Burning

When fulfilling their responsibilities under the *Bushfires Act* 1949, SFNSW should take account of the following principles:

- a) Prescribed burning regimes should take into account wildfire history and reflect the ecological requirements of any threatened species, or their habitat, known or likely to occur in the area. Burning should be varied by season, intensity and interval.
- b) Prescribed burning should be conducted in a manner which promotes and maintains an understorey mosaic which includes significant areas of dense understorey vegetation, particularly within the habitat of CWR vertebrates.
- c) In areas where intervals between fires are less than 5 years, prescribed burning should be conducted in a manner that minimises the impact on understorey vegetation and large fallen logs (>40cm dbh and 5m in length).

13. Grazing

- a) The extent of grazing authorities issued by SFNSW should not be extended except where they fulfil SFNSW's responsibilities under the *Bushfires Act*.
- h) Where a grazier is responsible for burning which is not in accordance with the Fuel Management Plan approved under the *Bushfires Act*, grazing authorities of that grazier within the control of SFNSW, should not be renewed.

14. Weeds

- a) SFNSW and the NPWS should develop a joint weed control strategy for implementation on their respective tenures.
- b) The weed control strategy should consider ameliorative actions for specific areas where forestry activities (eg. roading, drainage works) have caused, or may cause, weed invasion of threatened species habitat.
- c) This strategy should have due regard to possible impacts on non-target species.
- i) This strategy must be fully implemented by SFNSW.

15. Feral animals

- a) SFNSW and the NPWS should develop a joint feral animal control strategy for implementation on their respective tenures.
- b) The feral animal control strategy should provide for areas of known or predicted core habitat of CWR vertebrates and threatened plants impacted by feral animal activities (eg. pigs, goats). This strategy should also consider the issue of feral bees.
- c) This strategy should have due regard to possible impacts on non-target species.

- j) This strategy must be fully implemented by SFNSW.

16. Pre-logging and pre-roading flora surveys

- a) Surveys for those threatened plants requiring species-specific prescriptions according to Section 5.3 of this Protocol, must be conducted in known or potential habitat in the net logging area, and within 50m of the boundary of the net logging area.
- b) Surveys must be conducted prior to the commencement of roading operations where potential habitat for threatened plants occurs, including buffer zones likely to be disturbed by the construction of new roads and by road widening and realignment.
- c) Potential habitat is as jointly agreed to by SFNSW and the NPWS.

17. Pre-logging and pre-roading fauna surveys

- a) Fauna surveys for those threatened species requiring species-specific prescriptions according to Section 5.2 of this Protocol, must be conducted in known or potential threatened fauna habitat in the net logging area and within 50m of the boundary of the net logging area. See Species Prescriptions below.
- b) Surveys must be conducted prior to the commencement of roading operations where potential habitat for threatened fauna occurs, including buffer zones likely to be disturbed by the construction of new roads and by road widening and realignment.
- c) Potential habitat is as defined for individual species by the IAP Expert Fauna Panels, or in the absence of that information, as jointly agreed by the NPWS and SFNSW.
- d) Any incidental records of threatened fauna encountered during surveys and pre-logging site inspections must be provided to the NPWS.
- e) Persons conducting pre-logging and pre-roading surveys and site inspections must also search for and record the threatened species habitat features in the list below. Training in the identification of these threatened species features must be provided.
 - Nest, den and roost sites (especially raptor and owl nests and roosts, and nests and dens of threatened hollow-dependent species).
 - Owl pellets, distinctive scats (eg. Tiger Quoll, Koala and Brush-tailed Rock Wallaby scats), a sample of predator scats and distinctive tracks (such as Tiger Quoll).
 - Latrine and den sites of the Tiger Quoll.
 - Crushed cones beneath *Allocasuarina* spp.
 - Yellow-bellied glider “V-notch” trees and trees with other incisions made by Yellow-bellied Gliders.
 - Skeletal remains.
 - Caves, tunnels and disused mineshafts.
 - Conical diggings made by potoroos and bandicoots.
- b) Results of these surveys must be provided to the NPWS.

18. Survey Methodology

The survey methodologies conducted to fulfil the conditions of this protocol must be those approved by the NPWS, in consultation with SFNSW. The results of all surveys must be provided to the NPWS within 30 days of the information being collected.

These survey methodologies will:

- take into account currently used survey methodologies;
- have regard to cost effectiveness.

Currently used survey methodologies may continue until otherwise agreed.

19. Ground Habitat Protection

SFNSW should take reasonable measures to protect ground habitat (understorey, ground cover, large logs on the forest floor) from specified forestry activities.

20. Notification

Where any of the conditions of this protocol requires a matter to be notified to the NPWS, approved by the NPWS, or some other action by the NPWS, then NPWS means the Manager of the relevant NPWS Zone or their delegate.

21. Licensing

In the event that the cumulative effect of the General Prescriptions and Species Prescriptions leads to more than a 20% reduction in the net logging area in, or significantly compromises the silvicultural objectives for any one compartment, SFNSW may seek a review of the Prescriptions as applied to that compartment. The NPWS must consult with the relevant Harvesting Advisory Board, where relevant, prior to completion of the review.

22. Bushfires Act

Notwithstanding any of the above conditions, SFNSW may carry out activities necessary for its compliance with the provisions of the *Bushfires Act 1949*.

23. Monitoring Program

SFNSW and the NPWS must jointly develop a program to monitor the effects of this protocol by 30 June 1997.

8.2 Threatened Fauna Prescriptions

The following fauna prescriptions outline the principles to be adhered to in managing these species. At the time of issuing licences, the NPWS must consult with SFNSW and ensure that the licence conditions reflect the intent of these protocols.

5.2.1 Owls and Arboreal Marsupials

For planning purposes, results from surveys or predictive modelling should be consulted for the general area of the compartment(s) to be harvested. If no reliable survey or modelling information is available for the compartment or surrounding area (within 2 km), surveys should be conducted as part of the planning exercise.

Specific Prescription:

Species	Prescription
Powerful Owl	Logging exclusion within 50 m of nest site. Logging exclusion within 30 m of permanent roost. Where available 300 ha of potential habitat must be retained within a 2km radius. Where information indicates an abundance of 1 Greater Glider per hectare or more, 8 habitat trees per hectare should be retained.
Sooty Owl	Logging exclusion within 50 m of nest site. Logging exclusion within 30 m of permanent roost.
Masked Owl	Logging exclusion within 50 m of nest site. Logging exclusion within 30 m of permanent roost. Fire regime to maintain open foraging habitat. Where available 300 ha of potential habitat must be retained within a 2km radius.
Squirrel Glider	Logging exclusion over an 8ha area centred around records found during pre-logging surveys. This area should cover, where possible, the toposequence. When 10 of these sites, separated by 2 km or more are accumulated within a two year period in any Management Area, SFNSW can apply to the NPWS for review of this prescription.
Yellow-bellied Glider	Logging exclusion within 50 m of den site. Retention of V-notch feed tree and a further 15 trees within 100 m. Trees to reflect forest type and exceed 30 cm diameter where available
Brush-tailed Phascogale	Within 3 km of a Brush-tailed Phascogale record, 50 ha of potential habitat should be reserved along mid-slopes and ridges. This area can include areas of old growth forest where the area of old growth forest reserved occurs on the mid-slope and ridges. When 10 of these sites, separated by 3 km or more are accumulated within a two year period in any Management Area, SFNSW can apply to the NPWS for review of this prescription.

5.2.2 Critical Weight Range Vertebrates

CWRVs will be managed according to the following:

- a) Rainforest will be excluded from logging, as per normal practice. In areas with Schedule 1 and 2 CWRV species, areas of rainforest will be buffered with a 20m exclusion of machinery. Trees may be felled out of and in to the buffering exclusion zone, but not the rainforest.
- b) Commercial and private firewood licences should specify that fallen logs over 40 cm diameter with hollows should not be removed.
- c) Surveys for feral predators should be undertaken after harvest by daylight and/or nocturnal techniques. Species specific control measures (eg. in accordance with the Vertebrate Pest Control Manual - NSW Agriculture) should be undertaken to remove feral predators as required and reasonable, using the results of the predator scat survey and post harvest inspections to justify action taken.
- d) Fuel reduction burning should be limited to less than 75% of any compartment with CWRV protocols.
- e) Grazing should be managed to maximise CWRV conservation.
- f) Surveys: Information from the district wildlife management program should be briefly collated with information available from other sources, in particular the SFNSW Wildlife Database and the NPWS Wildlife Atlas. If there are records of Schedule 1 or 2 CWRVs within 2 km of the planned operation, a survey of the compartment (where appropriate) and adjacent areas of likely habitat should be undertaken.

Specific Prescription:

Species	Prescription
Bush Thick-knee	Data base search, planning phase survey - site specific management; protection of nests by 20 m buffer
Albert's Lyrebird	Data base search, planning phase survey, protection of nests by 10 m buffer
Tiger Quoll	Where records exist within 5km, a targeted survey will be carried out. Standard Environmental protection, 12 ha exclusion of suitable configuration, with link to a riparian zone for maternal den site; 3.5 ha exclusion of suitable configuration, with link to a riparian zone for permanent dens, 12 ha exclusion of suitable configuration for latrine sites. Exclusion areas are to be mapped on Harvesting Plans. Design of connection corridors should take into account Tiger Quoll records.

Specific Prescription continued:

Species	Prescription
Long-nosed Potoroo	Standard Environmental protection as listed above, 6 retained trees per ha within the net logging area, harvesting and burning excluded from 5m buffer around these retained trees or clumps
Long-footed Potoroo	As per recovery/interim management plan.
Brush-tailed Rock Wallaby	Covered by general CWRV guidelines. Refer also to Rocky Outcrops.
Rufous Bettong	Standard Environmental protection as listed above.
Parma Wallaby	Standard Environmental protection as listed above.
Red-legged Pademelon	Standard Environmental protection as listed above.

1.1.7

5.2.3 Threatened Frogs

Threatened frogs will be managed according to the following:

- a) Measures relevant to frog management are described in this protocol.
- b) For planning purposes, results from surveys should be consulted for the general area of the compartment(s) to be harvested. If no reliable survey information is available for the compartment or surrounding area (within 2 km), surveys should be conducted as part of the planning exercise.
- c) The following further principles will be used to manage frog habitat in state forest:
 - grazing and associated burning should be excluded from swamps and ephemeral wetlands,
 - any burning to be done in conditions that preclude encroachment into the exclusion zone, or in such a manner consistent with continued wetland management (it may be necessary to periodically burn swamps to maintain the appropriate vegetation for frog habitat)
 - where concentrations of Schedule 1 or 2 breeding male frogs (more than 10 per ha) are detected, stream crossings should be bridged wherever possible. This principle to be applied within 500 m of the perimeter of the concentration of frogs.
 - Protection of all ponds and dams by a 10 m buffer (as separate from running water and permanent wetlands protection detailed in other prescriptions).

Specific Prescription:

Species	Prescription
<i>Pseudophyrne corroborae</i>	According to species recovery plan.
<i>Pseudophyrne australis</i>	Pre-logging surveys in potential habitat if record within 2km; site specific management if found. Protect sandstone habitat from exploitation by bush rock collection.
<i>Mixophyes fleayi</i>	Pre-logging survey in potential habitat if record within 2km. Protect all sites with 40 m buffer either side of stream for 200 m upstream and 200 m downstream of the record.
<i>Mixophyes balbus</i>	Protect all sites with 30 m buffer either side of stream for 200 m upstream and 200 metres downstream.
<i>Mixophyes iteratus</i>	On first and second order streams, protect all sites with 30 m buffer either side of stream for 200 m upstream and 200 metres downstream.
<i>Philoria kundagungan</i>	Where recorded in the riparian area along first or second order streams, planners should place connection corridors on this stream (see 5.1 of this protocol). Elsewhere, buffer record with 50 m radius exclusion.
<i>Philoria loveridgei</i>	Where recorded in the riparian area along first or second order streams, planners should place connection corridors on this stream (see 5.1 of this protocol). Elsewhere, buffer record with 50 m radius exclusion.
<i>Philoria sphagnicolus</i>	Where recorded in the riparian area along first or second order streams, planners should place connection corridors on this stream (see 5.1 of this protocol). Elsewhere, buffer record with 50 m radius exclusion.
<i>Litoria aurea</i>	Pre-logging surveys in potential habitat. According to species recovery plans. Maintenance of forest dams in appropriate areas. Pending finalisation of species recovery plan, 5 ha exclusion around water body where recorded. After 10 records per management area, prescription should be reviewed
<i>Litoria brevipalmata</i>	5 ha exclusion around known records. After 10 records per management area, prescription should be reviewed

5.2.4 Threatened Bats

Control of disturbance to active roost sites and maternity colonies of species listed as endangered or vulnerable is the major objective of this protocol. Localised logging exclusion and constraints on management will be used where this is an effective means of management. To apply the protocol a practicable level of knowledge about bat occurrence may need to be obtained through survey.

Threatened bats will be managed according to the following:

If no reliable survey or modelling information is available for the nearby area (within 5 kilometres) a suitable survey must be done as part of the planning process.

- If threatened fruit bats are detected during pre-harvest inspection, the full extent of roosting camps must be identified in the harvesting plan.
- Likely multiple-bat roost trees (>100 cm dbh dead stags, large trees with accessible base hollow) should be inspected prior to operations commencing within 100 metres of such trees.
- Habitat use, in particular any change of locality of known colonial roost sites, should be recorded on compartment histories.
- Burning should be excluded from reserved areas as far as practicable under the Bushfires Act. Post-logging burning should plan for no more than 75% coverage of the gross harvesting areas in areas where Schedule 1 or 2 micro-bats have been detected.
- Bat roost sites should be monitored by SFNSW as part of the general monitoring program. Bat roosts should be monitored for occupancy and activity, where possible this should be done on a bi-annual basis. Monitoring can form part of the planning exercise for other, nearby compartments.
- The prescriptions in the following table must be applied to protect individual roosting sites. For micro-bats, these prescriptions are aimed at protecting the microhabitat, and shelter from predators, created by the understorey cover that commonly encloses roost trees.

Specific Prescription:

Species	Prescription
Fruit-bats, including Black Flying-fox	Provision of a 50 metre exclusion zone around known roosting camps
Yellow-bellied Sheath-tail Bat Beccari's Mastiff Bat Eastern Little Mastiff Bat Greater Broad-nosed Bat Hoary Bat Great Pipistrelle	Provision of a 50 metre exclusion zone around any known roost sites harbouring more than three individuals of a species.
Queensland Long-eared Bat Greater Long-eared Bat	Provision of a 50 metre exclusion zone around any roost site harbouring an individual where evidence exists of prolonged use.
Large Pied Bat <i>Vespadelus troughtoni</i>	Provision of a 50 metre exclusion zone around the entry to known major subterranean roosting sites.
Golden Tipped Bat	Provision of a 40 metre exclusion zone on each side of the creek 200 metres upstream and downstream of known sites of capture of an individual of the species.
Large-footed Myotis	Provision of a 40 metre exclusion zone on each side of permanent streams and around other natural water bodies used by the species. (Subterranean roost sites are dealt with in Part 5.1)
Little Bent-wing Bat Common Bent-wing Bat <i>Vespadelus troughtoni</i> Large Pied Bat	SFNSW and the NPWS will develop a management strategy for forests around known maternity and hibernating colonies. (Subterranean roost sites are dealt with in Part 5.1)
Note: When 10 roost sites, separated by 2 km or more are accumulated within a two year period, SFNSW can apply to the NPWS for review of this prescriptions.	

