SAWMILLERS EXPORTS PTY LTD

Supplement to the Draft Environmental Impact Statement

on the export by Sawmillers Exports Pty Ltd of woodchips produced from silvicultural operations in State forests in Northern NSW and from private property operations

May 1994

Prepared by
Margules Groome Pöyry Pty Ltd

SAWMILLERS EXPORTS PTY LTD

Supplement to the Draft Environmental Impact Statement

on the export by Sawmillers Exports Pty Ltd of woodchips produced from silvicultural operations in State forests in Northern NSW and from private property operations

May 1994

Prepared by
Margules Groome Pöyry Pty Ltd

Table of Contents

Page No

FIGURES

TABLES

Glossary of Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AHC	Australian Heritage Commission
ANCA	Australian National Conservation Agency
CaLM	NSW Department of Conservation and Land Management
CEPA	Commonwealth Environment Protection Agency
CRA	Comprehensive regional assessment
DASET	Commonwealth Department of the Arts, Sport, the Environment and Territories
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority New South Wales
EF(IP) Act	NSW Endangered Fauna (Interim Protection) Act 1991
ESD	Ecologically Sustainable Development
ESP Act	Commonwealth Endangered Species Protection Act 1992
ESZ	Extended Supply Zone
FCNSW	Forestry Commission of New South Wales (now SFNSW)
FIS	Fauna Impact Statement
FMA	Forest Management Area
GLEA	Great Lakes Environment Association
IC	Industry Commission
Impact Act	Commonwealth Environment Protection (Impact of Proposals) Act 974
IUCN	International Union for the Conservation of Nature
LGA	Local Government Area
LSZ	Likely Supply Zone
NCEC	North Coast Environment Councils
NEFA	North-East Forest Alliance
NFPS	National Forestry Policy Statement
NPA	National Parks Association of NSW
NPW Act	NSW National Parks and Wildlife Act 1974.
NPWS	National Parks and Wildlife Service of New South Wales
OGF	Old Growth Forests
PAC	Parliamentary Accounts Committee of the NSW Parliament
RAC	Resource Assessment Commission
RNE	Register of the National Estate
ROTAP	Rare or Threatened Animals and Plants
SEMGL	Standard Erosion Mitigation Guidelines for Logging
SEPL	Sawmillers Exports Pty Ltd
SFNSW	State Forests of New South Wales (formerly FCNSW)
TI(IP) Act	NSW Timber Industry (Interim Protection) Act 1992
WHA	World Heritage Area

1.0 INTRODUCTION

This document has been prepared to meet the requirements of the Administrative Procedures under the Environment Protection (Impact of Proposals) Act 1974 (the Impact Act). It is part of an environmental impact assessment prepared in response to a direction by the Minister for the Arts, Sport, the Environment and Territories following the designation of Sawmillers Exports Pty Ltd by the Minister for Resources as proponent for a proposal to export woodchips produced from silvicultural operations in State forests in Northern NSW and from private property operations.

It summarises and responds to matters of substance raised in public comment received on the draft Environmental Impact Statement (EIS) on the proposal and has been prepared as a supplement to the draft EIS. The Supplement, together with the draft EIS, constitutes the final EIS on the SEPL proposal.

The draft EIS was available for a 10 week public review period from 3 November 1993 to 14 January 1994. Public comments on the draft EIS were received by the Commonwealth Environment Protection Agency (CEPA). At the request of a number of interested persons and organisations, submissions were accepted by CEPA up to 9 February 1994.

A total of 75 public submissions were received by SEPL from CEPA. Of these 28 were multipage submissions from 9 State and Commonwealth Government agencies and 19 conservation organisations, including a combined submission from the North-East Forest Alliance (NEFA)and the North Coast Environment Council (NCEC). Other submissions were one or two page letters. All submissions have been taken into account in preparing this supplement. A list/summary of the submissions received is at Appendix 1.

In this Supplement, a number of abbreviations and acronyms are used. A Glossary of Abbreviations is included at the front of the report for the convenience of readers.

The final EIS will be submitted to CEPA on behalf of the Minister for the Environment, Sport and Territories as required by the Administrative Procedures under the Impact Act.

Major Issues Raised

The major issues raised in the public submissions included:

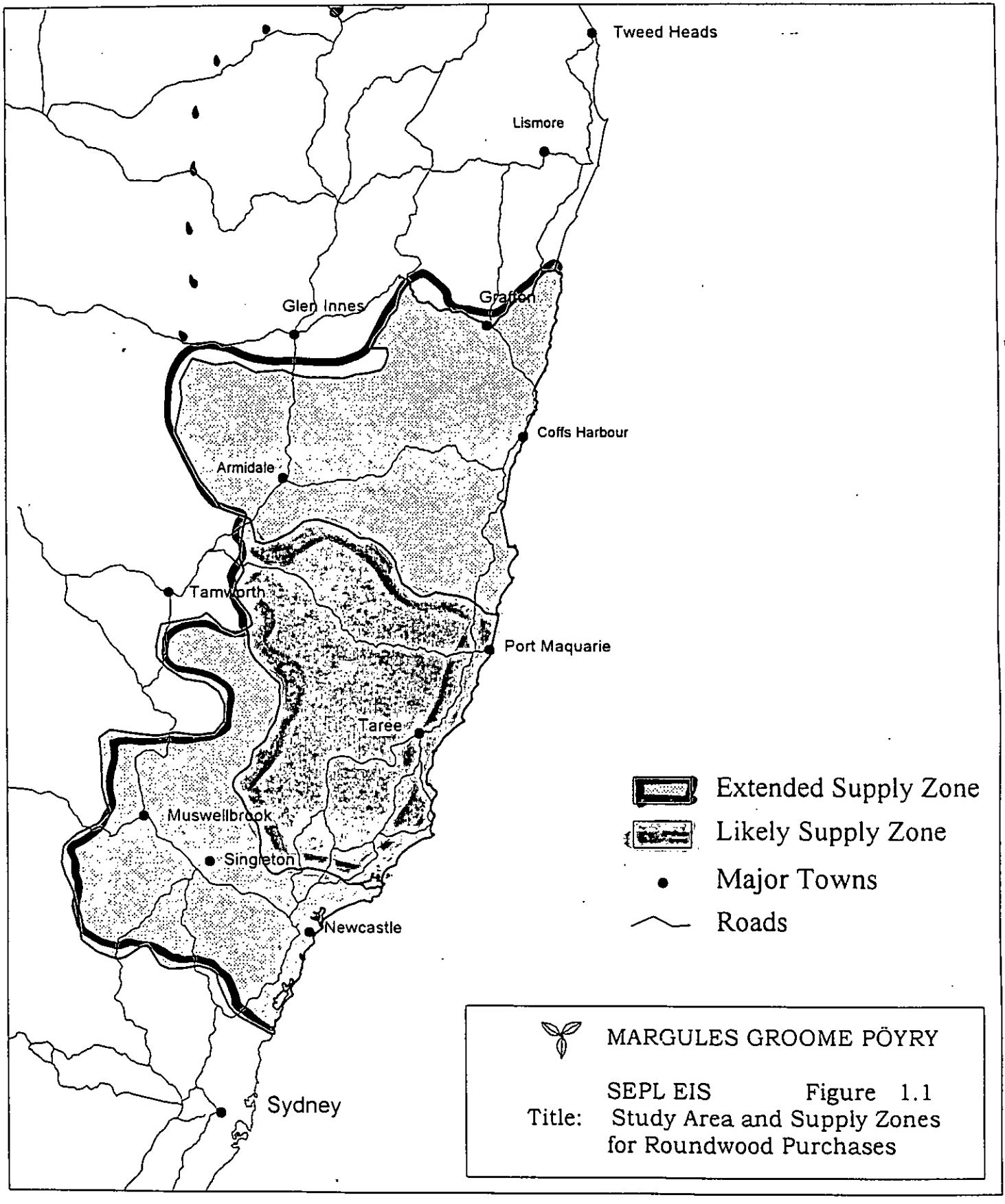
- The Proposal and Assessment
- Reserves/Conservation Values
- Cultural Values
- Environmental Sustainability
- Resources
- Socio-economics
- Alternatives

Study Area

The northern extent of the *extended supply zone* (ESZ) and therefore the Study Area as described in section 1.0 of the draft EIS has been reduced and the ESZ as referred to in this Supplement (and thus the final EIS) is as shown in Figure 1.1. This change has been made to more closely reflect the current and expected economic haulage distance for the supply of chips. In the event that changes in this or other factors subsequently make purchase beyond these boundaries economic, any studies necessary to extend approvals to the expanded area will be undertaken.