5.2.5 Whistlers and Robins

Specific Prescription:

Species	Prescription
Olive Whistler and Pink Robin	20 m machinery exclusion around rainforest where species recorded in pre-logging surveys.
Gilberts Whistler	Data base search for records. Call play back in likely habitat. Exclusion of logging in 4 hectare blocks around territories

5.2.6 Cockatoos and Parrots

Foraging resources for parrots and cockatoos will be managed generally in the same fashion as other forest products - for a sustainable yield over time. The main tool for species management will centre on the protection of nest sites. This will require reservation prescriptions as appropriate. Details of specific reservations are included in the implementation table following.

Specific Prescription:

Species	Prescription
Glossy Black Cockatoo	Searches for foraging sites as part of planning. Site specific management of foraging resource. Nest sites, protected by 50m radius exclusion. Active management of wildlife regulations. If more than 10 nest records are found within a Management Area, this prescription should be reviewed.
Superb Parrot	As per recovery plan.
Turquoise Parrot	Training field staff in recognition of the species and its habitat to allow effective observations during planning and operations Nest site protected by minimum 20 m radius exclusion.
Swift Parrot	Training field staff in recognition of the species and its habitat to allow effective observations during planning and operations Harvesting excluded temporally from flowering eucalypts upon detection.

5.2.7 Other Species

There are prescriptions needed for other species, listed below, that are not yet finalised. These will be addressed jointly as required. Existing prescriptions will be used where available until replacements are agreed.

REPTILES

Cacophis harriettae

Hoplocephalus bitorquatus

Hoplocephalus bungaroides

BIRDS

Osprey

Red-tailed Black Cockatoo

Rufous Scrub bird

Square-tailed Kite

MAMMALS

Hastings River Mouse

Koala

Queensland Tube-nosed Bat

Queensland Blossom Bat

8.2 Threatened Flora Prescriptions

The following flora protocol prescriptions outline the principles to be adhered to in managing these species. At the time of issuing licences the NPWS, when composing licence conditions for these species, will consult with SFNSW and the conditions will reflect the intent of these protocols.

Adequately reserved species (4 species in total) are covered by Prescription A below. Inadequately reserved species were divided into two groups: those that require disturbance, and those that do not. Those that require disturbance are covered by Prescription B below; those that do not require disturbance are covered by Prescription C below. Table 5.1 shows which plants are covered by which prescriptions.

Generally speaking, species that are covered by Prescription B fall into two broad guilds:

1. Obligate seeders, disturbance-adapted, short-lived (2-10yrs)
2. Obligate seeders, disturbance-adapted, medium longevity (10-100yrs)

Generally speaking, species that are covered by Prescription C fall into four broad guilds:

3. Obligate seeders, not disturbance-adapted (includes species for which response is unknown)
4. Resprouters and seeders, disturbance-adapted
5. Resprouters
6. Seasonal geophytes.

Prescription A:

This prescription applies to:

Amorphospermum whitei
Eucalyptus glaucina
Eucalyptus tetrapleura
Tetratheca juncea

These species were considered to be adequately reserved in NSW by the Briggs and Leigh criterion, ie >1000 individuals reserved in formal conservation reserves in 1995.

- a) Pre-logging surveys in suitable habitat are required for these species.
- b) Buffers of 10m radius must be established around 50% of individuals of these species. Specified forestry activities must be excluded from these buffers. All attempts should be made not to fell trees into these buffers.
- c) Around buffers established in b), an additional 10m wide modified harvesting zone must be established. Within this zone, at least 50% of the canopy must be retained. As far as possible, this canopy must be evenly spaced.

Prescription B:

This prescription applies to species in the following guilds:

1. Obligate seeders, disturbance-adapted, short-lived (2-10yrs)
2. Obligate seeders, disturbance-adapted, medium longevity (10-100yrs)

It was considered that all of these species were inadequately reserved in NSW by the Briggs and Leigh criterion, ie <1000 individuals reserved in formal conservation reserves in 1995.

- a) Pre-logging surveys in suitable habitat are required for the species within these guilds.
- b) Damage to plants caused by specified forestry activities must be avoided. No buffer is required as disturbance nearby is likely to promote regeneration.

Prescription C:

This prescription applies to the species in the following guilds (except for species covered by Prescription A):

3. Obligate seeders, not disturbance adapted (includes species for which response is unknown)
4. Resprouters and seeders, disturbance adapted
5. Resprouters
6. Seasonal geophytes.

It was considered that all of these species were inadequately reserved in NSW by the Briggs and Leigh criterion, ie <1000 individuals reserved in formal conservation reserves in 1995.

- a) Pre-logging surveys in suitable habitat are required for the species within these guilds.
- b) Buffers of 10m radius must be established around all individuals of these species. Specified forestry activities must be excluded from these buffers. All attempts should be made not to fell trees into these buffers.
- c) Around buffers established in b), an additional 10m wide modified harvesting zone must be established. Within this zone, at least 50% of the canopy must be retained. As far as possible, this canopy must be evenly spaced.

References:

Briggs J. D. and Leigh J. H. 1996. Rare or Threatened Australian Plants: 1995 revised edition pp 466, CSIRO Publishing: Melbourne.

Table 5.1 : Summary of tentative allocation of species to ‘functional guilds’ and application of appropriate protocols.

Species	Functional Guild	Prescription
<i>Acacia bynoeana</i>	?3	C
<i>Acacia courtii</i>	2	B
<i>Acacia georgensis</i>	2	B
<i>Acacia ruppii</i>	2	B
<i>Amorphaospermum whitei</i>	3	A
<i>Angophora robur</i>	4	C
<i>Arthraxon hispidus</i>	?	C
<i>Boronia umbellata</i>	3	C
<i>Bothriochloa biloba</i>	?3	C
<i>Caesia parviflora</i> var <i>minor</i>	6	C
<i>Corchorus cunninghamii</i>	1	B
<i>Corokia whiteana</i>	?2	B
<i>Correa baeuerlenii</i>	4	C
<i>Corybas undulatus</i>	6	C
<i>Cryptostylis hunteriana</i>	6	C
<i>Cynanchum elegans</i>	5	C
<i>Diuris tricolor</i>	6	C
<i>Diuris venosa</i>	6	C
<i>Elaeocarpus</i> species A	5	C
<i>Endiandra hayesii</i>	3	C
<i>Eucalyptus glaucina</i>	4	A
<i>Eucalyptus kartzoffiana</i>	4	C
<i>Eucalyptus nicholli</i>	4	C
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	4	C
<i>Eucalyptus parvula</i>	4	C
<i>Eucalyptus tetrapleura</i>	4	A
<i>Floydia praealta</i>		C
<i>Grevillea beadleana</i>	3	C
<i>Grevillea masonii</i>	3	C
<i>Hakea trineura</i>	2	B
<i>Hibbertia hexandra</i>	2	B
<i>Hibbertia marginata</i>	5	C
<i>Hicksbeachia pinnatifolia</i>	3	C
<i>Leptospermum sejunctum</i>	?4	C
<i>Lindsaea incisa</i>	5	C
<i>Macadamia tetraphylla</i>	4	C
<i>Macrozamia johnsonii</i>	5	C
<i>Marsdenia longiloba</i>	5	C
<i>Melaleuca groveana</i>	4	C

Table 5.1 continued

Species	Functional Guild	Prescription
<i>Melichrus hirsutus</i>	3	C
<i>Ochrosia moorei</i>	3	C
<i>Olearia flocktoniae</i>	1	B
<i>Parsonsia dorrigoensis</i>	5	C
<i>Phyllota humifusa</i>	4	C
<i>Plectranthus nitidus</i>	?3	C
<i>Pomaderris brunnea</i>	2	B
<i>Pomaderris parrisiae</i>	2	B
<i>Prostanthera cryptandroides</i>	?3	C
<i>Prostanthera</i> species 6	2	B
<i>Pterostylis</i> species D	6	C
<i>Pultenaea campbellii</i>	4	C
<i>Quassia</i> species B	3	C
<i>Randia moorei</i>	3	C
<i>Restio longipes</i>	4	C
<i>Sarcophilus fitzgeraldii</i>	3	C
<i>Sarcophilus hartmanii</i>	3	C
<i>Sarcophilus weinthalii</i>	3	C
<i>Senna acclinis</i>	3?4	C
<i>Sophora fraseri</i>	2	B
<i>Styphelia perileuca</i>	5	C
<i>Symplocos baeuerlenii</i>	3	C
<i>Syzygium hodgkinsoniae</i>	3	C
<i>Syzygium moorei</i>	3	C
<i>Tasmannia purpurascens</i>	2	B
<i>Tetratheca glandulosa</i>	2	B
<i>Tetratheca juncea</i>	5	A
<i>Thesium australe</i>	?3	C
<i>Triplariana nowraensis</i> (syn. <i>Baeckea camphorata</i>)	?3	C
<i>Tylophora woollsii</i>	3	C
<i>Uromyrtus australis</i>	2	C
<i>Zieria floydii</i>	?3	C

8 SPECIAL SITES PROTOCOL

The Cabinet decision required a protocol to be developed for the protection of special sites.

Special sites include Forest Preserves, Flora Reserves, other reserved vegetation sites, Aboriginal sites, European heritage sites, and other general scientific reserves.

Special sites shall be protected under this protocol through the continued application of statutory and regulatory controls. In the case of Aboriginal sites protection is afforded under relevant sections of the *National Parks and Wildlife Act 1974* and through the SFNSW Preferred Management Priority (PMP) system. European heritage sites are protected under the *Heritage Act 1977* and through the SFNSW Preferred Management Priority (PMP) system.

Harvesting restrictions and/or prohibitions will continue to apply to Forest Preserves, Flora Reserves, and other reserved vegetation sites, and other general scientific reserves as recognised under the SFNSW Preferred Management Priority (PMP) system.

8 EXPLANATORY NOTES

7.1 Rare Non-commercial Forest Types

Rare forest types were defined using IAP information. SFNSW then identified those rare forest types which had commercial value. These were excluded from the list either on a State-wide or regional basis.

Where forest type mapping does not exist, areas of rare non-commercial forest type will be identified during the harvesting plan process and protected.

8.2 Old Growth

This protocol applies to all areas other than the Eden Management Area where permanent land use decisions were taken during the IAP. Old growth was a significant factor in the determination of the permanent reserve design at Eden.

The Broad Old Growth Mapping Project maps have been accepted on the main basis for identifying candidate old growth.

The field validation process is to be continued, with some minor amendments.

It was agreed that NPWS, SFNSW, DUAP and the stakeholders would undertake a review of the Agency agreed field validation procedure, as outlined in here, and the alternative option “point to plant”.

If all the Agencies agreed, the protocol may be revised as a result of this review.

In identified regrowth areas, in recognition of partially reduced habitat and recruitment tree retention rates, it was agreed that old growth down to 10 hectares in size would be subject to the Old Growth Protocol. The area this applies to is shown on Maps 2, 3 and 4.

8.2 Rainforest

Rainforest is defined by both BOGMP and RN17 forest type maps.

Rainforest will be protected from logging.

Discretionary rainforest will be dealt with under the Old Growth Protocol.

It was agreed that NPWS, SFNSW, DUAP, and stakeholders would jointly hold one or more field validation workshops to resolve issues relating to on-ground identification and delineation of rainforest boundaries as defined under the Protocol.

If all the Agencies agreed, the protocol may be revised as a result of this review.

Rainforest within the IDFA areas will have a 20 metre buffer from which timber harvesting is excluded.

All warm temperate rainforest, as defined by RN17, outside the IDFA areas, will have a 20 metre buffer from which timber harvesting is excluded.

7.4 THREATENED SPECIES

The only species dealt with are those threatened by forestry activities.

Section 5.1 contains a set of state-wide General Prescriptions that are generally habitat or threat based. Species considered to be adequately protected by the General Prescriptions are listed below:

FROGS

Assa darlingtoni
Crinia tinnula
Litoria olongburensis
Litoria subglandulosa

REPTILES

Coeranoscincus reticulatus
Hoplocephalus stephensii
Underwoodisaurus sphyrurus

NON-FLYING MAMMALS

Common Planigale
 Eastern Chestnut Mouse
 Red-legged Pademelon
 White-footed Dunnart

BIRDS

Australasian Bittern
 Black Bittern
 Bush-Hen
 Collared Kingfisher
 Comb-crested Jacana
 Mangrove Honeyeater
 Painted Honeyeater
 Rose-crowned Fruit-dove
 Superb Fruit-dove
 Superb Parrot
 Swift Parrot
 Turquoise Parrot
 White-eared Monarch
 Wompoo Fruit-dove
 Yellow-eyed Cuckoo-shrike

There are a number of other species that were not protected adequately by the General Prescriptions alone. These are the subject of individual prescriptions for particular groups of species. These species are listed hereunder.

FROGS

Pseudophyrne corroboree
Pseudophyrne australis
Mixophyes fleayi
Mixophyes balbus
Mixophyes iteratus
Philoria kundagungan
Philoria loveridgei
Philoria sphagnicolus
Litoria aurea
Litoria brevipalmata

NON-FLYING MAMMALS

Brush-tailed Phascogale
 Brush-tailed Rock Wallaby
 Hastings River Mouse
 Long-nosed Potoroo
 Long-footed Potoroo
 Parma Wallaby
 Red-legged Pademelon
 Rufous Bettong
 Squirrel Glider
 Tiger Quoll
 Yellow-bellied Glider

BIRDS

Albert's Lyrebird
 Bush Thick-knee
 Gilberts Whistler
 Glossy Black Cockatoo
 Masked Owl
 Olive Whistler
 Powerful Owl
 Sooty Owl
 Superb Parrot
 Swift Parrot
 Turquoise Parrot

FLYING MAMMALS

Fruit-bats, including Black Flying-fox
 Yellow-bellied Sheath-tail Bat
 Beccari's Mastiff Bat
 Eastern Little Mastiff Bat
 Greater Broad-nosed Bat
 Hoary Bat
 Great Pipistrelle
 Queensland Long-eared Bat
 Greater Long-eared Bat
 Large Pied Bat
Vespadelus troughtoni
 Golden Tipped Bat
 Large-footed Myotis
 Little Bent-wing Bat
 Common Bent-wing Bat
 Large Pied Bat

There are also a group of species which require site specific protection. This group has been minimised to the greatest extent possible in the interests of certainty. These species are as follows:

FROGS

Litoria castanea
Litoria piperata
Litoria spenceri
Heleioporus australiacus

MAMMALS

Black-striped Wallaby
 Broad-toothed Rat
 Eastern Quoll
 Southern Brown Bandicoot
 Smoky Mouse

REPTILES

Varanus rosenbergi

BIRDS

Albert's Lyrebird
 Black-breasted Button-quail
 Black-throated Finch
 Bush Thick-knee
 Double-eyed Fig Parrot
 Eastern Bristle-bird
 Marbled Frogmouth
 Red Goshawk
 Regent Honeyeater

The NPWS has indicated it will ensure that licences granted for forestry activities are consistent with this protocol.

It is intended to issue licences over large areas of the non-IDFA state forest to provide quicker access for SFNSW to those areas.