Some submissions queried the need to make a distinction between the LSZ and the ESZ, pointing out that the distinction seemed somewhat anomalous since, by the year 2000, over 50% of the thinnings are expected to come from beyond the LSZ. As stated in the draft EIS (p1), the boundary between the LSZ and the ESZ reflects the current economic haulage limit for the supply of chips and SEPL's suppliers preferentially supply from within the LSZ. It was emphasised that these boundaries have been drawn on existing economic considerations. It is acknowledged that the distinction between the two zones becomes more blurred late in the period covered by the proposal, when economic considerations can be expected to have changed. However, it is not considered that the discussion and assessment of the environmental impacts of the proposal would be any different if references to two zones were removed at this stage.

FIGURE 1.1
STUDY AREA



2.0
THE PROPOSAL AND ASSESSMENT

2.1
Scope of Assessment

Many public submissions contended that the draft EIS was deficient or inadequate as it did not cover in detail the environmental impacts of obtaining woodchips from the whole range of sources drawn on by SEPL. Those not covered were sawmill waste and logging residues. As pointed out in the draft EIS (p1), these sources were specifically excluded by the Minister for Resources from the designation of the proposal to be assessed.

The draft EIS, therefore concentrated on the impacts related to the designated sources of "woodchips produced [by SEPL] from silvicultural residues obtained from State forests in New South Wales and from clearing or forestry operations on private property". This Supplement to the draft EIS has been prepared on the same basis and does not respond to issues raised in the public submissions, which are outside the scope of the designated sources. For the purposes of this EIS, such terms as "State forests", "crown timber" and "crown timber supply zone" refer to land under the management and control of SFNSW

Many of the comments made, particularly those by NEFA/NCEC, appear to assume that the role of SEPL draft EIS has been to prepare a complete evaluation and justification for the timber industry in north-east NSW and (as is implied in the Introduction to the NEFA/NCEC submission) was intended to be an assessment of north-east NSW forests. This is not the case, and an understanding of the true purpose and intention of this EIS would do much to remove the "confusion" that appears to be the basis of many comments from NEFA/NCEC and others. The proposal, as clearly stated in Section 2.2 of the draft EIS, relates to the use of predominantly younger eucalypt roundwood, obtained from the designated sources, to produce high quality eucalypt woodchips to be sold on the international market.

Similar misinterpretation or misunderstanding of the proposal and its limitation predominantly to the use of younger eucalypt roundwood, obtained from the designated sources, appears to lie behind many other comments. These appear to assume that, because the roundwood will be used for export woodchips, the proposal will inevitably lead to an expansion of clear felling or that the environmental impacts will necessarily be the same as those at Eden or in Tasmania.

Many submissions made reference to nationally agreed policies, such as the NFPS and the ESD Strategy, claiming that the management of State forests or the proposal are contrary to the objectives of the policy or that some government action referred to in the policy had not been undertaken. The implication of these claims being that export approval for woodchips from the designated sources should be withheld. The policy objectives and strategies contained in these policies are largely for guidance of government agencies and often their achievement is a mid to long term matter requiring action by governments and their agencies and beyond the control and powers of commercial enterprises like SEPL.

SEPL has been exporting woodchips obtained from the north-east region of NSW for many years. The export approvals under which these woodchips have been shipped have included sawmill and logging residues, as well as chips from

the designated sources referred to above. However, these two sawlog related sources are not included in the designation by the Minister for Resources of the Proposal as a proposed action or in the direction by the Minister for the Arts, Sport, the Environment and Territories that this EIS be prepared. The main purpose of the current EIS, therefore, is to identify and assess the environmental impacts of obtaining roundwood from the designated sources for supply to SEPL as woodchips that are additional to the impacts of obtaining the balance of SEPL's supplies of woodchips.

2.2 Additional Impacts due to Proposal

For operations in State forests, these additional impacts are essentially the impacts over and above those of sawlog operations. For private land, additional impacts will be the impacts of removing additional trees and logging residues for pulpwood during selective logging for sawlogs and the impacts of removing pulpwood over and above the usual impacts of clearing of the land for agriculture. It needs to be recognised that, in all cases other than selective logging for pulpwood on private land, the production of pulpwood is not the primary purpose of the operation.

As noted in the draft EIS, less than 0.06% of the native forest throughout the ESZ will be affected on an annual basis by the provision of roundwood material for supply to SEPL as woodchips.

The additional impacts from State forest and private land operations are discussed in general terms below. Discussion of specific impacts is included in the relevant sections of later chapters.

State forests

At the time of the preparation of the SEPL draft EIS, the State Government body responsible for the management of State forests was the Forestry Commission of NSW. Subsequently, the name of the organisation was changed to State Forests of NSW (SFNSW). In this Supplement it will be referred to as the SFNSW irrespective of the period being referred to, unless the context requires reference to the previous name (ie Forestry Commission)

All operations on State forests are subject to the control and direction of SFNSW which is charged with the responsibility of meeting dual objectives in its activities:

- maintaining forest biodiversity and ecosystems, and
- maintaining efficient commercial wood production in perpetuity.

It is SFNSW which specifies the location of work (including areas from which felling is excluded), the access routes to and from the location, the intensity of harvesting, the trees to be felled and those to be retained, the utilisation standards of the logs produced and the specifications of environment protection measures to be adopted.

A number of submissions challenged the statement in the draft EIS that no trees are felled in State forests solely to produce roundwood for SEPL chips. The production from State forests of the roundwood material from which woodchips are obtained for SEPL does not involve the primary logging of forest in north-

east NSW. It is re-iterated that there are no operations in State Forests which are conducted solely in order to provide woodchip material.

The primary purpose of operations in State forests which result in the production of silvicultural residues is the promotion of higher productivity and growth rates on the retained trees. Where culls are removed in logging operations integrated with sawlog removal, the primary purpose of the integrated logging is the production of sawlogs. A secondary purpose is the removal of commercially unusable trees as culls providing additional growing space to promote adequate and healthy regeneration. For thinning operations, in either regrowth stands or plantations, the primary purpose is the removal of a proportion of the stems to provide growing conditions to enhance the growth rates and size of the retained stems (those seen as of particular potential value for sawlogs or as future habitat trees). The sale, as pulpwood or other products, of the smaller, poorer form stems removed to achieve the purpose of enhancing growing conditions is secondary. In neither case is the primary purpose the production of pulpwood.

It is clear that the initial sawlog operation is the primary contributor to environmental disturbance since it is this operation which occurs in old growth forests, which removes a significant proportion of the mature trees of the forest, which involves the initial disturbance to understorey vegetation and soil and which requires the initial establishment of roads, snig tracks and log dumps. Silvicultural operations, however, are undertaken in areas which (for thinning) have already been or (for culling) are currently subject to these disturbances and will involve only marginal additional impacts to those of the initial disturbance.

The additional impacts involved in the production of silvicultural residues (culls) from integrated sawlog operations will arise from the felling of additional trees and from the extra movement in the forest to transport the roundwood from the stump. It is unlikely that extra snig tracks,log dumps or roads will be required. The extent of the additional tree removal will be dependent on particular sites and the gap sizes necessary to meet the regeneration requirements of the site and forest type. The silvicultural specifications and the general environmental protection measures to be adopted during logging operations will be set by SFNSW and will be in accordance with the conditions established through the Minister for Planning's determinations under the TI(IP) Act following completion of the State EIS process.

Silvicultural operations in the State Forests of north-east NSW focus on the modification of regrowth forest and plantations to optimise timber production, and to enhance the size and growth rates of the trees which are retained. Thus, thinning operations involve the removal of a proportion of, generally, the younger trees in a regrowth forest, with retention of the larger, stronger and more vigorous specimens throughout. The dynamics of eucalypt regrowth are such that this process of culling a proportion of the stems in a regrowth forest would occur naturally through a significant proportion of saplings dying before reaching maturity due to competitive exclusion by more vigorous healthy specimens. The SEPL Project proposes to harvest that material and utilise it for woodchips.

The additional impacts of thinning operations in regrowth stands and plantations will arise from the removal of a proportion of young trees and will involve felling of suppressed and smaller co-dominant trees and the re-opening of existing and past tracks through the forest. There will be consequent mechanical damage to understorey vegetation, soil disturbance and compaction from snigging and log loading as well as changes to the forest structure through a change in the ratio of dominants and co-dominants to suppressed trees. Impacts related to canopy

removal will be minimal since the target stems for thinning are the least likely to contribute to canopy cover. Any impacts which do arise are expected to be short lived because the effect of removal of suppressed and smaller co-dominant stems will be to stimulate the retained stems to close canopy and re-capture the site.