There is provision in the protocol for SFNSW to apply for a review of conditions in an individual compartment should the effect on wood resource or silvicultural practice be onerous.

8 TRANSITIONAL ARRANGEMENTS

8.1 Rare Non-commercial Forest Types

Compliance with the protocol by 1 January 1997. All reasonable measures prior to that date to ensure access is being minimised.

8.2 Old Growth

Outside the identified regrowth zones the protocol is to be implemented by 1 January 1997. The previous protocol will apply until then.

Within the zones shown on Maps 2, 3 and 4, all reasonable measures should be taken to adhere to the protocol from the date of its adoption by the Government, with a final date for complete implementation of 31 March, 1997.

In the interim the previous protocol will apply as a minimum measure.

8.2 Rainforest

Compliance with the protocol by 1 January 1997. All reasonable measures prior to that date to ensure maximum adoption of the protocol immediately.

8.2 Threatened Species

Compliance with the parts of the protocol not requiring species-specific surveys by 31 March, 1997. Compliance with all parts of the protocol by 1 May, 1997. Survey methodology to be completed by February 15, 1997.

APPENDIX E

**EXPERT'S PACKAGE – SUMMARY OF STATE FORESTS OF NSW
PROTECTIVE MEASURES THAT AFFECT BIODIVERSITY**

HO 22919/6

28 March, 2001

Mr Michael Davis
Ecologically Sustainable Forest Management Group - NSW
Resource and Conservation Division
Department of Urban Affairs and Planning
GPO Box 3927
SYDNEY NSW 2001

Dear Mr Davis,

The following information is relevant background material for the ESFM workshops on forest practices and threatened species conservation.

The forestry practice systems that controls threatened species management outside of the Licence structure are:

- I. Forest Management Zoning in State forests;
- II. Fuel Management and Fire Suppression; and
- III. Silviculture.

The current Licence structure is composed of the Pollution Control Licence and a set of Conservation Protocols. In addition as part of the Forest Agreement process, negotiation is underway to determine the conditions of a Threatened Fish Species Licence. The Licence is being negotiated with NSW Fisheries. The Threatened Fish Species Licence attends to a survey and permit system for in-stream works in known or potential threatened fish species habitat. In addition, the Licence attends to prescriptions for the maintenance of fish habitat and fish passage from operations and in-stream works for non-threatened fish.

A description of the Forest Management Zoning in State forests is attached.

FUEL MANAGEMENT AND FIRE SUPPRESSION

Policies

- The resources of SFNSW are available for emergency fire management and may be committed progressively in a measured and co-operative response to the need to protect life, property, community assets and forest values.
- All wildfires on State forest, which cause or are considered likely to cause damage will be controlled. Control action will be given priority over all other activities.
- Prescribed fires will be used as one of a number of manipulative tools to manage forest fuels in accordance with approved Regional Fuel Management Plans. Regional Fuel Management Plans will identify specific fuel management zones and the fire regimes within those management zones necessary to protect life, property, community assets and/or achieve economic and ecologically sustained forest management.

Strategies

- Conduct and/or participate in programs to minimise the occurrence of preventable wildfires.
- Plan and use fire under appropriate burning prescriptions to:
 - protect life, property and other high value assets
 - provide substantial barriers in State forests to the progress of high intensity wildfires
 - reduce fire hazards produced by harvesting and other forest activities
 - produce seedbed and site conditions necessary for forest regeneration
 - maintain specific ecological values.
- Organise SFNSW resources into an efficient and effective fire fighting authority capable of combating simultaneous campaign fires and integrating with the resources of other fire fighting authorities.
- Prepare for each Region/District/Management Area, and keep under constant review, a Fire Suppression Plan. These plans are to include objectives and operational requirements for pre-suppression (including fuel management) fire suppression and post-fire recovery.
- Arrange for Fire Suppression Plans to be integrated with Bush Fire Management Committee plans prepared under Section 41AB of the Bush Fires Act (1949).
- Periodically analyse records of weather, fuel types and loads, fuel moisture content, fire behaviour and fire effects recorded in operational burning plans and use such analysis to review burning prescriptions and operational procedures.
- Evaluate the effectiveness of prescribed burning and other manipulative practices in achieving fuel management objectives.
- Train all staff for appropriate roles in fire management from base level to Incident Controller of campaign fires. Where appropriate, training programs will be competency based according to Australian Fire Competency Standards and will provide accreditation.
- Maintain a system of roads, fire trails and helipads to provide access and safety for firefighters.
- Operate a fire detection system which gives timely warning of fires threatening the community and/or State forest.
- Establish independently, or where appropriate, by co-operation with other fire authorities, an initial attack system which is fast, aggressive and effective with the primary objective of controlling wildfires quickly and with least cost plus loss. When, in accordance with policy, initial attack on a wildfire in State forest is deferred because the fire is not considered to be causing damage or likely to cause damage, the incidence of the fire and the reasons for deferring control action shall be recorded.
- Contribute to Statewide fire management by representation on the Bush Fire Council, the Bush Fire Co-ordinating Committee and where Local Government Areas include significant areas of State forest, Regional Fire Associations and Bush Fire Management Committees.
- Maintain formal liaison with fire fighting authorities in Victoria and the Australian Capital Territory to periodically review operational plans and procedures for the control of fires which cross or may cross State borders.

- Undertake research and development and foster research and development by other Agencies and Institutions into fire fighting technology, fire behaviour, fire management systems and fire effects on forests.
- Translate appropriate research findings into operational practice.
- Engage professionally trained teachers and journalists to improve community awareness and understanding of wildfires, prescribed fires and the policies, strategies and operational practices relating to fire management.

1.1.8 Precincts for prescribed burns

Forest fuel is comprised of two main components – fine fuel and large fuel. SFNSW defines fine fuel as organic matter up to 25 mm in diameter that is deposited on, or attached to, the ground surface. Fine fuel is the material that is most readily and easily burnt because of its size and arrangement (or degree of aeration). Large fuel is dead organic material greater than 25 mm in diameter. Large fuel is important in relation to fire damage and fire control because, once ignited, it burns for a long time and generates a high level of heat. The ignition of large fuels has a role in generating and maintaining a convection column.

Fuel management is aimed at the fine fuel rather than large fuel component. Low intensity fuel reduction will reduce fine fuel weight by up to 75 per cent on 35 to 60 per cent of the gross area treated. After low intensity burning, the fine fuel weight will recover to 70 to 80 per cent of the pre-burn weight in two to three years. High intensity wildfire generally reduces fine fuel by more than 75 per cent, and a high proportion (approaching 100 per cent) of the area is generally burnt over.

Within the Regional Fuel Management Plan the following fuel precincts are provided:

- Protection of high value assets;
- Broad area fuel management;
- Post-logging fuel management;
- Fuel management in young regrowth stands;
- Fuel management for specific management or ecological purposes; and
- Fuels that are not to be managed or are not to be burnt.

Protective measures relevant to threatened species conservation

The identifiable protective measures are:

The planning and use of fire under appropriate burning prescriptions to:

- Protect life, property and other high value assets;
- Provide barriers against the progress of substantial wild fires;
- Reduce fire hazards produced by harvesting and other forest activities;
- To produce seedbed and site conditions necessary for forest regeneration; and
- Maintain specific ecological values.

Broad area prescribed burning only to be undertaken in sclerophyll forest to achieve a spatial and temporal mosaic.

No prescribed burning in rainforest.

Pre-harvest burning must only be used where post-harvest burning is inappropriate. It is not to be used where:

- Sensitive advanced growth may be damaged or killed;
- It will pre-empt post-harvest burning;
- Weed invasion may result.

Prescribed burning in commercial sub-alpine forest associations must be confined to narrow defined firebreaks. Broad area burning is not allowed.

Strategic firebreaks are to be established using non-burning methods if necessary.

Grazing may be used to compliment broad area burning.

All wild fires on State forests likely to cause damage will be controlled. Control action will be given priority over all other activities.

SILVICULTURE

Policy

Silvicultural practices on State Forests will maintain and enhance sustained productivity, vitality and diversity of forest ecosystems.

Objective

- Harvesting practices will provide for:-
 - the needs of current and future generations
 - the maintenance of the full range of ecological communities across the regional landscape
 - the maintenance or enhancement of the forest's wood productive condition
- Management practices will ensure that harvest plans reflect site specific silvicultural requirements appropriate to the condition of the forest ecosystem.

Strategy

The silvicultural policy will be implemented by:

- I. Determining the most appropriate silvicultural practices from information obtained from a site specific assessment of ecosystem type, stand structure and condition, timber, flora, fauna and erosion hazard, the Silvicultural Guidelines (under development for inclusion in the Native Forest Management System Manual) and the Eco-Field Guide taking into account ESFM principles and current and future industry requirements.

Principles used above include:

- Using silvicultural regimes appropriate to forest type and stand condition in the Upper North East and Lower North East CRA areas (Light and medium Australian Group Selection, Light, medium and heavy single tree selection) and Eden (Thinning and integrated harvesting/regeneration systems).
 - Using silvicultural system that are sympathetic with the maintenance and conservation of native species, particularly threatened species, and their habitat.
 - Using silvicultural systems that provide for the maintenance of the productivity of forest soils and water quality.
 - Actively managing threats to forest health and vitality such as fire, pests and weeds to protect and enhance forest ecosystems.
- II. Specifying the intended outcomes of harvesting in terms of regeneration requirements, stand structure and condition, habitat and other assessed forest values in Harvest Plans.
 - III. Monitoring and reporting of silvicultural and ecological outcomes, undertaking research, environmental restoration and the ongoing review of silvicultural practices.
 - IV. Providing on-going training of State Forests' staff and contractors in silvicultural systems and practices.
 - V. Providing a full time Silviculturist to guide the development of improved silviculture across the forest estate, both native forest and plantation.

Silviculture regimes applicable in South CRA

A quantifiable matrix of silviculture regimes based on forest associations is under construction for the South CRA as part of the FRAMES project. The matrix and a brief plain English summary of each probable silviculture regime will be distributed at the workshop during the introduction.

Yours sincerely,

Russell Cowgill
Harvest Regulation Officer
Sustainable Forest Management

FOREST MANAGEMENT ZONING IN STATE FORESTS

Acknowledgements

Thanks to the other members of the Project Reference Group for their contributions to the development of this document: to David Ridley, General Manager, Forest Policy and Programs (State Forests of NSW), for advice and direction and to staff from the Regions who assisted by discussing early drafts.

Reference Group Members:

Barbara Sanders and Ian Cranwell from Dept of Urban Affairs and Planning.
Kevin Shanahan from National Parks and Wildlife Service.
Jim Simmons, Bob Bridges, Tony Howe and Tony O'Hara from State Forests.
Howard Reed from Department of Mineral Resources.

Steve Shaw
Project Manager

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Part 1 Introduction

Forest Management Zoning (FMZ) is a land classification system which sets out in map format the way State Forests 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 timber harvesting and other activities.

The Commonwealth, State and Territory Governments agreed to the development of National Forest Reserve Criteria, in accordance with the National Forest Policy Statement. The Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee (known as JANIS) produced a report outlining the criteria. Called “Nationally Agreed Criteria For The Establishment Of A Comprehensive, Adequate And Representative Reserve System For Forests In Australia” the report sets out the components of the Comprehensive, Adequate And Representative (CAR) reserve system. These components are commonly referred to as the JANIS criteria. The criteria are linked to the International Union for Conservation of Nature (IUCN) guidelines for Protected Area Management Categories.

The FMZ system replaces the Preferred Management Priority (PMP) classification system and constitutes one of the basic planning and management tools for State Forests. It relies on spatial planning to help balance different (and often competing) management objectives such as wood production, protection of the forest environment and water and soil resources, and the provision of recreation, education and research facilities.

The primary objective of this FMZ system is to separate clearly those areas of State forest managed as conservation reserves from those areas managed for timber production. This ensures that management of the forests by State Forests’ will contribute both to regional biodiversity and provision of a constant and sustainable supply of timber to industry.

The FMZ maps complement management plans derived from Comprehensive Regional Assessments (CRA) and the Regional Forest Agreements (RFA). The maps are subject to continuing revision and any proposed changes to those areas set aside for conservation purposes require public comment and either Parliamentary action or Ministerial approval depending on the particular zone.

A FMZ map is a major strategic layer for other more detailed operational planning such as preparation of harvesting plans.

Forest Management Zoning is a simple two tiered classification system. In the first tier each part of every State forest is classified into one of seven zones, according to the priority given to the management of particular forest values in the area and to the level of security that applies to the zone. Each zone has certain forest management activities that are permitted or not permitted. In Part 2 there is a description of each zone and an activities table to provide guidance for ‘Activities Not Permitted’, ‘Activities Permitted with Standard Conditions’ and ‘Activities Permitted with Special Conditions’.

Standard conditions are conditions applicable to the proposed activity that are specified in relevant planning documents, such as codes of practice, operational circulars, protocols, licenses, management and working plans or included in Integrated Forestry Operation Approvals (under the *Forestry and National Parks Estate Act 1998*). Generally these prescribed conditions are relevant where ever activities are permitted on the forest estate..

Special conditions are conditions specified for the proposed activity that are in addition to or supplement the standard conditions. They may also include particular approvals or additional constraints that may be required as a condition for certain activities. Generally these prescribed conditions are relevant at a site-specific scale.

In the second tier each zone may be classified for its “special values”, These values recognise particular natural or cultural features or specific forest uses and may be applied to the zone as a whole or to an individual site within a zone. These special values are described in Part 3.

Part 2 ZONES

Zone 1- Special Protection

Management to maximise protection of very high natural and cultural conservation values.

Areas within this zone are designed to meet the requirements of JANIS dedicated (formal) reserves in the National Forest Policy Statement and, as such, are equivalent to IUCN -Protected Area categories I II, III or IV. *(See Appendix 1 for definitions of IUCN categories and Appendix 2 for an extract from JANIS on reserve design criteria.)*

Classification Guidelines

- Size: 40 ha or more preferred; however where there are significant values to be protected and where, for example, available area is limited a smaller size may be appropriate.¹
- Boundaries: Where practicable boundaries should be based on easily recognisable topographic features such as major creeks, cliff lines, distinct ridge lines and roads in combination with major legal (cadastral) boundaries such as State forest boundaries.

Examples:

- Representative examples of forest ecosystems and high conservation value old growth forest
- Outstanding examples of forest ecosystems, areas of known unique or uncommon biological values or areas of high biodiversity
- Rainforest that meets size and boundary requirements
- Areas of particular beauty, grandeur or attraction
- Sites of historical, indigenous or non-indigenous cultural heritage, or scientific significance
- Localities or habitat of key threatened and sensitive fauna and flora.

Notification and Revocation of Zone Boundaries

- New areas are set apart as Flora Reserves under Section 25A of the Forestry Act
- Opportunity will be provided for public and inter-agency comment on new proposals and boundary amendments.²
- Notification of new areas requires publication of the proposal in the Parliamentary Gazette
- An Act of Parliament is required to revoke this Zoning.

¹ Based on Forest Preservation in State Forests of NSW, Research Note No 47

² A process for public comment will be used that is similar to that listed in Schedule 8 *Forestry and National Park Estate Act 1998*

Management Guidelines for Zone 1 Special Protection:

- Management and protection of native forests containing very high natural and cultural conservation values.
- Section 25A of the *Forestry Act* requires a working plan (management plan) for each Flora Reserve approved by the Minister for Forestry.³ Opportunity will be provided for public and inter-agency comment on proposed new or amended working plans.⁴
- Activities within Flora Reserves are not included within Integrated Forest Operation Approvals and are subject to *Environmental Planning & Assessment Act* requirements.

Activities Table: Zone 1 Special Protection.

Activities Not Permitted	Activities PERMITTED WITH STANDARD CONDITIONS	Activities Permitted with Special Conditions
- Any activity not permitted by the working plan. <i>Examples of activities that are not permitted:-</i> ♦ Timber harvesting^① ♦ Removal of forest products and materials ♦ Grazing by domestic stock^② ♦ Gravel/hard rock quarrying ♦ Mineral and petroleum exploration^③	- Any activity consistent with the working plan. <i>Examples of activities that are permitted with standard conditions:-</i> ♦ Scientific studies (eg fauna surveys including trapping) approved by State Forests. ♦ Maintenance of existing roads and fire trails. ♦ General access for activities such as bush walking or photography is not restricted, except as required to meet specific management needs. ♦ Prescribed burning ^④ ♦ Recreation developments where there is clearly an existing use. ♦ Limited tree removal for safety, viewing or construction of facilities in areas used for recreation. ♦ Beekeeping. ^⑤ ♦ Feral animal and noxious weeds control	- Any activity specified in the working plan as requiring special conditions or special approval. <i>Examples of activities that are permitted only with special conditions:-</i> ♦ Construction of new roads and fire trails. Construction will only be permitted in exceptional instances and only under the following conditions: • <i>no practical alternative location is available,</i> • <i>the values of the zone will not be significantly affected by the road or fire trail,</i> • <i>opportunity is provided for public comment on the proposal</i> • <i>Ministerial approval is given for the proposal</i> * .

^① Timber harvesting will not be permitted notwithstanding Section 27F Forestry Act.

^② No new grazing Occupation Permits will be issued. Any existing Occupation Permits will be subject to phase-out requirements (including completion by mid year 2000) to be managed by the

³ In the absence of an approved working plan (during the introductory or transitional period) the examples listed in the Activity Table: Zone 1 Special Protection will be adopted as management requirements. (See also prescribed burning reference note.)

⁴ A process for public comment will be used similar to that listed in Schedule 8 *Forestry and National Park Estate Act 1998*

inter-agency Occupation Permits Taskforce. This Taskforce comprises the Chief Executive Officers of State Forests and NSW Farmers Federation and the Directors General of National Parks & Wildlife Service and Dept Land & Water Conservation

- ③ *Many (but not all) Zone 1 areas will be exempted from the provisions of the mining legislation by agreement between Ministers under Section 21 of the Forestry Act. Where Zone 1 areas have not been so exempted, then exploration for minerals and petroleum may be permitted 'with special conditions'. Any mining proposals flowing from exploration require standard environmental impact assessment and development approval processes. A decision to proceed with mining may lead to a change of Zones, for example from Zone 1 or 2 to Zone 3,4 or 7 - (or in some cases revocation of the State forest) if the mining is incompatible with the values of the original zone or continued forest management.*
- ④ *Planned to be fully cognisant of the values that the zone is designed to protect. Where prescribed burning is other than an "Activity Permitted with Standard Conditions", specific requirements will be listed in the working plan. In some cases prescribed burning may be an "Activity Not Permitted", in other cases it may be an "Activity Permitted with Special Conditions". In the absence of a working plan (during the introductory or transitional period) prescribed burning will be An Activity Permitted with Special Conditions to emphasise the focus on environmental management.*
- ⑤ *Permits will not be issued for new sites. Any existing permits may be renewed, transferred or reallocated.*

Zone 2- Special Management

Specific management and protection of natural and cultural conservation values where it is not possible or practicable to include them in Zone 1. Areas within this zone are designed to meet the requirements of JANIS informal reserves in the National Forest Policy Statement, and as such are equivalent to IUCN Protected Area categories II, III, IV or VI. They are of a size and design sufficient to maintain the values they seek to protect and can be accurately located on maps.

Classification Guidelines

- Size: 40 ha or more preferred. A smaller size may be appropriate, however, where there are significant values to be protected and where, for example, available area is limited.
80 metres minimum width for linear areas.
- Boundaries: Where practicable boundaries should be based on easily recognisable topographic features such as major creeks, cliff lines, distinct ridge lines and roads in combination with major legal (cadastral) boundaries such as State forest boundaries.

Examples:

- Areas for conservation of fauna, eg corridors
- Representative examples of forest ecosystems and high conservation value old growth forest
- Examples of forest ecosystems, areas of known unique or uncommon biological values or areas of high biodiversity
- Rainforest that meets size and boundary requirements
- Areas of particular beauty, grandeur or attraction
- Sites of historical, indigenous or non-indigenous cultural heritage, or scientific significance
- Localities or habitat of key threatened and sensitive fauna and flora
- Areas of forest that have high conservation or biodiversity values which are not possible or practicable to include in Zone 1.

Notification and Revocation of Zone Boundaries

- Opportunity will be provided for public and inter-agency comment on any proposed new declarations, revocations or boundary amendments⁵
- Minister for Forestry approval by notice in the Gazette is required for new declarations, revocations or boundary amendment.⁶

⁵ See Schedule 8 Forestry and National Park Estate Act 1998 [viz new Section 21A (7) Forestry Act].

⁶ Arising from CRA negotiations revocation or alterations to boundaries of areas listed in Appendix 3 require joint agreement of the Minister for the Environment, the Minister for Planning, the Minister for Forestry and the Minister for Mineral Resources.

Management Guidelines for Zone 2 Special Management.

- Management and protection of native forests containing significant natural and cultural conservation values. Specific management requirements are listed in Section 21A *Forestry Act* (Schedule 8 *Forestry and National Parks Estate Act 1998*).
- Management direction and instructions will be included in Regional management plans.⁷

Activities Table: Zone 2 Special Management.

Activities <i>Not Permitted</i>	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions
• Any particular kind of operation the Minister advises State Forests by notice in writing that is prohibited. <i>Examples of activities that are not permitted:-</i> ♦ Timber harvesting ♦ Removal of forest product and materials ♦ Grazing by domestic stock^① ♦ Gravel/hard rock quarrying	• Any activity that is consistent with the management plan for the area. <i>Examples of activities that are permitted with standard conditions:-</i> ♦ Scientific studies (eg fauna surveys including trapping) approved by State Forests. ♦ Maintenance of existing roads and fire trails. ♦ General access for activities such as bush walking or photography is not restricted, except as required to meet specific management needs. ♦ Beekeeping. ♦ Prescribed burning^② ♦ Recreation developments where there is a history of recreational use, or where there are outstanding scenic attractions. ♦ Limited tree removal for safety, viewing or construction of facilities in areas used for recreation. ♦ Mineral and petroleum exploration. ^③ ♦ Feral animal and	• Any particular kind of operation the Minister advises State Forests by notice in writing that is prohibited unless particular conditions are complied with. <i>Examples of activities that are permitted only with special conditions:-</i> ♦ Construction of new roads and fire trails. <i>New roads or fire trails must only be constructed when no practicable alternative exists to provide for forest management or access to commercial forest. Such roads must be of minimum length, width and disturbance to facilitate safe and economic access.</i>

⁷ In the absence of a Regional Management Plan (during the introductory or transitional period) the examples listed in Activity Table: Zone 2 Special Management will be adopted as management requirements. (See also prescribed burning reference note.)

	noxious weeds control.	
①	<i>No new grazing Occupation Permits will be issued. Any existing Occupation Permits will be subject to phase out requirements (including completion by mid year 2000) to be managed by the inter-agency Occupation Permits Taskforce. This zone is applied on dedicated leasehold only where voluntary agreement is reached with the lessee.</i>	
②	<i>Planned to be fully cognisant of the values that the zone is designed to protect. In the absence of a regional management plan (during the introductory or transitional period) prescribed burning will be “An Activity Permitted with Special Conditions” to emphasise the focus on environmental management</i>	
③	<i>Conditions of exploration licences are reviewed by State Forests prior to approval to undertake exploration. Issues such as the type of exploration and disturbance (such as additional roading to facilitate exploration) are reviewed to ensure any potential impacts are minimised. Any mining proposals flowing from exploration require standard environmental impact assessment and development approval processes. A decision to proceed with mining may lead to a change of zones (e.g. from Zone 1 or 2 to Zone 3, 4 or 7) or in some cases revocation of the State forest if the mining is incompatible with the values of the original zone or continued forest management.</i>	

Zone 3- Special Prescription.

Management for conservation of identified values and/or forest ecosystems and their natural processes, whilst also facilitating other management and production activities.

These activities (which in some cases may include timber, forest product and materials extraction) are minimised in their design and implementation to maintain or enhance the values that the area is zoned to protect.

Areas within this zone are designed to meet the requirements of JANIS “Values Protected by Prescription” in the National Forest Policy Statement. They are designated for both protection of the values contributing to the CAR reserve system and for other management activity including timber production under certain prescribed conditions.

Classification Guidelines

Size: The minimum size is the size required for protection of the value and the facilitation of other management activity. For example, a minimum of 50 metres either side of a road might be required for a roadside landscape aesthetics zone. Generally this classification will be broad areas or strips, rather than smaller areas around site specific points.

Boundaries: Where practicable boundaries should be based on easily recognisable topographic features such as major creeks, cliff lines, distinct ridge lines and roads in combination with major legal (cadastral) boundaries such as State forest boundaries.

Examples:

- Visual protection areas
- Recreation areas
- Extensive areas (rather than individual specific sites) that may include numerous individual sites of Indigenous cultural heritage
- Extensive areas (rather than individual specific sites) that may include numerous individual sites of non-indigenous cultural heritage
- Catchment areas
- Education areas
- Scientific research areas

Notification and Revocation of Zone Boundaries

- The Divisional Manager may approve changes to the zone after considering public comment on the proposed amendments.⁸

⁸ A process for public comment will be used similar to that included in Schedule 8 *Forestry and National Park Estate Act 1998* except that ‘the Divisional Manager’ replaces ‘the Minister’.

Management Guidelines for Zone 3 Special Prescription.

- The priority is to protect and manage identified conservation values whilst allowing other management and production activities, modified where required, which enhance or maintain those values.
- The zone contributes to timber production, other forest product or materials extraction and/or other management objectives, only where identified conservation values can be satisfactorily protected.
- Each individual Zone 3 area will have prescribed 'activities not permitted', and 'special conditions' which must be implemented to facilitate certain activities. These activities and conditions for each Zone 3 area will be approved by the Regional Manager and then be included in State Forests' Geographic Information System (GIS) data base.⁹

Activities Table: Zone 3 Special Prescription.

Activities Not Permitted ¹⁰	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions ¹¹
• Case by case assessment dependent on the specific special value involved. <i>Individual areas may exclude specific activities to protect the value involved.</i> Some special cases for UNE/LNE areas are listed below in references ① & ②	• Case by case assessment dependent on the specific special values involved. <i>Examples of activities that are usually permitted with standard conditions:</i> ♦ Scientific studies approved by State Forests. ♦ Infrastructure maintenance. ♦ Road maintenance. ♦ Feral animal and noxious weeds control. ♦ Beekeeping. ♦ Prescribed burning. ♦ Mineral and petroleum exploration. ♦ Grazing by domestic stock	• Case by case assessment dependent on the specific special value involved. <i>Special conditions specific to the identified Special Value of the Zone apply as well as standard conditions.</i> <i>Examples of activities that need particular consideration to be permitted with special conditions:-</i> ♦ Timber and other forest product extraction. ♦ Gravel/hard rock quarrying in some circumstances. ♦ Road construction. ♦ Infrastructure development.

① *In the UNE & LNE CRA Regions Zone 3 areas on dedicated leasehold have generally been designated to provide for 'Reserved Areas' and at the same time facilitate recognition of prior rights of lessees for grazing. (These pre-existing rights are not effected by zoning.). On these dedicated lease areas activities*

⁹ In the absence of any approved conditions (during the introductory or transitional period) any proposal to undertake timber and other forest product extraction, gravel/hard rock quarrying, road construction or infrastructure development in the zone will require the Regional Manager to determine and approve (or exclude) activities and any associated special conditions.

¹⁰ The Regional Manager is authorised to. determine appropriate exclusions.

¹¹ The Regional Manager is authorised to set and approve appropriate Special Conditions.

that are not permitted are:-timber harvesting; removal of forest products and materials; gravel/hard rock quarrying.

- ② In the UNE & LNE CRA Regions some Zone 3 areas have been designated to provide for 'Reserved Areas' and at the same time facilitate recognition of significant mineral or petroleum resources and ongoing or imminent exploration. On these areas activities that are not permitted are: timber harvesting; removal of forest products.*

Zone 4- General Management.

Management of native forests for timber production utilising the full range of silvicultural options as appropriate; and conservation of broad area habitat and environmental values which are not dependent on the structure of the forest.

This zone is designed for a range of uses, but timber production has a high priority.

This zone contributes to the JANIS criteria “Values Protected by Prescription” through the application of protocols designed to detect and protect threatened flora and fauna species, communities and habitat listed under the *Threatened Species Conservation Act*.

1.1.9 Classification Guidelines

Size: _____ Minimum size and harvesting practicalities may vary with local conditions.

Boundaries: Boundaries will largely be determined by requirements to identify adjoining zones.

Examples: All native forest areas not classified in Zones 1, 2, 3, and 7.

Notification and Revocation of Zone Boundaries

1.1.10 Procedures for modification of Zone 4 areas will be dependent on which adjacent zones are involved and their requirements for amendment to boundaries.

Management Guidelines for Zone 4 General Management.

- Sustainable timber production.
- Forest management will be directed towards improving overall long term timber productivity through appropriate harvesting and silvicultural practice and the establishment and development of effective regeneration in native forest.

Activities Table: Zone 4 General Management.

Activities Not Permitted	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions
	All forest management activities, including: • Production of timber and other forest products using the full range of silvicultural options as appropriate. • Infrastructure development and maintenance. • Road construction and maintenance. • Gravel/hard rock quarrying. • Recreation. • Scientific research. • Prescribed burning. • Beekeeping. • Grazing by domestic stock. • Mineral and petroleum exploration	

Zone 5- Hardwood Plantations.

Management of hardwood plantations to maximise sustainable timber production on a continuing and cyclical basis.

Hardwood plantations are managed:

- in a sustainable manner.
- to maximise the plantation value and productivity by appropriate intensive management regimes consistent with good forest practices as provided in approved codes of practice.

Classification Guidelines

- All existing plantations of native hardwood species.
- Substantially cleared land or pastoral land acquired for the purpose of establishing hardwood plantations. Classification (which may occur prior to dedication as State forest to indicate management intent) must occur within two months of dedication.
- The zone may include small areas that are unsuitable for plantation (e.g. swamps, rocky areas, recreation sites, buildings) and areas subject to routine or statutory restraints (e.g. filter strips). However, significant mappable areas not managed as plantation such as rainforest and steep areas are not included as plantation but zoned appropriately as Zone 1, 2, 3, or 4.
- Joint venture plantations on freehold land are **not** subject to forest zoning.

Notification and Revocation of Zone Boundaries

Changes to the zone require approval of the Divisional Manager.