For both thinning and integrated sawlog operations, the silvicultural specifications and the general environmental protection measures to be adopted will be set by SFNSW and will be in accordance with the conditions established through the Minister for Planning's determinations under the TI(IP) Act following completion of the State EIS process. All operations will be under the direction of SFNSW staff and to their requirements.

Private land

On private land, operations will consist of removing additional trees (thinnings) and logging residues for pulpwood during selective logging or removing pulpwood from trees cleared during the conversion of land to agriculture.

A large majority of private properties considered for logging for supply of roundwood to SEPL would have had significant past disturbance. Much of this would have been in the form of logging of varying intensities, though usually selective for prime logs, often leaving a mixture of overmature trees of varying sizes and scattered patches of regrowth. Many areas would have received several selective cuts, with utilisation of more defective trees increasing at each cut. Tracks for haulage and snigging, usually on ridge tops and spurs, and log dumps have long been established in these areas. Many other areas now carrying substantial maturing tree cover would have been subject to failed ringbarking/clearing and burning operations dating back many years.

If not disturbed in this manner, there is little doubt that the large majority of forested private land would have been subjected to very regular burning for pasture over a very long period. Much of this burning, particularly in the early years of settlement, would have been at moderate to high intensities and as often as could be sustained.

For private property selective logging operations, as for State forest sawlog harvesting, the initial sawlog operation is the primary contributor to environmental disturbance since it is this operation which removes a significant proportion of the mature trees of the forest, which involves the initial disturbance to understorey vegetation and soil and which requires the initial establishment of roads, snig tracks and log dumps. Additional impacts arising from pulpwood removal will arise from removal of logging residues (heads and butts) and additional trees removed as thinnings. Additional impacts will consist of the mechanical effects of a larger quantity of logs being transported over snig tracks, log dumps and roads and the effects on forest structure of the removal of a larger number of trees where thinnings are taken. Since many of the forests logged on private land are regrowth forests following earlier failed clearing or selective logging over a long period, the mechanical effects may be the most important.

For pulpwood removals from private land following clearing for conversion to agriculture, almost the whole of the environmental impacts are due to the clearing operation. Additional mechanical effects from log transport are the only likely additional adverse impacts and these are likely to be insignificant compared to the effects of the clearing machinery. If private land is to be cleared, and the NFPS (p27) acknowledges that private forest owners may wish to clear native forest for a range of economic purposes, it is difficult to justify an argument that the material which is cleared from this land should be stockpiled and burned. Given that private property operations and land clearing will continue, the salvage of material and resources from these operations appears appropriate.

2.3 Supply of Roundwood from State forests

A number of submissions also raised issues relating to land use planning and allocation in north-east NSW and other related policy issues for the Commonwealth and State Governments. Some went on to make recommendations to Commonwealth Ministers or to CEPA in relation to these issues. Many of the issues raised are not directly relevant to the SEPL proposal and are not dealt with in detail in this Supplement.

It needs to be said at the outset that where wood for supply to SEPL as roundwood or woodchips is to be obtained from State forests, the normal conditions will apply to these operations as to any other forest operations in the same forests. Landuse allocation, including conservation reservation, will be in accordance with the State's current policies and practices; as will environmental planning, licensing and regulation. Determinations by the Minister for Planning under the Environmental Planning and Assessment Act 1979 will apply, in addition to normal monitoring and supervision conditions.
Where, under State legislation or policy, harvesting is excluded from some areas, either permanently or pending completion of further studies or consideration for reservation, harvesting of roundwood for supply of woodchips to SEPL will not take place. Equally, if such areas later become available for logging and harvesting of roundwood for supply of woodchips to SEPL occurs, it will do so in concordance with the conditions applying to harvesting elsewhere in State forests or any special conditions specified for those areas.

2.4 Requirements of Legislation not Fulfilled

Submissions contended that the draft EIS had not fulfilled the requirements of the Administrative Procedures under the Impact Act, basing this contention on claims of inadequate content, inadequate public consultation and reliance on the NSW environmental impact assessment process.

2.4.1 Content of EIS inadequate

Many submissions claimed that the SEPL draft EIS made erroneous claims, misrepresented or failed to properly assess the natural environment.

Most of the submissions which made this claim did so without providing any information or referring to specific parts of the draft EIS on which the claim is

based. Others making the claim did so on the basis that the draft EIS did not cover the impacts of producing woodchips from sawmill or logging residues.

The SEPL draft EIS was prepared to meet guidelines provided by DASET and the requirements of the Administrative Procedures under the Impact Act. Paragraph 4.1 of the Administrative Procedures requires that a draft EIS include specified information "to the extent appropriate to the circumstances of the case". Much of the information and many of the issues referred to in the NEFA and other submissions relate to wood sources, and to operations for obtaining wood from those sources, which are outside the sources designated by the Minister for Resources as the subject of this environmental impact assessment. As noted above in the Introduction, the draft EIS concentrated on the impacts related to the designated sources, ie to "woodchips produced from silvicultural residues obtained from State forests in New South Wales and from clearing or forestry operations on private property".

Submissions on other specified issues relating to the designated sources are responded to in the relevant section of this Supplement.

A submission from the Armidale Branch of the National Parks Association of NSW states that the SEPL draft EIS should be rejected because the Need For The Project from the Company Perspective set out in the Summary of the SEPL draft EIS is deceptive and misleading. It claims that, rather than seeking to improve chip quality and increased flexibility in selecting sources for the purchase of up to the maximum 500 000 tonnes per annum specified in the current licence (draft EIS, pii), the Company's real intention is to expand sources of supply to compensate for a projected decline in the availability of sawmill chips.

The text in the main part of the draft EIS on the Need For The Project from the Company Perspective makes it clear that the NPA Armidale Branch claim misinterprets the EIS and SEPL's intentions. In Section 2.3.1 of the draft EIS (p7), SEPL openly states it is seeking increased flexibility in selecting sources of supply, within the maximum 500 000 tonnes per annum exports, to overcome the effects of sawlog quotas having been reduced for all North Coast sawmills. That section also makes clear that this flexibility is in part to enable the improvement of chip quality necessary to meet market requirements.

A number of submissions also raised issues relating to land use planning and allocation in north-east NSW and other related policy issues for the Commonwealth and State Governments and some went on to make recommendations to Commonwealth Ministers or to CEPA. It is not appropriate for SEPL to respond on issues which are the responsibility of Governments. It is appropriate however to point out that, other than for land owned by Boral and its subsidiary sawmilling companies, SEPL or associated companies cannot control or determine the use made of the land from which roundwood supplies for SEPL are obtained. This applies equally to private property and Crown Land.

2.4.2 Inadequate Public Consultation

Several submissions criticized the public consultation involved in the SEPL EIS process. The principal criticisms were in submissions from NEFA and the Great Lakes Environment Association which claimed that the EIS made no attempt to assess community preferences, to ensure a proper public consultation process was undertaken or to provide relevant and reliable information for public

consideration of the proposal. It was also claimed the display of the draft EIS was insufficiently publicised.

In addition to the formal public review and submission of written comments on the draft EIS required by the Administrative Procedures under the Impact Act, the EIS process for the SEPL proposal included two public consultation workshops held in Maitland and Wauchope. These were held prior to the preparation of the draft EIS, during the scoping phase. The major purpose of these workshops (draft EIS Appendix 3) was to disseminate information about the proposal to known interested groups and members of the public and to identify and clarify issues of public concern. Discussion at these workshops, incidentally, provided information on community preferences.

However, it misrepresents the purposes of an EIS to claim that an EIS should assess community preferences. As indicated in the Department of the Arts, Sport, the Environment and Territories (DASET) guidelines (draft EIS Appendix 2, p1), the aims of the SEPL draft EIS and the public review process included:

- to provide a source of information from which interested individuals and groups may gain an understanding of the project,

- to provide a forum for public consultation and informed comment on the project.

The draft EIS should therefore be regarded as one of the information bases on which community preferences may be formed. It would be premature to attempt to assess community preferences in relation to the project prior to the release of the project information contained in the draft EIS.

The public consultation process undertaken for the SEPL draft EIS is that set out in the Administrative Procedures under the Impact Act with the addition of the two public workshops held during the scoping phase. The suggestion that this was not a proper consultation process is rejected.

In regard to the claim that the display of the draft EIS was insufficiently publicised, advertisements notifying the availability of the draft EIS for public review, the places at which it was available for public perusal and for sale, together with the address and closing date for comments were advertised in 14 newspapers. These were the Sydney Morning Herald, the Newcastle Herald, the Australian, the Age (Melbourne) and local newspapers published in Coffs Harbour, Grafton, Tamworth, Taree, Dungog, Gloucester, Singleton, Cessnock, Kempsey and Wauchope. The advertisement and the newspapers in which it appeared were approved by CEPA as required by the Administrative Procedures under the Impact Act.

The Bellingen Environment Centre submission claimed that making the draft EIS available for public review over the Christmas-New Year period was a deliberate ploy to subvert the public participation process. The draft EIS was available formally for a 10 week public review period commencing on 3 November 1993, over 7 weeks before Christmas, and concluding on 14 January 1994. Because of the January fire emergency and other special circumstances, a number of submissions were accepted after the closing date. Since the last of these was received on 9 February, the effective public review period was 14 weeks.

This claim of deliberate subversion of the process is shown to be absurd by the facts that

- the requirement in the Administrative Procedures under the Environment Protection (Impact of Proposals) Act 1974 is for 4 weeks public review but in this case an effective period of more than 3 times this has applied,
- the draft EIS was available to the public 7 weeks before the commencement of the Christmas-New Year holiday period, and
- the timing and the length of the formal public review was approved by CEPA before its commencement.

2.4.3 Reliance on New South Wales EIA process

Many submissions criticized the reliance of the SEPL draft EIS on the as yet incomplete environmental impact assessment process being undertaken by State Forests of New South Wales (SFNSW) under the NSW Environmental Planning and Assessment Act 1979. SFNSW has prepared or is preparing EISs for Forest Management Areas under its control in north-east NSW for display, assessment and determination under that legislation. The current assessment status of these EISs is shown in Table 2.1. Some submissions also reflect a misconception that SEPL (or Boral and its subsidiary sawmilling companies) is able to control or dictate at least some aspects of the management of State forests. The decision to rely on the NSW assessments arises from the extent of the control which SFNSW has over the planning and carrying out of operations in State forests.

For operations providing roundwood to SEPL from the designated sources in State Forests, SFNSW specifies the location of work (including areas from which felling is excluded), the access routes to and from the location, the intensity of harvesting, the trees to be felled and those to be retained, the utilisation standards of the logs produced and the specifications of environment protection measures to be adopted. As part of its general management of forest areas under its care, SFNSW is also responsible for the allocation of areas to particular uses (including setting aside areas for conservation purposes), for silvicultural decisions, for the construction and maintenance of roads for harvesting and other access, for forest protection measures (including fire control, fire protection and fuel reduction) and for obtaining the necessary environmental and other approvals for its management and operational proposals.

The level of impacts of any operation from which SEPL obtains roundwood from State forests is almost wholly influenced therefore by SFNSW management which is the subject of the SFNSW EISs. Apart from the fact that it is not its responsibility, SEPL is not in a position to prepare an EIS covering the whole range of management in State forests since the decisions influencing the level of impacts of that management are not under its control. It is appropriate therefore that the EISs and FISs prepared by the SFNSW for operations throughout their Management Areas are the determinants for forestry activities in those areas. The SEPL draft EIS and this Supplement to the draft EIS, therefore have not attempted to duplicate the SFNSW EISs.

TABLE 2.1
ASSESSMENT STATUS OF NSW EISs

Management Area	Actual/Anticipated Exhibition Date	Comments
Mount Royal	23 Sep - 17 Nov 1992	Being reviewed
Wingham	7 Sep - 9 Nov 1992	Determined. Areas deferred for further assessment. General S120 licence issued but has been challenged
Glen Innes	17 Nov 1992 - 29 Jan 1993	Determined. Access to London Bridge SF deferred. No general S120 licence issued.
Dorrigo (3 year EIS)	October 1994	
Kempsey/Wauchope	14 Jul - 31 Oct 1993	Determined 25 March 1994. Draft S120 licence received 28 April 1994.
Grafton	August 1994	
Casino/Murwillumbah	July 1995	
Gloucester/Chichester	February 1995	
Tenterfield	October 1994	
Urbenville	February 1995	
Urunga/Coffs Harbour	January 1995	
Walcha/Nundle/Styx River	March 1995	
Warung	September 1995	
Wyong/Cessnock	December 1995	

With regard to the timing of the SEPL draft EIS and the SFNSW EISs, it is argued in submissions that no approval should be given to SEPL until the State EISs on which it relies have been completed and assessed. While this may be the ideal situation, it does not take into account the existing situation of an operating industry seeking continued access to existing sources or the economic disruption that would occur. It should be noted that the NSW Parliament has enacted the Timber Industry (Interim Protection) Act 1992 (the TI(IP) Act) to avoid this economic disruption in the sawmilling and associated industries while the SFNSW EISs are completed and assessed.

In accordance with the NSW TI(IP) Act, a moratorium on harvesting is in force in areas of old growth forest (including in north-east NSW) pending completion of the relevant area EIS and in areas proposed as wilderness under the Wilderness Act 1987 until completion of their assessment as wilderness. The TI(IP) Act also sets out areas which may be harvested pending the completion of the EISs.

In these circumstances, harvesting will be proceeding in some areas but will be excluded from more sensitive areas until the completion of the environmental assessment of harvesting and other management measures in those areas. Of course, the moratorium until State EIAs have been completed will include harvesting operations supplying SEPL. If and when SEPL operations, along with general harvesting, commences in some of these areas, it will be in accordance with any conditions imposed as a result of these State environmental assessments.

It would be premature, pre-emptive and presumptuous for SEPL to prepare an EIS for Commonwealth purposes which purported to describe the way in which

operations would be conducted in State forests in NSW ahead of the completion of the similar documentation for State purposes currently being prepared by the managing authority for those forests.

The SEPL draft EIS and this Supplement to the draft EIS, have therefore been prepared on the basis that,

- until the SFNSW EIS for a particular Forest Management Area (FMA) is completed and determined, operations supplying SEPL with roundwood from designated sources will be excluded from areas set aside from harvesting in that FMA, and

- following completion of the State EIA process for that FMA, operations supplying SEPL with roundwood from designated sources will comply with any requirements arising from that EIA and be on areas approved following that EIA.

It was pointed out that the SEPL draft EIS omitted Figure 2.2 (referred to on p15) which was intended to show the current assessment status of the EISs which had been or were being prepared by SFNSW for forest areas in north-east NSW. The information intended to be conveyed in Figure 2.2 of the draft EIS is shown in Table 2.1 in this Supplement and is correct as at April 1994.

3.0
RESERVES AND AREAS OF HIGH CONSERVATION VALUE

3.1
Conservation Reserves

Many submissions made the point that conservation reserves in the north-east region of NSW do not contain an adequate representation of the State's flora, fauna and their assemblages. The reservation status of forest types and particular vegetation or fauna species is discussed in Chapter 5.

State processes to identify and reserve further areas in north-east NSW to achieve a more comprehensive and representative conservation reserve system are underway, supported in forested areas by legislation like the TI(IP) Act and the NSW Wilderness Act. The allocation of public land on which the operations from which roundwood from designated sources is obtained is the responsibility of the managers of the land concerned, within the limits set by State policies and legislation.

Many submissions also made the point that, in the National Forest Policy Statement, the Commonwealth and State governments agreed:

- to a system of comprehensive regional assessments of the forests of a region.
- that a comprehensive, adequate and representative reservation system will be in place by an early date to protect old growth forest and wilderness values.
- until the assessments are completed, forest management agencies will avoid activities that may significantly affect those areas of old growth forest or wilderness that are likely to have high conservation value.

These submissions generally sought that no export approval be given for woodchips from the designated sources until a comprehensive, adequate and representative reservation system is established. Such a decision on export approval is a policy matter for the Commonwealth. However, on the basis of the following, it is clear that operations to obtain roundwood for chips from designated sources are not inconsistent with the NFPS.

It should be noted that the NFPS undertaking to avoid certain activities is applicable to "those areas of old growth forest or wilderness that are likely to have high conservation value", and is not intended to apply to all old growth forests as many submissions imply. In relation to obtaining pulpwood from the designated sources in State forests, as was indicated in the draft EIS (p17), schedules to the TI(IP) Act, provide for:

- the setting aside of substantial areas of old growth forests on which no harvesting can take place until a State EIS is obtained,
- for harvesting to be permitted on other forest areas pending the completion of these EISs, and
- for a moratorium on harvesting on land which is subject to proposals under Section 7 of the NSW Wilderness Act 1987.

The thinning operations in regrowth and plantations, which are expected to provide the major part of the roundwood to come from the designated sources, are, by definition, not carried out in old growth forests. The only operations to obtain roundwood for chips which could occur in what are now old growth forests, are the removal of culls which will be integrated with, or immediately follow, sawlog operations. The restrictions on areas of old growth forest available for such sawlog operations and the moratorium on nominated wilderness areas in the TI(IP) Act limit the places where these operations can occur to areas less likely to have high conservation values.