Management Guidelines for Zone 5 Hardwood Plantations

- Establishment of hardwood plantations is restricted to substantially cleared areas or suitable end-of-rotation plantation stands.
- Management of hardwood plantations will conform to the *Timber Plantation Harvest Guarantee Act*, associated codes of practice and other regulatory requirements.
- Conservation values in plantations will be incidental to the primary purpose of intensive timber production.

Activities Table: Zone 5 Hardwood Plantations.

Activities Not Permitted	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions
	All forest management activities including: • Site preparation, establishment, cultural practices, infrastructure development and maintenance • Road construction and maintenance • Prescribed burning • Production of plantation timber and other forest products • Gravel/hard rock quarrying • Recreation • Grazing by domestic stock • Beekeeping • Mineral and petroleum exploration	

Zone 6- Softwood Plantations.**Management of softwood plantations to maximise sustainable timber production on a continuing and cyclical basis.**

Softwood plantations are managed:

- in a sustainable manner.
- to maximise the plantation value and productivity by appropriate intensive management regimes consistent with good forest practices as provided in approved codes of practice.

Classification Guidelines

- All existing softwood plantations
- Substantially cleared land or pastoral land acquired for the purpose of establishing softwood plantations and dedicated as State forest
- The zone may include small areas that are unsuitable for plantation (e.g. swamps, rocky areas, recreation sites, buildings) and areas subject to routine or statutory restraints (e.g. filter strips). However, significant mappable areas not managed as plantation such as rainforest, steep and native forest retention areas are not included as plantation but zoned appropriately as Zone 1, 2, 3, or 4.

Notification and Revocation of Zone Boundaries

Changes to the zone require approval of the Divisional Manager.

Management Guidelines for Zone 6 Softwood Plantations

- Establishment of softwood plantations is restricted to substantially cleared agricultural land acquired for the purpose or suitable end-of-rotation plantation stands.
- In plantation planning and design, the need for native forest connection corridors and retention strips for wildlife and general conservation values shall be considered and incorporated as appropriate.

Activities Table: Zone 6 Softwood Plantations.

Activities Not Permitted	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions
	All forest management activities including: • Site preparation, establishment, cultural practices, infrastructure development and maintenance • Road construction and maintenance • Production of plantation timbers and other forest products • Prescribed burning • Gravel/hard rock quarrying • Recreation • Grazing by domestic stock • Mineral and petroleum exploration	

Zone 7 - Non Forestry Use.

Management of cleared (non-forested) areas, such as those used for special developments.

Classification Guidelines

Size: 10 ha minimum. For linear areas a minimum width of 80 metres (except where even a small area would be inconsistent with the surrounding area if it were similarly zoned, e.g. transmission line clearing 20 metres wide or a 2 ha gravel pit within or through a Zone 1 or 2 area.)

Boundaries: Boundaries will be determined by the extent of the cleared area.

Examples:

- Electrical power lines and towers
- Communication towers
- Gas pipeline easements.

Notification and Revocation of Zone Boundaries:

Changes to the zone require approval of the Divisional Manager.

Zone 7 Non-Forestry Use: Management Guidelines

Cleared land maintained in that state for a specific use of the area.

Activities Table: Zone 7 Non-Forestry use.

Activities Not Permitted	Activities Permitted with Standard Conditions	Activities Permitted with Special Conditions
• Activities that conflict with the specific non-forest use of the site.	• Activities that don't conflict with the specific non-forest use of the site.	

Part 3 SPECIAL VALUES

Categories of Special Values

There are twelve **Special Values** that can be grouped into three categories:

NATURAL VALUES	CULTURAL VALUES	FOREST USE VALUES
O High Conservation Value Old Growth	I Indigenous	T Tourism/Recreation
R Rainforest	H Historical (Non indigenous)	E Education
N Natural Feature		S Scientific Research
F Flora		L Landscape (Visual)
W Wildlife (fauna)		C Catchment

applications of Special Values

The two applications of special values are described below and their utilization in the various zones is illustrated in Table 1.

In the first application the special value may be attached to a Forest Zone classification to indicate the broad dominant values associated with a particular zone¹². This may indicate the general nature of a reserve or to identify that the zone has a special value requiring additional management prescriptions.

- Zones 1 and 2 will always be identified with the dominant or most significant Special Value of the area to give a broad indication of the reason for creating each 'reserve'. Although there will almost always be more than one special value present in these areas the purpose of this system is to provide a simple and very broad appreciation of the management intent of the reserves. There may be occasions to use two special values to identify these zones, however no more than two special values should be used.
- Zone 3 will always have at least one special value. In this case the special value identifies an area where additional management prescriptions (beyond the standard State Forests prescriptions) will apply. The specific additional prescription will be recorded with the zoning proposal and approval.
- Other zones may be identified by zone alone or by zone and one (or two) special values.
In the second application the special value classification identifies where specific special value sites are located within State forests. In these cases the special value is specifically attached to the actual sites, irrespective of the zone in which it occurs. This application is most commonly used when applied to cultural values.
- For example, an area, identified by any Zone (1 to 7) and a forest uses value "C (catchment)", say Zone 3C, may have one or more non-indigenous cultural heritage sites located within it. In the FMZ system each site is specifically identified and classified "H" but such occurrence is not reflected in the classification of the broad management zone (Zone 3C).

¹² Specific details of all values within an area are recorded in State Forests' databases, compartment histories and specific reports.

Table 1 Application of Special Values Across Forest Management Zones.

Zone	Special Values											
	Natural					Cultural		Forest Uses				
	Natural Feature	High Conservation Value Old Growth	Rainforest	Flora	Wildlife (Fauna)	Indigenous Cultural Heritage	Non-Indigenous Cultural Heritage	Scientific Research	Visual Aesthetics	Catchment	Tourism Recreation	Education
	N	O	R	F	W	I	H	S	V	C	T	E
1 Special Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	①	①
2 Special Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3 Special Prescription				②	②	✓	✓	✓	✓	✓	✓	✓
4 General Management						✓	✓	✓	✓	✓	✓	✓
5 Hardwood Plantation				③	③	✓	✓	✓	✓	✓	✓	✓
6 Softwood Plantation				③	③	✓	✓	✓	✓	✓	✓	✓
7 Non Forest Use						✓	✓	✓	✓	✓	✓	✓

① A new Zone 1 Special Protection would not usually be created for these special values.

② In exceptional circumstances these special values may be applied in Zone 3.

③ May be used where natural vegetation is retained within plantation areas.

These natural values are managed by prescription and would not usually require special value classification within these zones

Definitions of Special Values

NATURAL VALUES

F (Flora): Flora of specific value or significance.

O (High Conservation Value Old Growth): identified for protection in the RFA outcomes.

R (Rainforest): Rainforest identified for protection in the RFA outcomes.

W (Wildlife): Fauna or habitat of particular value or significance.

N (Natural Feature): Non-forest attributes such as geological and landform features or wetlands, for example, warranting management recognition and/or protection.

CULTURAL VALUES

I (Indigenous Cultural Heritage): Broad areas where Indigenous Cultural Heritage issues significantly modify management.

- *Specific site locations are not included in the Forest Management System (Site locations are maintained by National Parks and Wildlife Service in their Aboriginal Sites Register and a subset accessed through State Forests' GIS.)*

H (Non-indigenous Cultural Heritage): All sites of non-indigenous exploration and settlement recognised to be of local or regional historical significance.

FOREST USE VALUES

S (Scientific Research): All sites of current long-term research, which require management consideration.

These are listed in State Forests Research Register, Special Purpose Permits, Permanent Growth Plot Register and Environmental Impact Statement and other environmental reports.

V (Visual Aesthetics): Aesthetic areas of known public sensitivity especially forested skylines that are visible from population centres, well-used major roads, or other vantage points where management practices need to be modified to protect landscape values

C (Catchment): Catchments in which management practices need (or may be perceived to need) to be modified to provide additional protection to water quality and/or yield.

Examples include areas forming significant parts of catchments for domestic, industrial or aquaculture (e.g. trout farms) water supplies, wetlands or other sensitive, high conservation-value aquatic systems.

T (Tourism/Recreation): Sites with established recreation facilities or sites planned and suitable for development requiring additional management to protect the inherent values.

Such sites commonly have easy and reliable access and proximity to sites of natural beauty (e.g. waterways, waterfalls, scenic vantage-points, or areas with outstanding vegetation features). Management provides amenities such as picnic tables, barbecues, forest drives, walking trails, water supply and toilets and understorey clearing and grassed areas.

It is not intended that broader recreational use of the forest, say, general driving, walking and riding be included in this classification.

E (Education): Sites used to demonstrate forest values, ecologically sustainable forest management, and to promote forest management awareness.

These cover areas used by schools or other education groups near high population centres or field study centres, on relatively easy terrain with reliable access for large groups, or contain special attributes for demonstrating cultural heritage, forest values or forest practices.

APPENDIX 1

IUCN Protected Area Categories

The definition of “Protected Area” as defined by the International Union for the Conservation of Nature is:

*An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.*¹³

- Category Ia Strict Nature Reserve: protected areas managed mainly for science.**
Areas of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
- Category Ib Wilderness Area: protected area managed mainly for wilderness protection.**
Large areas of unmodified land, or slightly modified land, or land and water, retaining their natural character and influence, without permanent or significant habitation, which are protected and managed so as to preserve their natural condition.
- Category II National Park: protected area managed mainly for ecosystem protection and recreation**
Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for this and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
- Category III Natural Monument: protected area managed mainly for conservation of specific natural features.**
Areas containing one, or more specific natural or natural/cultural features which are of outstanding or unique value because of its inherent rarity, representative of aesthetic qualities or cultural significance.
- Category IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention**
Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
- Category V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation.**
An area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural values, and often with high biological diversity. Safe guarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
- Category VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.**
Areas containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

¹³ Guidelines for Protected Area Management Categories IUCN Commission on National Parks and Protected Areas with the assistance of the World Conservation Monitoring Centre. 1994

APPENDIX 2

JANIS RESERVE DESIGN¹⁴

The criteria, which should influence reserve design, include:

- Boundaries should be set in a landscape context with strong ecological integrity, such as catchments;
- Large reserved areas are preferable to small reserved areas, though a range of reserve sizes may be appropriate to adequately sample conservation values;
- Boundary-area ratios should be minimised and linear reserves should be avoided where possible except for riverine systems and corridors identified as having significant value for nature conservation;
- Reserves should be developed across the major environmental gradients if feasible, but only if these gradients incorporate key conservation attributes which should be incorporated in the CAR system;
- Each reserve should contribute to satisfying as many reserve criteria as possible;
- Reserve design should aim to minimise the impact of threatening process, particularly from adjoining areas;
- Reserves should be linked through a variety of mechanisms, wherever practicable, across the landscape.

Reservation alone will not ensure conservation of biodiversity or other natural and cultural values, and active management is required to ameliorate threatening processes and ensure that the reserve system retains the biodiversity and other values, including old-growth forest, for which it was established. Such management may involve the use of specific fire regimes, and even managed disturbance or selective reduction of certain populations. Extensively depleted forest ecosystems may need to be included in reserves and rehabilitated to ensure the primary criteria of comprehensiveness is achieved. Species and forest ecosystems recognised as endangered and vulnerable may require priority management action, such as development of recovery plans. Recognising the dynamic nature of forest ecosystems, and the inevitability of incremental loss of reserved old growth through wildfire and other natural processes, old growth values will need to be maintained by appropriate management strategies across the forest estate as a whole.

Reserves will require significant funding for establishment and ongoing management including the costs associated with data acquisition and monitoring of management performance.

Modifications to reserve design will be required through time as new values are identified and programs monitoring the effectiveness of established reserves identify deficiencies in reserve design and management. Monitoring programs should enable appropriate reporting of the effectiveness of the establishment and success of the CAR reserve system.

¹⁴ An extract from "Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia. A Report by the ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee. 1997

APPENDIX 3

Areas, negotiated in the CRA, in which any revocation or alterations to boundaries require joint agreement of the Minister for the Environment, the Minister for Planning, the Minister for Forestry and the Minister for Mineral Resources:

CRA Region	State Forest Number	State Forest Name	Compartment Number	Area (ha)
UNE	15	'DOUBLEDUKE'	147	630.1
UNE	19	'GIBBERAGEE'	123	324
UNE	19	'GIBBERAGEE'	124	291.4
UNE	303	'GIRARD'	35	85.4
UNE	303	'GIRARD'	38	4.4
UNE	303	'GIRARD'	40	90.6
UNE	303	'GIRARD'	41	80.1
UNE	303	'GIRARD'	42	109.3
UNE	303	'GIRARD'	47	88.8
UNE	303	'GIRARD'	59	66.3
UNE	303	'GIRARD'	60	34.8
UNE	303	'GIRARD'	61	45.5
UNE	303	'GIRARD'	62	4.3
UNE	535	'ORARA WEST'	818	292.9
UNE	662	'KEYBARBIN'	393	348.9
UNE	662	'KEYBARBIN'	394	309.2
UNE	662	'KEYBARBIN'	395	295.3
UNE	662	'KEYBARBIN'	396	335.1
UNE	662	'KEYBARBIN'	397	342.5
UNE	815	'BILLILIMBRA'	666	300.2
UNE	815	'BILLILIMBRA'	677	188.7
UNE	815	'BILLILIMBRA'	678	179.4
UNE	815	'BILLILIMBRA'	679	83.8
UNE	845	'EWINGAR'	670	261.7
UNE	845	'EWINGAR'	676	133.3
UNE	845	'EWINGAR'	684	344.9
LNE	32	'YARRAHAPINNI'	486	138.3
LNE	32	'YARRAHAPINNI'	494	92.4
LNE	32	'YARRAHAPINNI'	495	158.1
LNE	32	'YARRAHAPINNI'	496	73.4
LNE	32	'YARRAHAPINNI'	499	96.3
LNE	32	'YARRAHAPINNI'	500	107.1
LNE	470	'WAY WAY'	483	139.9
LNE	470	'WAY WAY'	484	171.7
LNE	470	'WAY WAY'	485	140.1
LNE	470	'WAY WAY'	486	8
LNE	470	'WAY WAY'	487	152.8
LNE	470	'WAY WAY'	488	114.3
LNE	470	'WAY WAY'	489	151.3
LNE	470	'WAY WAY'	494	91.5
LNE	470	'WAY WAY'	496	104.4
LNE	470	'WAY WAY'	497	84.5
LNE	609	'OAKES'	402	385.9
LNE	609	'OAKES'	403	212.2
LNE	645	'BRASSEY'	1238	2.3
LNE	645	'BRASSEY'	1261	4.8
LNE	909	'CARRAI'	18	414
LNE	909	'CARRAI'	20	257.6
LNE	909	'CARRAI'	21	479
LNE	911	'DOYLES RIVER'	229	121.2
LNE	911	'DOYLES RIVER'	230	308.5
LNE	911	'DOYLES RIVER'	231	134.9
LNE	911	'DOYLES RIVER'	232	105.5
LNE	911	'DOYLES RIVER'	233	200.7
LNE	911	'DOYLES RIVER'	247	24.6
LNE	911	'DOYLES RIVER'	249	144.9
LNE	911	'DOYLES RIVER'	250	105.4
LNE	911	'DOYLES RIVER'	251	110.3
LNE	911	'DOYLES RIVER'	252	95.8
LNE	911	'DOYLES RIVER'	254	124.8
LNE	911	'DOYLES RIVER'	256	97
LNE	911	'DOYLES RIVER'	257	91.6