3.2 Wilderness Areas

Some submissions claimed that logging would impact on wilderness areas. Submissions also recommended that areas identified as wilderness by NPWS should be excluded until future management is resolved.

By definition, operations which take place in previously logged areas (regrowth or plantations) do not take place in wilderness areas. As pointed out above in relation to conservation reserves, the TI(IP) Act, provides for a moratorium on harvesting on land which is subject to proposals under Section 7 of the NSW Wilderness Act 1987. Any operations to produce roundwood for chips for SEPL will, therefore, not take place on land identified as wilderness until future management is resolved.

With regard to possible indirect effects of logging, eg visual impacts seen from wilderness areas, SEPL does not control the allocation of public land to particular operations and this is the responsibility of the managers of the land concerned. Similarly, for private property, SEPL does not control land owners decisions but, before logging for pulpwood is undertaken, will consider the effects on wilderness. Pre-logging investigations will include this aspect.

3.3 World Heritage Areas

Many submissions, including those from NPWS, NEFA/NCEC, other conservation organisation and individuals raised the issue of possible effects on World Heritage areas. NPWS, in particular, recommended that the proposed action should not be undertaken in areas of existing World Heritage, or in areas nominated for or being considered for World Heritage listing and buffer areas for World Heritage properties. Many other submissions stated that no export licence should be issued until world heritage values had been assessed.

Parts of the existing Australian East Coast Temperate and Sub-tropical Rainforest World Heritage property, which consists entirely of secure conservation reserves (National Parks, Nature Reserves, Flora Reserves) and from which all logging is excluded, fall within the study area. In 1992, Australia put forward to the IUCN a re-nomination for the Central Eastern Rainforests of Australia, to include the existing World Heritage property and additional areas, some of which are within the study area. In its evaluation of this nomination, IUCN requested that the addition of parts of the Carrai Plateau and Mt Seaview areas and extensions to the Barrington Tops National Park be further evaluated.

All the areas in the 1992 nomination are of national park or of other secure conservation status and thus will not be logged. Some of the IUCN suggested

additions are State Forest but these are mostly areas that are already reserved from production. Many are areas which NPWS has previously identified as worthy of National Park status. All areas, both nominated and IUCN suggested, are public land and no private property is included.

Since, therefore, no logging will occur on any of these lands, if it ever does, until after the evaluation and nomination process has been completed, there is no possibility of roundwood for chips being produced and no reason for withholding an export licence for supplies from the designated sources pending completion of the process.

4.0
CULTURAL VALUES

4.1
National Estate Places/Values

The major submission on these aspects of the proposal came from the AHC. In its submission, the AHC stated that drawing roundwood from silvicultural operations and residues from logging in State forests will not have a direct impact on any places listed in the RNE. However, in relation to operations on private property adjacent to listed land, AHC expressed concern that there may be indirect impacts on the national estate values of the places. It also expressed concern that there was insufficient information in the draft EIS on clearing private land to assess potential impacts on individual places listed in the RNE because of their high natural values.

It is acknowledged that the draft EIS did not have the information on clearing private land necessary to assess potential impacts on individual listed places. As stated in the draft EIS (p47) private land owners intentions regarding harvesting (clearing or selective felling) during the period to 2003 were not sampled and thus this information is not available. Its value would be questionable in any case because of the high chance of owners intentions changing over that period of time.

It is proposed to assess, on a case-by-case basis as part of the pre-logging investigation, any potential indirect impacts on places listed on the RNE, or on the Interim List, of any logging which will supply roundwood for chips to SEPL from private property. This will be done in consultation with the AHC and to assist in the identification of the need for such assessment SEPL obtains information on listings through the AHC mailing list. The commitment given in the draft EIS (p209) and based on the current extent of listing, that companies supplying roundwood to SEPL will not harvest wood for this purpose from areas on the RNE or the Interim List is confirmed.

While the conditional nature of this commitment has been criticised in some submissions, the AHC has advised that it has deferred consideration of natural places within the north-east NSW region pending a regional assessment of the area. It is noted that one of the initiatives in the NFPS (p28) for achieving Commonwealth and State Governments' objectives for private native forests is

> "Approvals for the export of woodchips from private native forests for terms longer than the current annual renewal period will be considered where those forests are included in a comprehensive regional assessment and a Commonwealth-State regional agreement".

In the light of this initiative and the insignificance of the projected volume of chips to be sourced from private land each year (<10 000 tonnes) compared with the potentially available volume of chips from alternative sources, it seems highly unlikely that the commitment cannot be kept. If, as noted in the draft EIS (p209), because of substantial increases in the areas listed it becomes necessary for companies supplying SEPL to apply to obtain roundwood from listed areas, an assessment of the effects on National Estate values and available alternatives would be made at the time.

As noted above, the AHC has advised that it has deferred consideration of natural places within the north-east NSW region pending a regional assessment of the area. Many submissions expressed concern at this and stated that no export licence should be issued until the National Estate has been identified.

The AHC has advised that until regional assessments of national estate values have been undertaken, it is difficult for it to provide advice on specific impacts of operations or mitigation measures and goes on to advise that, until such a regional assessment is done for the north-east NSW region, it would seem prudent to avoid harvesting in areas of high conservation values, including old growth and wilderness areas. The points made above in section 3.1 in relation to the NFPS undertaking concerning avoidance of such areas and the provisions of the TI(IP) Act and the NSW Wilderness Act are again relevant.

The protection given to areas of high conservation values in this way and the commitments given by SEPL that no roundwood for supply to the Company will come from places listed in the RNE or Interim List make the withholding of an export licence until the National Estate has been identified unnecessary.

4.2 Aboriginal Cultural Heritage

The major submissions raising issues to do with Aboriginal cultural and heritage were those from NPWS and NEFA/NCEC.

4.2.1 Protection Legislation

NPWS has noted that there is no discussion of the National Parks and Wildlife Act, 1974 in relation to its provisions for the protection of Aboriginal relics, sites and areas in the draft EIS which, on page 18, details other provisions of the Act. This appears to have resulted in some confusion over the protection given to Aboriginal cultural heritage by the NPWS Act and the AHC respectively. The provisions of both the NPWS Act and the AHC Act apply to forestry operations for the production of roundwood to supply export woodchips to SEPL.

Under the NPWS Act, NPWS is responsible, in addition to the responsibilities relating to flora and fauna indicated in Section 2.6.2 of the draft EIS, for the protection and preservation of all Aboriginal relics and Aboriginal Places in NSW. A relic is defined in the Act as any deposit, object or material evidence relating to the Aborigines of NSW. An Aboriginal Place has the legal status of a relic and is defined as a site of special significance to Aboriginal culture, and includes places of religious and spiritual significance (Haigh, n.d.). Under the Act it is illegal to damage, deface, or destroy a relic or Aboriginal Place without the prior written consent of the Director of the NPWS. The Act also requires that anyone who discovers a relic must report the discovery to the Director within a reasonable time.

As noted in Section 6.2.1 of the draft EIS (p114), in July 1992 there were over 3,500 sites within the study area listed on the NPWS site register, just over 300 of which occur within the LSZ.

Other than Aboriginal Places, the NPWS Act also makes provision to have other areas of land protected as Historic Sites, Aboriginal Areas and Protected Aboriginal Areas. Definitions of these categories of land and places within them which occur in the Study Area were listed in Section 6.2.1 of the draft EIS.

Section 2.6.1 of the draft EIS (p15) indicated the features of the AHC Act and the responsibilities of Commonwealth Ministers when considering proposed decisions which may affect places on the RNE. Places on the Register have national estate values and include places nominated because of their natural, Aboriginal and/or historic significance. Aboriginal places may only be nominated to the Register by State or Commonwealth government agencies and must have prior protection under State or Territory law (Bruce et al, 1989). In October 1992 there were over thirty Aboriginal environment places and over ninety natural environment places on the RNE or Interim List located within the study area.

The NEFA/NCEC submission expressed concern that the draft EIS contained no discussion of the implications of the Native Title Act, 1993.

The Native Title Act, 1993 had not been fully drafted as a Bill when the draft EIS was compiled. The implications of this Act have only recently been the subject of detailed study and still appear not to be fully resolved. At this stage only qualified legal practitioners are competent to comment on, and interpret, the implications of this Act and, in the absence of any known claim of native title in the study area further discussion is considered beyond the scope of this EIS.

Other Commonwealth legislation which could be relevant to the proposal is the Aboriginal and Torres Strait Islander Heritage Act, 1984. This Act provides that, if an artefact or land which is significant to Aboriginal people is threatened, an Aboriginal person or somebody acting on their behalf may make representations to the Commonwealth Minister. Following investigations, the Minister may decide to take action to protect the artefact or place. This Act overrides the provisions of State heritage acts and is administered by the Aboriginal and Torres Strait Islander Commission.

4.2.2
Impacts on Aboriginal Cultural Heritage

NPWS was concerned that the EIS seemed to assume that there would be no significant impact on sites because proposed activities will mainly occur in previously cut-over regrowth areas and plantations and that there was little comment on the difference between new impacts and no impacts.

In addition to possible adverse effects on the many known sites listed on the RNE and by the NPWS, there is a range of forestry activities associated with the supply of wood chips to SEPL which are likely to affect a broad range and large number of presently unknown sites. Before discussing these likely impacts it is useful to examine the procedures which will be followed prior to the commencement of forestry activities on private land and in state forests.

Roundwood obtained from private property will mainly be supplied from the Great Lakes, Dungog, Gloucester, Walcha, Hastings, and Greater Taree LGA's. The requirement to obtain Development Consent from the relevant local government authority for forestry activities (including thinning or other silvicultural operations) varies with the LGA (Table 2.2 in the draft EIS). Whilst it is the responsibility of the landowner to seek council approval, where this is necessary, and to have any studies necessary to obtain it undertaken, SEPL will ensure that heritage studies are conducted within all areas of private land that are to be used to supply timber to the company.

Wood chips will also be supplied to SEPL from roundwood derived from thinning of natural regeneration, silvicultural residues (including culls) and plantation

thinning conducted in State forests within the ESZ. The major sources of roundwood for wood chips will be state forests in Morriset, Dungog, Gloucester, Bulahdelah, Walcha/Nundle, Taree/Wingham, Dorrigo, Kendall, Wauchope and Urunga State Forest Districts [draft EIS Table 3.1). As pointed out in Section 2.3.3 above, the level of impacts of any operation from which SEPL obtains roundwood from State Forests is determined by SFNSW management decisions, as are the protective measures to be undertaken in those forest areas. These issues are the subject of the SFNSW EISs discussed in that section.

SEPL's roundwood harvesting operations for silvicultural residues on private property will be undertaken on an integrated basis with the harvesting of any sawlogs. While road construction is the major cause of cultural site disturbance in forests, harvesting of timber is the next major cause of adverse impact to Aboriginal sites. As the overall amount of ground disturbance depends upon the intensity of logging and, as integrated logging for sawlogs and wood chips is the most intensive form of logging, it has the highest potential, of any type of logging operation, to disturb Aboriginal sites (Bowdler, 1983).

Construction of roads and other major ground disturbance activities associated with logging usually occurs in places that are also the most likely locations for Aboriginal camp sites and scarred trees, that is along ridgelines and spurs, and on flattish locations on hill tops (Bowdler, 1983; Collins and Morwood, 1991). Construction of roads and log dumps does not always destroy such sites, and such activity is often the only way in which these sites are revealed. Impacts at log dumps and on snig tracks can be quite severe but little can be done to protect sites in such locations as the sites are usually not visible until after construction has begun

However, in assessing the importance of the above information it should be noted that, as described earlier in Section 2.2 when discussing additional impacts due to the SEPL proposal, a large majority of the private properties likely to be logged for roundwood for SEPL will have been logged several times in the past. The tracks for haulage and snigging, usually on ridge tops and spurs, and log dumps have long been established in these areas. Also the generally low residual volumes available on private land means the intensity of integrated logging in these areas will rarely approach the intensity of sawlog-driven integrated logging on State forests.

Prior to the introduction of integrated logging on private property to provide roundwood for supply of chips to SEPL, the land owner, in conjunction with SEPL, has the responsibility to minimise the adverse affects of such logging on all sites of cultural heritage within the estate and to ensure that forestry activities do not result in disturbance to or destruction of any cultural heritage sites within the estate. Enquiries should be made to determine whether any sites on the NPWS sites register, the Heritage Council register and the RNE occur within the forests to be affected by the logging activity.

SEPL currently has all private land inspected to identify areas suitable for logging and those areas which should be retained for environmental protection. Inspection of the areas for the presence of cultural heritage sites will be incorporated within this program, together with detailed archaeological surveys where consultation with NPWS indicates these are necessary. Such consultation will form part of the pre-logging investigation undertaken before SEPL contracts to take roundwood from a property. SEPL will also ensure that sites listed by the NPWS or the AHC that are located on private land will not be affected by any wood chip production activity that occurs on that land and that

those discovered by pre-logging surveys or during logging activities will be treated in accordance with current legislative requirements.

NPWS commented that no specialist archaeological and heritage report appears in the appendices to the draft EIS.

The sections of the SEPL draft EIS concerned with Cultural and Historic Values (Section 6.2) and Significant Natural and Cultural Sites (Section 7.13) were based on a specialist archaeological and heritage report prepared by the professional archaeologist subconsultant named in the Study Team in the draft EIS. It was not considered necessary that the draft EIS include the full report, which was lengthy and also dealt with material irrelevant to the designated sources of woodchips. Additional material from the report is included in this Supplement to meet deficiencies noted in the NPWS Submission.

The NPWS submission recommended that the process by which archaeological surveys and management studies both in State Forests and on private land will be conducted should be addressed in detail within the EIS. Also the AHC submission noted that the mitigation measures for Aboriginal places referred to in Section 9.10.2 of the draft EIS apply only to Crown land.

As pointed out earlier in this section, the level of impacts of any operation from which SEPL obtains woodchips from roundwood from State Forests is determined by SFNSW management decisions, as are the protective measures to be undertaken in those forest areas. These issues are the subject of the SFNSW EISs discussed in Section 2.1.3. It is not considered appropriate for SEPL to attempt to detail in this EIS the way in which SFNSW will conduct operations required to meet its own responsibilities ahead of the completion of similar documentation for State purposes.

SEPLs intentions and commitments concerning pre-logging surveys and protection of sites on private property from which roundwood producing woodchips for the company is to be obtained are discussed above in this Section.

NPWS recommended in its submission that the archaeological research in the draft EIS be updated.

The data used in the original report by the archaeology/heritage subconsultant was the most recently available material when the report was compiled in November 1992. The subconsultant now advises that, although a significant amount of new information has become available since that time, its inclusion is unlikely to result in major changes to the discussion and recommendations in that report or the EIS.

4.2.3 Aboriginal Land Councils

The NEFA/NCEC submission commented that the SEPL draft EIS contained no identification of the cultural associations that many Aboriginal groups have with the study area and that consultation with such groups was not addressed.

As most of the cultural sites likely to be adversely affected by logging will be Aboriginal rather than European in origin, effective liaison with all relevant local and regional Aboriginal land councils is important. Table 4.1 below shows the regional and local Aboriginal land councils within the supply zones. Where any

adverse impacts are likely to occur to sites of significance to Aboriginal people, liaison with all local and regional Aboriginal land councils should precede any work in connection with harvesting roundwood for the supply of woodchips to SEPL. Where consultation with NPWS indicates it to be appropriate, liaison will be established and the views and suggestions of Aboriginal people be taken into consideration prior to contracts to take roundwood from private land being finalised.

TABLE 4.1
REGIONAL AND LOCAL ABORIGINAL LAND COUNCILS WITHIN THE SUPPLY ZONES

Regional ALC	Local ALC within region	LGA's covered by Local ALC
North Coast	Yaegl	Ulmarra
	Birringan Gargle	Ulmarra
	Grafton-Ngerie	Ulmarra, Nymboida, Grafton
Central Coast	Coffs Harbour	Ulmarra, Coffs Harbour, Bellingen
	Kempsey	Kempsey, Hastings, Walcha
	Thungutti	Kempsey, Dumaresq
	Bowraville	Nambucca
	Unkya	Nambucca
	Birpai	Hastings, Walcha
	Bunyah	Hastings
	Purfleet-Taree	Taree, Gloucester, Walcha, Hastings
	Forster	Great Lakes, Taree, Scone, Gloucester
	Karuah	Dungog, Great Lakes, Gloucester
	Worimi	Port Stephens
Northern Tablelands	Guyra	Guyra, Uralla
	Armidale	Dumaresq, Armidale, Uralla, Guyra
Northern	Tamworth	Walcha, Parry, Tamworth
	Amaroo	Walcha
	Nungaroo	Nundle, Parry
	Wanaruah	Singleton, Muswellbrook, Scone
Sydney and Newcastle	Mindaribba	Cessnock, Singleton, Port Stephens
	Awabakal	Newcastle, Cessnock
	Koompahtoo	Lake Macquarie, Cessnock
	Bahtabah	Lake Macquarie
	Darkinjung	Wyong

5.0 ENVIRONMENTAL SUSTAINABILITY

5.1 Climate

5.1.1 Global Warming

The EPA Submission criticises the way in which the draft EIS, in the section on Implications for Global Warming, summarises the conclusions of the RAC Forest and Timber Industry Inquiry with regard carbon storage by Australian forests.