LNE	911	'DOYLES RIVER'	258	112.2
LNE	911	'DOYLES RIVER'	259	1.9
LNE	911	'DOYLES RIVER'	260	144.4
LNE	911	'DOYLES RIVER'	261	134.1
LNE	911	'DOYLES RIVER'	262	89.8
LNE	911	'DOYLES RIVER'	263	135.5
LNE	911	'DOYLES RIVER'	269	136.4
LNE	911	'DOYLES RIVER'	270	128
LNE	911	'DOYLES RIVER'	271	171.9
LNE	911	'DOYLES RIVER'	272	112.6
LNE	911	'DOYLES RIVER'	273	171.9
LNE	911	'DOYLES RIVER'	1138	194.6
LNE	911	'DOYLES RIVER'	1139	203
LNE	911	'DOYLES RIVER'	1147	205.5
LNE	911	'DOYLES RIVER'	1148	84.2
LNE	911	'DOYLES RIVER'	1149	55.1
LNE	911	'DOYLES RIVER'	1150	73.9
LNE	911	'DOYLES RIVER'	1151	87.6
LNE	911	'DOYLES RIVER'	1152	118.1
LNE	911	'DOYLES RIVER'	1153	59.5
LNE	911	'DOYLES RIVER'	1155	112.4
LNE	911	'DOYLES RIVER'	1160	73
LNE	911	'DOYLES RIVER'	1161	139.1
LNE	911	'DOYLES RIVER'	1162	115.8
LNE	911	'DOYLES RIVER'	1163	95.7
LNE	911	'DOYLES RIVER'	1164	75.9
LNE	911	'DOYLES RIVER'	1165	97.3
LNE	911	'DOYLES RIVER'	1166	62.4
LNE	911	'DOYLES RIVER'	1167	135.8
LNE	911	'DOYLES RIVER'	1214	146.1
LNE	911	'DOYLES RIVER'	1238	99.4
LNE	911	'DOYLES RIVER'	1239	336.7
LNE	911	'DOYLES RIVER'	1240	192.7
LNE	911	'DOYLES RIVER'	1243	361.4
LNE	911	'DOYLES RIVER'	1244	268.1
LNE	911	'DOYLES RIVER'	1247	193.2
LNE	911	'DOYLES RIVER'	1248	96.6
LNE	911	'DOYLES RIVER'	1257	427.1
LNE	911	'DOYLES RIVER'	1258	258.2
LNE	911	'DOYLES RIVER'	1260	242.7
LNE	911	'DOYLES RIVER'	1261	502.8
LNE	911	'DOYLES RIVER'	1264	80.3

APPENDIX F

**EXPERT'S PACKAGE – SUMMARY OF THE OUTCOMES OF THE
UPPER AND LOWER NORTH EAST REVIEWS OF FLORA
PRESCRIPTIONS FROM EXISTING CONSERVATION PROTOCOLS**

SUMMARY PAPER**Threatened Flora Expert Panel Review of the
Flora Prescription Component of Existing Conservation Protocols
applied to Forestry Activities in North-Eastern New South Wales:**

Outcomes and Recommendations from the
Threatened Flora Conservation Requirements Workshop
convened by CRA Unit, NPWS Northern Zone,
Coffs Harbour, 13th-17th July, 1998.

**Expert panel members : Andrew Benwell, Phil Gilmour, Stephanie Horton,
Doug Binns, R. John Hunter**

This paper provides a summary of the outcomes of the Threatened Flora Workshop held to review the effectiveness of the Conservation Protocols in protecting threatened flora in wood production forests of the Upper North East and Lower North East regions of NSW.

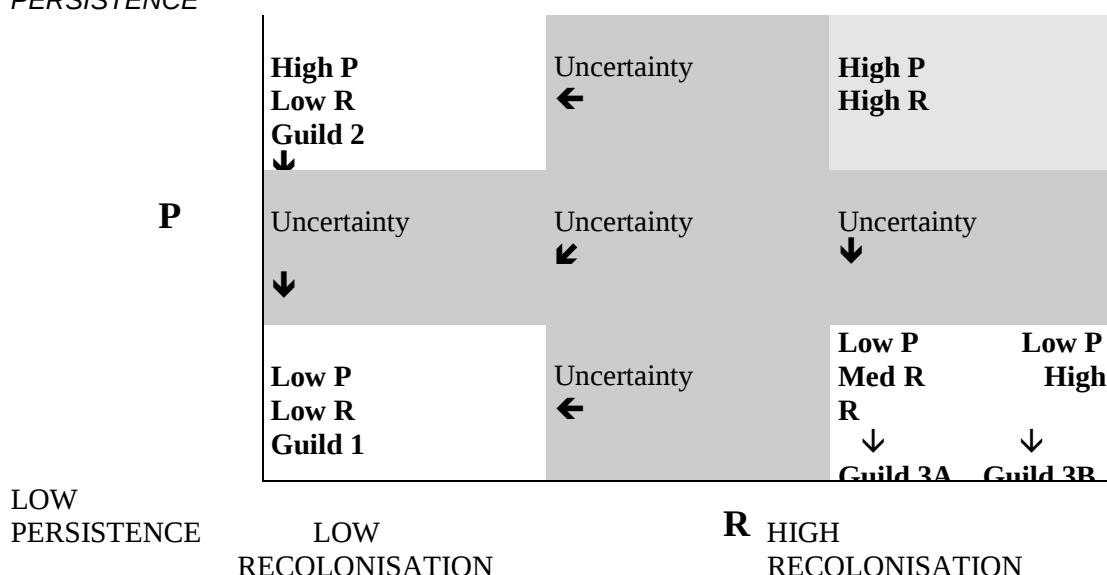
The summary is provided to stimulate thought and discussion of possible management strategies for Threatened Flora in the Southern Region. It is provided as an example of one approach that may be taken in the review of conservation measures practised for threatened flora in the Southern region. It is not intended to guide the outcomes of the Southern review process.

The Functional Guilds

The present grouping of species into groups of functional guilds is problematic, although the actual life-attribute classes used are logical. An alternative functional guild classification is recommended. This system incorporates the ecological concept of species **resilience**, which is a combination of a plant species **persistence**, including longevity and the ability to recover from disturbance, and **recolonisation**, including the ability to recruit into habitat post-disturbance (Figure 1). This scheme is analogous to that outlined by Noble and Slatyer (1980), although it should be noted that they use the term 'tolerance' where 'recolonisation' is used in this report.

Figure 1: **Chart of Functional Guilds based upon Vital Attributes** (cf. Noble & Slatyer, 1980)

1.1.11 HIGH
PERSISTENCE

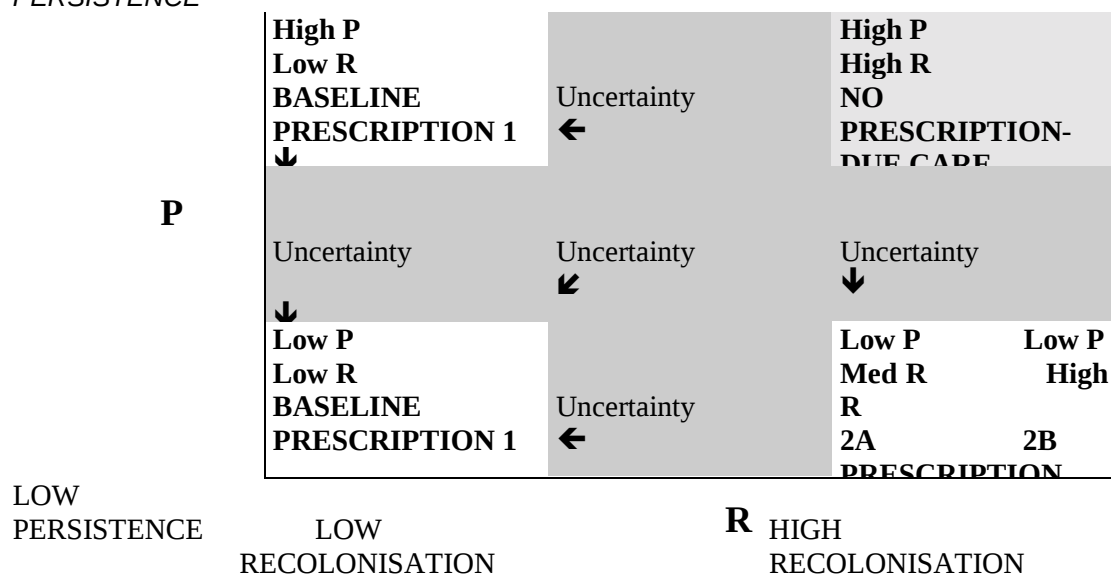


The actual functional guilds that will have prescriptions applied are the unshaded boxes in the above diagram. By providing a continuum of nine classes into which a plant species may be placed, the precautionary principle is more easily applied when assessing a species that may fall into one of the 'uncertainty' categories, which in lay-terms would equate to such categorisations as 'fairly good recolonisation', 'moderately low persistence', 'probably able to recolonise disturbed sites quickly', etc. Thus, for a species to be definitively categorised into 'High P, High T', for instance, knowledge of the species' autecology, response to disturbance and demographics must be considered to be very good, otherwise uncertainty would tend to relegate it to a lower resilience category.

Prescriptions for Threatened Plant Taxa

An alternative to the current flora prescriptions are presented here, as agreed by all panel members. Figure 2 illustrates how the agreed prescriptions are to be applied to each of the functional guilds defined in Figure 1.

Figure 2: **Chart of Prescriptions based upon Functional Guilds**

1.1.12 HIGH
PERSISTENCE

1.1.13 Buffers

When considering the width of an exclusion buffer around plant populations and individuals, the panel took into consideration the ecology of the species, the logic of minimising microclimatic changes within plant populations, and the operational need for the unambiguous placement of boundaries. The baseline buffer radius of **50 metres**, into which no trees may be felled and within which specified forestry activities are excluded, is related to the general upper stratum height in production forests and is a logical compromise which obviates the need to apply potentially complex forestry strategies, such as a 50% canopy retention rule, around what would often be a relatively small area.

In recognition of the ability of more resilient species to recolonise disturbed habitat, the buffers around populations and individuals in these guilds have been reduced accordingly. When stipulating that 90% of adult individuals must be buffered as a *population*, the intent is to adequately protect the population without excluding specified forestry activities from other areas due to the presence of the more scattered, isolated individuals.

1.1.14 Field Population Definition

The panel recommends that where the buffers applied to individual plants of a species merge, then the scattered individuals constitute a population.

Prescriptions and Functional Guilds

Prescription 1 - Baseline

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.
- The exclusion of all specified forestry activities within a radius of 50 metres around threatened plant populations and individuals.

Application of Baseline Prescription No.1 to Functional Guilds

- Functional Guild 1 - low persistence, poor recolonisation.

- Functional Guild 2 - high persistence, low recolonisation. The panel agreed that this group requires a larger area of undisturbed habitat and that prescription 1 is appropriate.

Prescription 2A - 20m / 90%

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.
- The exclusion of all specified forestry activities within a radius of 20 metres around threatened plant populations and individuals. Where buffers around individuals merge, then these individuals are regarded as part of a population, in which case at least 90% of the population area shall be buffered. No specific prescriptions apply to individuals scattered outside the main buffered population.

Application of prescription 2A to Functional Guilds

- Functional Guild 3A - low persistence, moderate recolonisation.

In considering these species, the panel agreed that extra protection of extant plants is essential, due to the species' lower recolonisation ability.

Prescription 2B - No Buffer

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.

No exclusion buffer is to be applied, but due care is required not to interfere with the species.

Application of prescription 2B to Functional Guilds

- Functional Guild 3B - low persistence, high recolonisation.

Species Management Strategy

In adopting a precautionary approach to the development of the functional guild classification and management prescriptions for threatened plant species, the panel recognised the need for a mechanism which facilitates the input of new research findings on the ecology and life history of protocol species to the revision of the Conservation Protocols. As a consequence, the panel recommends that Species Management Strategies be prepared where specific changes to the protocols are proposed. Species Management Strategies must be reviewed by independent experts in consultation with SFNSW and NPWS. A Species Management Strategy could, for example, include details of relevant autecological research and propose a broad landscape management approach to the conservation of a threatened plant species incorporating, for example, dedicated reserves across its distributional range and a weed control program. A Species Management Strategy could also include proposed measures to mitigate the impact of specified forestry activities or present scientific data to substantiate or refute the classification of a taxon to a particular functional guild.

Protocol Surveys and Monitoring

The expert panel also identified and discussed additional issues considered critical to the success of the flora protocols. Two key subjects were identified: protocol surveys and monitoring.

**Protocol Surveys
Methods**

- Validated records from flora databases are required to inform the protocol survey effort. Database integrity and record validity is of great concern in all landscape management exercises that must rely upon point locality information to direct surveys.
- CRA habitat models for protocol species were considered useful in directing the overall search effort and in delineating a potential search area for each species. Their use may save considerable time and resources, particularly as the models are further refined.
- The current minimum distance and time per compartment for flora traverses was considered adequate.

Who will conduct the surveys?

- Regional botanical experience is vital.
- Particular plant groups (eg. orchids) will require specialist identification skills.
- Protocol surveys for rare plant surveys must only be conducted by recognised, competent field botanists.

Where and how will the surveys be conducted?

- It was considered preferable to survey across a contiguous block of compartments, notwithstanding the current situation of local supply commitments. This method allows populations to be more effectively surveyed, mapped and buffered without the need to consider compartment boundaries. It was however recognised that SFNSW are currently attempting to follow this approach, which is to be commended.
- Seasonality is an important factor that must be considered when surveying for ephemeral, annual, geophytic or otherwise cryptic species.

Monitoring the Efficacy of Conservation Protocols

- Ecologically sustainable forest management (ESFM) cannot be demonstrated without the results of a program to monitor the efficacy of the Conservation Protocols.
- In the case of threatened plant species, relatively simple, species and population-based studies are required to provide key autecological and life history information (eg. pollination ecology) and data on population and seed bank dynamics in relation to forestry activities.
- Simple comparative studies (Before-After-Control-Impact) should be carried out by SFNWS in conjunction with NPWS staff. If necessary, populations of protocol species on Service estate could be used as control sites for such studies.
- It follows from the above points that both pre-logging and post-logging surveys are required as an integral part of the Conservation Protocols.
- Methodological principles for monitoring are detailed by Burgman *et al.* (1998).
- A simple, efficient and effective methodology for monitoring protocol flora species can be jointly devised by SFNSW and NPWS once the importance of monitoring is accepted by production forest managers.
- Feedback and collation of autecological and distributional data will assist in the ongoing review of the conservation status of protocol species, which may ultimately reduce the number of threatened taxa that production forest managers must specifically address through ESFM protocols.

References

- Burgman, M., Ades, P., Hickey, J., Williams, M., Davies, C. and Maillardet, R. (1998). **Methodological guidelines for the utility and statistical validity of survey and monitoring programs.** Report prepared by the University of Melbourne for The Forest & Wood Products Research and Development Corporation.
- Noble, I.R. & Slatyer, R.O. (1980). **The use of vital attributes to predict successional changes in plant communities subject to recurrent disturbances.** *Vegetatio* 43: 5-21.