The RAC conclusions (RAC 1992) were that it is possible to harvest a forest in such a way that the long term storage of carbon in the forest and derived timber products either is greater or is less than carbon storage in unharvested forest. A higher carbon storage would be favoured when the majority of harvested timber is used for sawn products rather than for pulp, when sawmilling and other forest waste is minimised and/or substituted for fossil fuel during production, when sawn timber products are retained for long periods and when soil disturbance during harvesting is minimised. Lower carbon storage would occur when the majority of harvested timber is used for pulp and when rotations are short thus increasing soil disturbance.

In assessing the overall effects of the production of roundwood from designated sources for use by SEPL, the following might be considered While the end use for the woodchips is pulp manufacture, the purpose of the silvicultural operations which produce the roundwood is to increase the productivity of the native forest above that achieved by sawlog operations only. This increase in productivity increases the proportion of wood eventually harvested for sawlogs or long term storage items like poles. Data is not available to estimate the nett effect on carbon storage over a rotation period of the forest, but the above would suggest the outcome may well be positive rather than negative relative to the current situation.

Submissions also point to the RAC conclusion (RAC 1992, para K51) that the analysis carried out by the Inquiry does not support the case for converting old growth forests into regrowth forests **in order** to create a positive carbon balance and so reduce atmospheric carbon dioxide concentration (emphasis added). This conclusion refers to the purpose of converting old growth forests, not the fact of doing so, whereas the purpose of harvesting of old growth forests in north-east New South Wales is the production of economic products. Consideration of the nett effects of the benefits of this production against the disbenefits of decreased carbon storage are beyond the scope of this EIS, particularly since the allocation of old growth forests to harvesting on State forests or clearing on private land is not within SEPL control.

5.1.2 Climate Change

Submissions drew attention to the expectation that global warming will result in climate change which is likely to place forests in north-east NSW under stress and expressed concern that the draft EIS did not discuss this.

RAC reviewed this aspect as part of its Forest and Timber Industry Inquiry and reported that the distribution of forest species will change in response to

changing regional climates, which in turn is likely to increase the risk of extinction of some forest dependant species. RAC noted the adequacy of the existing network of conservation reserves will need to be carefully evaluated in the light of the predicted impact of regional changes in the conservation status of species and habitats and those responsible for the future allocations of conservation reserves should take this into account (RAC 1992, paras K52 & K53). The relationship of the SEPL proposal to conservation reserves is discussed in Section 3.1 above.

5.2 Soils and Erosion Issues

The NEFA/NCEC submission is critical of the information on geology and soils in the draft EIS claiming it is inadequate, but then goes on to argue that a even a more thorough review would not be adequate without a more detailed level of regional planning which it says is inadequate for public lands and private lands. The draft EIS was prepared on the basis of existing information, including that being gathered for the SFNSW EISs process and it is considered it is sufficient to assess the potential impacts of the proposal to the extent appropriate to the circumstances of the case as required by the Administrative Procedures. The level of regional planning is a matter for the relevant State authorities and beyond the scope of this EIS.

The draft EIS is also criticised for relying on the SFNSW EISs for detailed information and assessment of soils and erosion potential in relation to State forests. As noted in the draft EIS, much of the relevant literature on soils and erosion for the study area relates only to cleared agricultural land. Since there are little or no specific data on the potential impacts on soils of the removal of silvicultural residues known from the SEPL study area, the draft EIS has relied substantially on discussion of the impacts of standard timber harvesting on these aspects, including data collected for the SFNSW EISs and has attempted to relate those data to the substantially less intensive silvicultural operations. It is also appropriate to rely on the State assessments for State forest operations since these will be conducted to SFNSW prescriptions and any conditions set in determinations by the Minister for Planning under the TI(IP) Act.

The issue of loss of nutrients through effects of harvesting (through soil erosion/leaching, biomass removal and post-logging burns) is also raised but no evidence is offered to counter the review in the draft EIS other than a review of literature on burning losses and the view that the draft EIS discussion is based on SFNSW research. There is no burning involved with obtaining roundwood from the designated sources.

The Department of Water Resources, in a submission from its North Coast Region, points out that the review in the draft EIS (p50) of State legislative regulations and controls makes reference to the Water Act 1912 but not to the River and Foreshores Improvements Act 1948 which is administered by Water Resources. Under this Act, the Department has the ability to control any activity that has the potential to disturb the stream bank or flood plain generally within 40m of the top of the bank, but is also able to control activities that are likely to detrimentally impact on the stability of a river or stream that is occurring outside the 40m limit.

A submission from CaLM points out that some of the safeguards developed and implemented for environmental protection on Crown lands, including State forests, (e.g. SEMGLs) do not automatically apply on private land. It also points

out that guidelines, such as the SEMGLs and CaLMs 'Guidelines for Mitigation of Erosion and Land Degradation for Permanent Clearing on Protected Land' (CaLM 1993), are statements of erosion control principles and practices that must be interpreted at each site to provide operational standards for that site. CaLM also suggests that the erosion hazard and sediment control strategy contained in Conditions 40 and 41 of the determination by the Minister for Planning under the TI(IP) Act for the Wingham Management Area (Minister for Planning 1993) could also be relevant to approvals for logging on private land.

As discussed elsewhere in relation to other environmental factors, pre-logging investigations will be carried out for prospective private property purchases of roundwood for supply of chips to SEPL and these will include studies of soil characteristics and erosion potential as necessary. The information from these investigations will provide the basis for decisions on whether to proceed with the purchase, for design of harvesting plans and environmental protection measures and for seeking necessary approvals. The pre-logging assessment of environmental impacts and the design of harvesting plans and environmental protection measures will take into acount the guidelines and planning approval conditions referred to by CaLM. Approval processes for private land operations are further discussed in Section 5.7.4.

5.3
Hydrology, Water Quality and Aquatic Systems

5.3.1
Prediction of Environmental Effects

A submission from the Nambucca Valley Conservation Association (NVCA) criticises the predicted impacts outlined in the SEPL draft EIS and, in particular, those predicted in relation to the aquatic environment. The NVCA fails to take into account the spatial scale within which the impacts are predicted. The draft EIS acknowledges that there are likely to be adverse effects associated with logging and roading on forest ecological values. However, these are obviously more pronounced within the actual areas of active harvesting and road construction. Most impacts are highly localised and of a short-term nature due to the very nature of thinning operations (small cover removal) and their wide distribution in space and time.

In Section 7.3.1 of the draft EIS (p128), operational definitions of the spatial and temporal scale of environmental impacts were made so that statements of the degree of impact (NVCA's concern) have a precise meaning. Three spatial scales were selected in the EIS namely, site, local and regional scales. The assessment of environmental impacts arising from the proposed activities outlined in the draft EIS remains the same within the spatial scales and long time frame (10 years) described in the EIS.

NEFA/NCEC contends that the classification of spatial scales within which the impacts on streams and rivers of the supply zone are predicted is "arbitrary and meaningless". Although the spatial scales may appear arbitrary they do relate, in part, to the physical and biological longitudinal zonation of the river system.The site spatial scale includes the streams of the State forests at the **catchment** level, and it is at this level that whole stream ecosystems are protected and maintained, with impacts minimised to a large extent by the dispersal of forestry operations in space and time. For example, if the site scale had been confined to the very small 1st order streams within the sub-catchment

level, impacts arising from forestry operations would appear to be more pronounced, especially within the immediate vicinity of operations. However, the whole stream ecosystem of a State forest area comprises many streams in sub-catchments that are unaffected by thinning operations thus, within the catchment at any one time, there is a mosaic of disturbed and undisturbed sub-catchments.

Many studies have shown that, whilst forestry operations are taking place in the upper sub-catchments of a river catchment, impacts on downstream water quality and the aquatic biological communities of the main streams are minimal or do not occur at the downstream catchment level. It should also be pointed out that current forest management practice essentially maintains a continuous forest cover on an ecologically sustainable basis, and that forested catchments per se are protective of downstream water quality and other catchment values. Hence, the aquatic ecosystems of the main streams draining forested catchments are essentially protected and maintained in a viable state.

5.3.2 Impact on Catchment Hydrology

NVCA's comments on impacts on catchment hydrology, relating specifically to impacts on water yield, again do not take account of the spatial scale within which the impacts are predicted. Also NEFA/NCEC says the draft EIS fails to consider the cumulative impact of woodchipping on water yields.