APPENDIX G

FIELD TRIP INFORMATION

ESFM FOREST TOUR SOUTH COAST REGION 29 JUNE 1999

ITINERARY

Stop	Time	Location	Topic
1	11:30am	Clyde Mountain	Overview Land Tenure and Forest Zoning
2	12:45pm 1:00pm 1:30pm 2:30pm	Compartments 529-530-531 Buckenbowra State Forest (Old Bolaro Road) Compartment 530 – Log dump 1 Log dump 1 and surrounds Log dump 9	Harvest Planning – Introduction Lunch Harvesting Practices and Spotted Gum Silviculture Non-harvest Areas
3	3:30pm	Monga Flora Reserve	Tableland Forest Types
4	4:15pm	Monga SF – Compartment 819	Tableland Silviculture

Planning Unit 529-530-531

Buckenbowra State Forest

Threatened Species Specific Prescriptions

N o	Species	Status	Prescription	Example
1	Powerful Owl	Within planning unit	▪ 4 records, 300 ha of potential habitat identified for each. ▪ 30m buffer around permanent roost site ▪ 50m buffer around nest sites	Mike to show map of potential habitat.
2	Sooty Owl	Within planning unit	▪ Pre-logging surveys along gully lines and heads of gullies within 50m on the net logging area. ▪ 30m buffer around permanent roost sites ▪ 50m buffer around nest sites	Highlight presence of rainforest. Nick to discuss pre-harvest mark up of drainage features.
3	Masked Owl	Within 2km	▪ 1 record, 300 hectares of potential habitat identified ▪ 30m buffer around permanent roost sites ▪ 50m buffer around nest sites	Mike to show map of potential habitat.
4	Yellow-bellied Glider	Within planning unit	▪ Logging exclusion within 50m of den site ▪ Retention of v-notch trees and a further 15 trees within 100. Trees to reflect forest type and exceed 30cm diameter where available.	Nick to show location of records.
5	Glossy Black Cockatoo	Within planning unit	▪ 50m buffer around nest site ▪ protection of <i>Allocasuarina</i> where it dominates the canopy ▪ retention of individual <i>Allocasuarina</i> where more than 30 crushed cones have been found beneath tree.	Nick to show <i>Allocasuarina</i> spp.

8	Brush-tailed phascogale	Within 2km	▪ 20m machinery buffer around rainforest ▪ fallen hollow log over 40cm diameter should not be removed by commercial or private firewood licensees. ▪ Feral predator surveys using diurnal and nocturnal techniques. Feral predators identified to be removed as required and reasonable. ▪ The area covered by fuel reduction burning should not exceed 75% of the net logging area in any one compartment. ▪ Grazing regimes to minimise adverse impacts on CWRV species.
9	Tiger Quoll	Within 5km	▪ Targeted search during the pre-harvest mark-up for den and latrine sites with the net logging area. ▪ 3.5ha exclusion around permanent dens. ▪ 12 ha exclusion around latrines and maternity dens. ▪ 20m machinery buffer around rainforest. ▪ Fallen hollow logs over 40cm diameter should not be removed by commercial or private firewood licensees. ▪ Feral predator surveys using diurnal and nocturnal techniques. Feral predators identified to be removed as required and reasonable. ▪ The area covered by fuel reduction burning should not exceed 75% of the net logging area in any one compartment. ▪ Grazing regimes to minimise adverse impacts on CWRV species.
10	Correa baeurerlenii	Within planning unit	Prescription C ▪ 10m exclusion buffer around records ▪ 10m modified buffer around buffer with 50% canopy retention evenly spaced.

1999 Log Yield Statistics
Planning Unit 529-530-531
Buckenbowra State Forest

Log Product	Yield from 116 hectares	Yield/Hectare
Large compulsory sawlogs (quota logs)	1310 m ³	11m ³
Small compulsory sawlogs	643 m ³	5.5m ³
Non-compulsory sawlogs (optional logs)	696 m ³	6 m ³
Total Sawlogs	2649 m ³	23 m ³
Pulplogs	1561 tonnes	13.5m ³
Total logs	4210 m ³	36 m ³

Size of Non-Harvest Areas within Planning Unit 529-530-531 Buckenbowra SF

Non Harvest Areas	Area in Hectares	%
Rainforest	21	6
PMP Flora and Fauna (outside the non harvest areas listed above)	14	4
Riparian Buffers (outside the non harvest areas listed above)	80	22
Land > 30 degrees (indicative) (outside the non harvest areas listed above)	28	8
Old Growth > 25 ha (IAP growth stage layer) (outside the non harvest areas listed above)	75	20
Connection Corridors (outside the non harvest areas listed above)	2	0.5
PMP Undeveloped Natural Forest (outside the non harvest areas listed above)	1	0
Rocky outcrops and Buffers (outside the non harvest areas listed above)	2	0.5
Heath and Buffers (outside the non harvest areas listed above)	9	2
Mass Movement Hazard (outside the non harvest areas listed above)	3	1
Archaeological Site (outside the non harvest areas listed above)	79	22
Inaccessible Non-harvest Areas (outside the non harvest areas listed above)	52	14
Total Non-harvest Areas	366ha	100
Gross area of planning unit	698ha	

SILVICULTURE NOTES FOR WORKSHOP ON FOREST PRACTICE AND THREATENED SPECIES MANAGEMENT

What is Group Selection silviculture?

Group selection silviculture is applied to stands where the wood productive condition of the stand is maintained or enhanced from the management of small randomly located groups of trees. This silviculture employs harvesting rules that set a spatial pattern to tree removal and retention. Within spatially harvested groups, harvesting periodically thins the stand by removing trees from below until removal of the final crop trees and subsequent re-establishment of the group.

In general, the successful establishment and effective wood production of the regeneration that develops following harvesting, increases as the size of the group increases.

What is Single Tree Selection silviculture?

Single tree selection silviculture is applied to stands where the wood productive condition of the stand is maintained or enhanced from the management of a mixed structure. Harvesting removes trees that have achieved an economic maturity that is not likely to be exceeded by additional net increment at the next harvest return. Harvesting also removes trees that promote growth onto other retained trees in the immediate vicinity.

1.1.15 Silvicultural decisions

The silvicultural options in any particular management section of a region will be determined by site quality, forest type, existing stand structures and markets. The foresters and supervising forest officers (SFO) making silvicultural decisions will be familiar with the silvicultural options available within the management section.

The following decision tree is used for site specific assessment of silvicultural requirements at a (sub compartment) stand level. It should be used both in the planning phase to estimate the proportions of the harvesting area to be treated in different ways and in the tree marking phase to decide on the appropriate marking up. The extent of a stand is determined by logistics. For example, a clump of mature trees in a generally two-tiered forest might be treated by group selection whilst the surrounding stand is treated by single tree selection. Assessment during the planning phase is essential so that the harvest plan contains some guidance for the SFO on the intended outcome of the harvesting operation. Integration of the planning, supervision and monitoring phases of management by involving the same people in all phases will ensure that the desired forest management outcomes are achieved. This will be an essential part of Native Forest Management System.

The decision tree is intended as a guide to decision-making. Its primary function is to ensure that a silvicultural decision, consistent with State Forests' Silvicultural Policy,

is made following explicit consideration of relevant factors. Otherwise harvesting of areas scheduled to supply commitments could be carried out without clearly defined silvicultural objectives. The decision tree is not a set of rules but a guide to setting site specific silvicultural objectives.

ASSUMED CONTEXT AND APPROACHES IN BIODIVERSITY MANAGEMENT

Within the Southern RFA/CRA Region biodiversity management occurs across the landscape by a range of different approaches. These approaches are outlined below. They overlay each other and operate at different scales. For example, catchments may be protected by the reserve system, and smaller areas of habitat such as rainforest, riparian zones and species localities may be protected by limiting or excluding certain management practices. At the same time measures put in place to manage for certain (not strictly biodiversity) values, such as filter strips to protect water quality, also deliver benefits to other values, such as riparian dwelling/dependent species.

To ensure biological diversity is protected, this Workshop will review the range of management mechanisms employed by agencies which directly and indirectly act to ensure flora and fauna species persist in the landscape. The workshop is focused on forest dependent species identified by the Response to Disturbance process as threatened or regionally significant in the Southern RFA/CRA region.

In keeping with the Threatened Species Conservation Act SFNSW and NPWS over the past few years have moved away from management on a case by case, site by site basis and have attempted to manage species and habitat at broader scales. The intention is to maintain viable populations of species across their range while at the same time accepting that during the course of SFNSW's management of their timber production forests there will be localised, compartment level declines.

Taken broadly there are four basic elements to the management approach:

- there is the spread of forested conservation reserves and the State Forest informal reserve system across the Southern CRA;
- there are generic prescriptions which exclude key habitats and other attributes such as old growth from the areas harvested;
- there are generalised habitat and food resource management prescriptions within harvesting areas;
- and there are specific prescriptions for those species not adequately covered by the generic approaches, those poorly known and those most at risk.

Landscape in this exercise is intended to mean public (NPWS, SFNSW and Crown land) and private land within catchments in the Southern CRA/RFA Region. The Southern CRA Region includes roughly 5.6 million ha of land. Of this area approximately:

2.8 million ha forested;

1.16 million ha National Park and Nature Reserve;

600,000 ha State Forest;

3.6 million ha private land

136,000 ha vacant crown land/other crown land

In keeping with the National Forest Policy Statement and the data sets being collected during the CRA process the term 'forest' is intended to mean forest and woodlands defined as including areas with greater than 10% canopy cover and greater than 5 m height.

The context and approaches used to manage biodiversity within the landscape includes the following:

1. Reserve system – formal and informal

1.1 Formal

In the Southern Region, national park and nature reserve includes 1.164 million hectares of land. There is an additional ???? ha of land reserved as Flora Reserves on the State forest estate.

1.2 Informal

Within the landscape there is also land that forms part of the informal reserve system such as some Crown reserves, areas classified as Forest Management Zone 2 of State forests including areas where logging is excluded (these are discussed below).

2. Connection corridors

2.1 Conservation Protocols:

- Corridors - each 500ha of State Forest must included either 2 exclusion zones of at least 40m wide which connect 2nd order streams, OR one exclusion zone at least 80m wide which connects 3rd order streams.

2.2 State Forest of NSW – Forest Management Zoning

- Wildlife corridors
- Informal reserve areas on State forests

2. Riparian protection

2.1 EPA Pollution Control Licence (conditions to manage diffuse source water pollution, including):

- Filter strips of undisturbed vegetation along drainage lines, prescribed streams, watercourses, wetlands and swamps, where the width of the filter strip is determined by stream order and “inherent soil erosion and water pollution hazard”.
- Buffer strips of a minimum of 5m along each side of all drainage depressions in which soil disturbance during forestry activities are prevented to the greatest extent practicable.

2.2 Conservation Protocols:

- Riparian buffers - forestry activities (except roads when there is no alternative route) excluded from exclusion zones of 10m either side of 1st order streams, 20m either side of 2nd order streams, 40m either side of 80% of 3rd or higher order streams.

Specific habitat protection

3.1 EPA Pollution Control Licence:

- Forestry activities prevented on slopes greater than 30 degrees.

3.2 Conservation Protocols:

- High Conservation Value Old Growth - forestry activities and harvesting machinery prohibited with HCVOG.

- Rainforest - harvesting excluded from within Rainforest. A 20m wide buffer around warm temperate RN17 rainforest.
- Rare non-commercial forest types - forestry activities (except road reopening) and harvesting machinery prohibited.
- Tree retention (non-regrowth zone) - Minimum of 10 hollow-bearing trees retained per 2ha of net logging area. Minimum of 10 recruitment trees retained per 2ha of net logging area.
- Tree retention (regrowth zone) - Minimum of 10 hollow-bearing trees where available retained per 2ha of net logging area (if < 10 available, retain all). Retain 1 recruitment tree for each hollow-bearing tree retained.
- Stag retention - Must be retained in areas outside the net harvesting area and visual protection strips.
- *Allocasuarina* stands, and flowering or fruiting *Banksia* spp and *Xanthorrhoea* spp. - minimise damage.
- Eucalypt feed trees - Minimum 4 mature winter flowering trees per 2 ha (may be also counted as a hollow-bearing tree or recruitment tree).
- Wetlands - forestry activities excluded from within all wetlands, and from exclusion zones of 10m around wetlands < 0.5ha, 20m around wetlands between 0.5 and 2.0ha, and 40m around all SEPP14 wetlands and other wetlands >2.0ha.
- Heath and Scrub - forestry activities prohibited within, and 20m around, all areas >0.2ha.
- Rocky outcrops and cliffs - forestry activities prohibited within, and 20m around, all areas > 0.1ha.
- Ground Habitat - SFNSW must protect, as far as possible, understorey vegetation, ground cover vegetation, leaf litter and fallen timber.

4. Species specific protection

Conservation Protocols include targeted species-specific prescriptions.

As a guide, in the Upper North East and Lower North East Regions the species specific exclusions or prescriptions and application of the connection corridor protocol resulted in a reduction by 6.7% of the state forest estate that would otherwise be available for harvesting.

5. Surveys

The Conservation Protocols include the requirement for agreed intensities and standards of pre-logging and pre-roading surveys. Pre-operational surveys consist of a compartment traverse which incorporates a threatened flora component designed to sample the range of environmental types within the compartment and a threatened fauna component searching for features such as caves, nest roost, feed trees and scats. Targeted surveys are conducted within compartments that contain known or potential habitat for those fauna species that require specific management.

Features and localities of species requiring modification to harvesting operations are also searched for during the marking up stage of harvesting operations.

6. Practices

6.1 SFNSW Management Practices:

- Forest Management Zoning - based on National Forest Reserve Criteria (JANIS).

- Fuel Management - by using prescribed burning to remove fine fuel and, therefore, minimise the occurrence of wildfires. There is no prescribed burning in rainforest.
- Prescribed burning of commercial sub-alpine forest is confined to narrow defined fire breaks. Strategic fire breaks may also be established using non-burning methods. Grazing may also be used to reduce fuel.
- Fire Suppression - in emergency situations to protect life, property, community assets and forest values. Includes establishment of fire breaks (as above) where necessary.
- Silviculture - single tree selection, group tree selection.

The State Forest of NSW estate in the Southern Region includes 694 188 ha of dedicated State forests and 7468 ha of land purchased. In the Upper North East Region the above exclusions, areas for unsuitable logging or practices resulted in ???% of State forests being unavailable for logging.

6.2 *Conservation Protocols:*

- Grazing management plans, Weed and Feral Predator Control Plans to be implemented.
 - Hazard reduction burning to consider requirements of threatened species in the area, maintain an understorey mosaic, minimise impact to large fallen logs.
- Firewood collection only permitted within 20m of a road or log-dump, not in exclusion zones, and must be < 40cm diameter.

APPENDIX H

PRIORITY FLORA SPECIES SHORTLIST FOR THE SOUTHERN CRA REGION

Priority flora species shortlist for the Southern CRA Region, compiled by the Environment and Heritage Technical Committee for the Response to Disturbance Workshop, June 1999.

Family	Species
Fabaceae (Mimosoideae)	<i>Acacia phasmoides</i>
Asteraceae	<i>Ammobium craspedioides</i>
Orchidaceae	<i>Caladenia concolor</i>
Orchidaceae	<i>Caladenia tessellata</i>
Cupressaceae	<i>Callitris oblonga</i> ssp <i>corangensis</i>
Asteraceae	<i>Calotis glandulosa</i>
Rutaceae	<i>Correa baeuerlenii</i>
Orchidaceae	<i>Cryptostylis hunteriana</i>
Asclepiadaceae	<i>Cynanchum elegans</i>
Monimiaceae	<i>Daphnandra</i> sp C (sp 1 Illawarra)
Fabaceae (Faboideae)	<i>Dillwynia glauca</i>
Rhamnaceae	<i>Discaria nitida</i>
Orchidaceae	<i>Diuris aequalis</i>
Myrtaceae	<i>Eucalyptus aquatica</i>
Myrtaceae	<i>Eucalyptus kartzoffiana</i>
Myrtaceae	<i>Eucalyptus langleyi</i>
Myrtaceae	<i>Eucalyptus parvula</i>
Myrtaceae	<i>Eucalyptus pulverulenta</i>
Myrtaceae	<i>Eucalyptus recurva</i>
Myrtaceae	<i>Eucalyptus saxatilis</i>
Myrtaceae	<i>Eucalyptus sturgissiana</i>
Orchidaceae	<i>Genoplesium plumosum</i>
Orchidaceae	<i>Genoplesium vernalis</i>
Proteaceae	<i>Grevillea iaspicula</i>
Proteaceae	<i>Grevillea molyneuxii</i>
Proteaceae	<i>Grevillea rivularis</i>
Proteaceae	<i>Grevillea wilkinsonii</i>
Haloragaceae	<i>Haloragis exalata</i> ssp <i>exalata</i> var <i>exalata</i>
Brassicaceae	<i>Irenepharsus magicus</i>
Brassicaceae	<i>Irenepharsus trypherus</i>
Myrtaceae	<i>Kunzea cerniceana</i>
Myrtaceae	<i>Leptospermum thompsonii</i>
Myrtaceae	<i>Melaleuca biconvexa</i>
Euphorbiaceae	<i>Monotaxis macrophylla</i>
Epacridaceae	<i>Monotoca rotundifolia</i>
Proteaceae	<i>Persoonia glaucescens</i>
Fabaceae (Faboideae)	<i>Phyllota humifusa</i>
Poaceae	<i>Plinthanthesis rodwayi</i>
Rhamnaceae	<i>Pomaderris cotoneaster</i>
Rhamnaceae	<i>Pomaderris gilmourii</i> var <i>cana</i>
Rhamnaceae	<i>Pomaderris pallida</i>
Rhamnaceae	<i>Pomaderris parrisiae</i>
Rhamnaceae	<i>Pomaderris sericea</i>
Orchidaceae	<i>Prasophyllum affine</i>

Orchidaceae	<i>Prasophyllum petilum</i>
Lamiaceae	<i>Prostanthera densa</i>
Orchidaceae	<i>Pterostylis gibbosa</i>
Restionaceae	<i>Restio longipes</i>
Sterculiaceae	<i>Rulingia prostrata</i>
Asteraceae	<i>Rutidosia leiolepis</i>
Asteraceae	<i>Rutidosia leptorrhynchoidea</i>
Myrtaceae	<i>Syzygium paniculatum</i>
Santalaceae	<i>Thesium australe</i>
Myrtaceae	<i>Triplarina nowraensis</i>
Rutaceae	<i>Zieria adenophora</i>
Rutaceae	<i>Zieria baeuerlenii</i>
Rutaceae	<i>Zieria citriodora</i>
Rutaceae	<i>Zieria granulata</i>
Rutaceae	<i>Zieria murphyi</i>
Rutaceae	<i>Zieria tuberculata</i>
Gentianaceae	<i>Gentiana wingecarribiensis</i>
Fabaceae (Mimosoideae)	<i>Acacia bynoeana</i>
Fabaceae (Mimosoideae)	<i>Acacia clunies-rossiae</i>
Fabaceae (Mimosoideae)	<i>Acacia flocktoniae</i>
Poaceae	<i>Amphibromus fluitans</i>
Fabaceae (Faboideae)	<i>Bossiaea oligosperma</i>
Orchidaceae	<i>Diuris tricolor</i>
Myrtaceae	<i>Eucalyptus robertsonii ssp hemisphaerica</i>
Proteaceae	<i>Hakea sp B (Kowmung River)</i>
Marsileaceae	<i>Pilularia novae-hollandiae</i>
Thymelaeaceae	<i>Pimelea spicata</i>
Orchidaceae	<i>Prasophyllum fuscum</i>
Fabaceae (Faboideae)	<i>Pultenaea parrisiae ssp parrisiae</i>
Lamiaceae	<i>Westringia kydrensis</i>
Fabaceae (Mimosoideae)	<i>Acacia chalkeri</i>
Fabaceae (Mimosoideae)	<i>Acacia dallachiana</i>
Fabaceae (Mimosoideae)	<i>Acacia jonesii</i>
Fabaceae (Mimosoideae)	<i>Acacia lucasii</i>
Aspleniaceae	<i>Asplenium hookerianum</i>
Euphorbiaceae	<i>Bertya brownii</i>
Orchidaceae	<i>Burnettia cuneata</i>
Orchidaceae	<i>Caladenia clarkiae</i>
Gentianaceae	<i>Chionogentias sylvicola</i>
Orchidaceae	<i>Corybas undulatus</i>
Poaceae	<i>Deyeuxia microseta</i>
Fabaceae (Faboideae)	<i>Dillwynia stipulifera</i>
Brassicaceae	<i>Drabastrum alpestre</i>
Epacridaceae	<i>Epacris coriacea</i>
Myrtaceae	<i>Eucalyptus badjensis</i>
Myrtaceae	<i>Eucalyptus gregsoniana</i>
Myrtaceae	<i>Eucalyptus hypostomatica</i>
Myrtaceae	<i>Eucalyptus macarthuri</i>
Myrtaceae	<i>Eucalyptus triflora</i>
Orchidaceae	<i>Genoplesium despectans</i>

Geraniaceae	<i>Geranium graniticola</i>
Goodeniaceae	<i>Goodenia glomerata</i>
Proteaceae	<i>Grevillea barklayana</i> ssp <i>macleayana</i>
Asteraceae	<i>Helichrysum calvertianum</i>
Hymenophyllaceae	<i>Hymenophyllum pumilum</i>
Myrtaceae	<i>Leptospermum epacridoideum</i>
Myrtaceae	<i>Leptospermum sejunctum</i>
Myoporaceae	<i>Myoporum bateae</i>
Myoporaceae	<i>Myoporum floribundum</i>
Asteraceae	<i>Olearia burgessii</i>
Asteraceae	<i>Olearia lasiophylla</i>
Asteraceae	<i>Ozothamnus adnatus</i>
Proteaceae	<i>Persoonia oxycoccoides</i>
Rutaceae	<i>Phebalium ellipticum</i>
Asteraceae	<i>Picris eichleri</i>
Apiaceae	<i>Platysace stephensonii</i>
Rhamnaceae	<i>Pomaderris costata</i>
Rhamnaceae	<i>Pomaderris pauciflora</i>
Lamiaceae	<i>Prostanthera rugosa</i>
Asteraceae	<i>Senecio macranthus</i>
Tremandraceae	<i>Tetratheca neglecta</i>
Apiaceae	<i>Trachymene saniculifolia</i>
Myrtaceae	<i>Darwinia briggsiae</i>
Poaceae	<i>Deyeuxia benthamiana</i>
Orchidaceae	<i>Genoplesium citriodorum</i>
Dilleniaceae	<i>Hibbertia hermanniifolia</i>
Lindsaeaceae	<i>Lindsaea trichomanoides</i>
Rhamnaceae	<i>Pomaderris brogoensis</i>
Rhamnaceae	<i>Pomaderris virgata</i>
Araliaceae	<i>Astrotricha</i> sp nov <i>Deua</i>
Orchidaceae	<i>Caladenia aestivalis</i>
Brassicaceae	<i>Cardamine gunnii</i>
Goodeniaceae	<i>Dampiera scottiana</i>
Rutaceae	<i>Eriostemon scaber</i> ssp <i>latifolius</i>
Orchidaceae	<i>Genoplesium</i> sp aff <i>systemum</i> (Brindabellas) (as in Bishop)
Proteaceae	<i>Grevillea alpina</i>
Proteaceae	<i>Grevillea baueri</i> ssp <i>asperula</i>
Proteaceae	<i>Grevillea linearifolia</i> (Kanangra/ Braidwood form)
Proteaceae	<i>Grevillea oxyantha</i> ssp <i>ecarinata</i>
Proteaceae	<i>Grevillea parviflora</i> ssp <i>parviflora</i>
Proteaceae	<i>Grevillea rhyolitica</i> ssp <i>rhyolitica</i>
Proteaceae	<i>Grevillea rhyolitica</i> ssp <i>semivestita</i>
Proteaceae	<i>Grevillea victoriae</i> var <i>breviflora</i>
Proteaceae	<i>Persoonia microphylla</i>
Proteaceae	<i>Persoonia mollis</i> ssp <i>caleyi</i>
Apiaceae	<i>Platysace</i> sp nov
Rhamnaceae	<i>Pomaderris betulina</i> ssp <i>actensis</i>
Rhamnaceae	<i>Pomaderris delicata</i>
Orchidaceae	<i>Prasophyllum canaliculatum</i>
Lamiaceae	<i>Prostanthera</i> sp <i>E</i>

Orchidaceae	<i>Pterostylis hians</i>
Fabaceae (Faboideae)	<i>Pultenaea rosmarinifolia</i>
Fabaceae (Faboideae)	<i>Pultenaea sp D</i>
Epacridaceae	<i>Styphelia adscendens</i>
Proteaceae	<i>Telopea mongaensis</i>
Proteaceae	<i>Telopea oreades</i>
Rutaceae	<i>Zieria arborescens ssp decurrens</i>
Polygonaceae	<i>Muehlenbeckia tuggeranong</i>
Cyperaceae	<i>Cyperus unioides</i>
Grammitidaceae	<i>Grammitis stenophylla</i>
Orchidaceae	<i>Pterostylis sp aff aphylla</i>
Orchidaceae	<i>Pterostylis sp aff cynocephala</i>
Orchidaceae	<i>Pterostylis sp aff longifolia</i> (Canberra)
Orchidaceae	<i>Pterostylis sp aff parviflora</i> (Brindabellas)
Orchidaceae	<i>Pterostylis sp aff parviflora</i> (Large Red-brown)
Orchidaceae	<i>Pterostylis sp aff parviflora</i> (linear sepals)
Orchidaceae	<i>Pterostylis sp aff parviflora</i> (Spring)
Orchidaceae	<i>Pterostylis sp aff reflexa</i> (Tablelands)

APPENDIX E

PRIORITY TERRESTRIAL FAUNA SPECIES SHORTLIST FOR THE SOUTHERN CRA REGION

Priority fauna species shortlist for the Southern CRA Region, compiled by the Environment and Heritage Technical Committee for the Response to Disturbance Workshop, June 1999.

Scientific name	Common Name
<i>Mastacomys fuscus</i>	Broad-toothed Rat
<i>Pseudomys fumeus</i>	Smoky Mouse
<i>Petrogale penicillata</i>	Brush-tailed Rock Wallaby
<i>Perameles nasuta</i>	Long-nosed Bandicoot
<i>Isodon obesulus</i>	Southern Brown Bandicoot
<i>Potorous tridactylus</i>	Long-nosed Potoroo
<i>Sminthopsis leucopus</i>	White-footed Dunnart
<i>Dasyurus maculatus</i>	Tiger Quoll
<i>Cercartetus nanus</i>	Eastern Pygmy Possum
<i>Phascogale cinereus</i>	Koala
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale
<i>Petaurides volans</i>	Greater Glider
<i>Petaurus norfolcensis</i>	Squirrel Glider
<i>Petaurus australis</i>	Yellow-bellied Glider
<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Pteropus poliocephalus</i>	Grey headed Flying-fox
<i>Pteropus scapulatus</i>	Little Red Flying-fox
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Scotorepens sp.</i>	unnamed Broad-nosed Bat
<i>Chalinolobus dwyeri</i>	Large Pied Bat
<i>Kerivoula papuensis</i>	Golden-tipped Bat
<i>Miniopterus schreibersii</i>	Large(Common) Bentwing Bat
<i>Myotis macropus</i>	Large-footed Myotis
<i>Mormopterus norfolkensis</i>	Eastern Little Mastiff Bat
<i>Mormopterus sp. 1</i>	unnamed Mastiff Bat
<i>Ninox strenua</i>	Powerful Owl
<i>Tyto tenebricosa</i>	Sooty Owl
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Ninox connivens</i>	Barking Owl
<i>Burhinus grallarius</i>	Bush Stone-curlew
<i>Xanthomyza phrygia</i>	Regent Honeyeater
<i>Meliphaga fasciata</i>	Black-chinned Honeyeater
<i>Sericornis citreogularis</i>	Yellow-throated scrub wren
<i>Polytelis swainsonii</i>	Superb Parrot
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Lathamus discolor</i>	Swift Parrot
<i>Petroica rodinogaster</i>	Pink Robin
<i>Melanodryas cucullata</i>	Hooded Robin
<i>Pachycephala olivacea</i>	Olive Whistler
<i>Dasyornis brachypterus</i>	Eastern Bristlebird
<i>Eurystomus orientalis</i>	Dollarbird
<i>Falcunculus frontatus</i>	Crested Shrike-tit
<i>Lophoictinia isura</i>	Square-tailed Kite
<i>Climacteris picumnus</i>	Brown Treecreeper
<i>Climacteris erythrops</i>	Red-browed Treecreeper
<i>Cinlosoma punctatum</i>	Spotted Quail-thrush
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black Cockatoo
<i>Litoria booroolongensis</i>	Booroolong Frog
<i>Pseudophryne bibronii</i>	Brown Toadlet
<i>Pseudophryne australis</i>	Red-crowned Toadlet
<i>Heleioporus australiacus</i>	Giant Burrowing Frog
<i>Litoria littlejohni</i>	Highlands Tree Frog
<i>Pseudophryne pengilleyi</i>	Northern Corroboree Frog
<i>Mixophyes balbus</i>	Stuttering Barred Frog

<i>Hoplocephalus bungaroides</i>	Broad-headed Snake
<i>Morelia spilota spilota</i>	Diamond Python
<i>Acanthophis antarcticus</i>	Common Death Adder
<i>Varanus rosenbergii</i>	Heath Monitor
<i>Pseudemoia spenceri</i>	Spencer's Skink
<i>Nannoscincus maccoyi</i>	Maccoy's Skink
<i>Drysdalia rhodogaster</i>	Unnamed

APPENDIX F

PRIORITY AQUATIC FAUNA SPECIES SHORTLIST FOR THE SOUTHERN CRA REGION

Priority fauna species shortlist for the Southern CRA Region, compiled by the Environment and Heritage Technical Committee for the Response to Disturbance Workshop, August 1999.

Scientific name	Common name
<i>Maccullochella macquariensis</i>	Trout Cod
<i>Macquaria australasica</i>	Macquarie Perch
<i>Prototroctes maraena</i>	Aust Grayling
<i>Mordacia praecox</i>	Non-parasitic Lamprey
<i>Mordacia</i>	Lamprey
<i>Bidyanus bidyanus</i>	Silver Perch
	Murray River Crayfish