Where changes in water yield are predicted in the EIS, these are at the sub-catchment level but, because thinning operations are dispersed in space and time throughout the LSZ, impacts on water yield at the **catchment** level are expected to be negligible due to the small areas of the total catchment area involved. Most of the thinning operations proposed in the EIS will remove a small percentage of crown cover, and impacts on water yield are generally not detectable from natural background fluctuations when crown removal is less than 20% of the catchment in which operations are current Cornish (1991).

The NEFA/NCEC submission reviews literature on changes in water yield associated with intensive or clear-felling harvesting operations in Victoria. Since, the SEPL proposal is for small-scale thinning operations dispersed in space and time (over 10 year period), the NEFA/NCEC review and data table presented are just not relevant to the impacts predicted in the draft EIS because of differences in scale and the intensity of forestry operations.

NVCA's references to the same Melbourne Water Board studies are not comparable due to the large scale of clear-felling harvesting operations carried out in the Victorian study, and are not relevant to the scale of thinning operations proposed in the draft EIS.

The draft EIS clearly states that no significant impacts on catchment water yields or streamflow volume are expected at the site scale and none at the local or regional scales. NVCA's comment that impacts on water yield would be expected at the local scale is incorrect, as this would imply impacts in the larger streams and tributaries of the main river systems (the local scale defined in the draft EIS). For impacts on water yield and streamflow to be significant at this local scale, this would require intense harvesting (>50% crown removal) or clear-felling operations over extensive tracts of land in the upstream catchments. The proposed activities outlined in the draft EIS are for small-scale thinning operations dispersed in space and time (10 years) over 30,000 ha of

the total 700,000 ha; therefore impacts on water yield are not expected at the site, local and regional scales as defined in the draft EIS.

5.3.3 Sedimentation of streams

Plantation and regrowth thinning operations in the LSZ will make use of existing road networks and no new roads are proposed in the draft EIS. Thinning operations will also make use of existing snig track networks in the State forests which, in some cases, may require some regrading (e.g. blading off). Impacts of existing roads and snig track systems are addressed in the current round of SFNSW EISs covering the various Management Areas within the LSZ.

The NVCA submission states the "snig track network...will have large areas of exposed soils" in State forest compartments. This is not the case, for example, a recent study by Lacey (pers. comm., unpublished data) on 41 coupes subjected to integrated harvesting operations in the Eden Management Area, showed that the percentage of the coupe with soil disturbance averaged 14% and, of this total, only 20% of this disturbed area had topsoil and/or subsoil exposed; hence, only about 3% of the total gross area was significantly disturbed and this cannot be considered a "large area". The remaining 80% of the disturbed area had the litter layer intact.

5.3.4 Hydrology

In its submission, NEFA/NCEC says the draft EIS fails to describe the condition of streams in areas affected by woodchipping. The draft EIS gave descriptions of regional water quality in the major rivers of the supply zones and these were based on available information at the time of writing the EIS. It is expected that the current round of SFNSW EISs will provide more detailed descriptions of rivers and water quality in the Management Areas within the supply zone.

5.3.5 Aquatic Biological Communities

The NEFA/NCEC submission noted that the published EISs for Mt. Royal, Wingham, Glen Innes, Dorrigo and Kempsey/Wauchope Management Areas did not include any assessments of the aquatic biological communities, whereas the (then) unpublished Grafton and Casino EISs did include assessments. The latter two EISs were the first in which the Requirements issued by the Director of Planning stated that the aquatic biological communities were to be specifically addressed.

The NEFA/NCEC submission also states that there has been "no apparent attempt to assess aquatic ecosystems within the LSZ". This is not the case, as the SEPL draft EIS addresses impacts on the aquatic ecosystems in Section 7.3.4 (p139). Although direct sampling data for the aquatic biological communities of streams and rivers in the supply zone were not available, information from the literature and the macroinvertebrate surveys by Balloch (1994a & 1994b) in the Grafton and Casino Management area provided a basis for assessing the generic effects of forestry operations on the stream ecosystems typical of the eastern drainage of NSW.

The NEFA/NCEC submission also criticises the surveys carried out by Balloch (1994a & 1994b) in the streams of the Grafton and Casino Management Areas on the basis of:

- the use of benthic macroinvertebrates
- the methods used
- non-sampling of other components namely, microinvertebrates, fish and aquatic flora
- the sampling of other stream habitats besides riffles
- exclusion of macroinvertebrates attached to stones etc in the samples.

Benthic macroinvertebrates were sampled during the surveys because of their known value in the biological assessment of water quality. Benthic macroinvertebrate assemblages in riffle sections of streams have the highest number of species because of the high structural diversity of this habitat, e.g., wide variation in substrate sizes (rocks, stones, gravels, sands and silt), food resources (algae, diatoms and detritus) and high dissolved oxygen regimes compared to, say, stream pool reaches which predominantly have sand/silt substrata of lower structural diversity. There is no taxonomic impediment to using benthic macroinvertebrates since their taxonomy is largely known, compared to the taxonomic impediment of using microinvertebrates which have been poorly described and researched for Australian inland waters. Sample processing of macroinvertebrates is much simpler than is the case for sample processing and identification of microinvertebrates, as the latter depends entirely on time-consuming microscopical examination.

Since the objective of sampling is to obtain a large representative sample from which to characterise the structure (species and relative abundance) of the stream benthic macroinvertebrate community, the survey method of "heel-kicking" for a given time period (1 minute's duration in the draft EIS) provides an adequate-sized sample that is representative of the benthic macroinvertebrate community of the stream being sampled. Sampling the riffle substratum for a 1 minute duration actually samples about $2m^2$ of substratum, which is equivalent to taking about 20 samples using one of quantitative samplers (e.g., core or box samplers having a common base area of $0.1m^2$)' which are widely used for research investigations. Although it was not mentioned in the description of the sampling method in the draft EIS, collections of macroinvertebrates attached to or clinging to rocks etc. were removed by hand and added to the overall benthic macroinvertebrate sample, as some of these attached organisms may not have been dislodged during the heel-kicking procedure.

Benthic macroinvertebrates were chosen over other components of the aquatic community (e.g., benthic algae, microflora or fish) because they are more readily sampled, easier to identify and to process and, unlike fish, they are less mobile and therefore exposed to changes in water quality. Fish are difficult to sample and can move away (behavioural avoidance) from disturbed stream reaches. Furthermore, many macroinvertebrates live in the streams from between 6 months to several years; and are therefore exposed to long-term fluctuations in water quality, thus acting as biological integrators of water quality history at the sampling site.

The comparison of the area of stream bottom sampled (approximately 42m² in the total of 21 minutes sampling duration) to the 8 million hectares of land in north-east NSW is nonsensical. Even if all forest streams had been exhaustively surveyed, the area of stream bottom sampled would only be a fraction of a per cent of the total area, the vast bulk of which is terrestrial non-stream habitat.

5.3.6 Other Impacts

The NEFA/NCEC submission reviews some of the literature on the effects of post-European settlement on the larger rivers of Australia. This review is just not relevant to the small streams found in the forested catchments of the supply zone.

Fire

The NEFA/NCEC comments on the effects of wildfire on increased runoff and streamflow are noted but the relevance of this information to the draft EIS is questioned, since only prescribed burning (not wildfire) is included as part of forest management activities. The small scale (areal extent and magnitude) at which prescribed burning is planned in the State forests of the supply zone is unlikely to contribute significantly to background nutrient loading of the main river systems. The draft EIS already stated that prescribed burning would contribute to nutrients and sediments entering streams.

Roads

The impacts of road construction and maintenance on the aquatic environment are addressed in the current round of SFNSW EISs covering the Management Areas comprising the supply zone.

Impacts are adequately covered and new erosion control guidelines (SEMGL) are operative . Also, other mitigative prescriptions are applied after site inspection and at the pre-harvesting level of planning.

Fish Species List

Comment by both NSW Fisheries and ANCA that the trout cod (Maccullochella macquariensis) is not found in the Richmond River or any eastern drainage is acknowledged. This species should be excluded from the list of fish species present or expected to be present in the supply zones.

5.4 Vegetation

5.4 1 Description Of Vegetation

The SFNSW Forest Types were chosen as a basis for vegetation description in the draft EIS because they represent the most comprehensive and detailed system which is available to date for the study area. They serve as a basis for forest management and for the type maps which have been prepared for the management areas. The flora surveys which have been carried out as a

background for EIS reports in the north coast area are also based on stratified random sampling of forest types in the management areas (York and Binns, 1990). The mapping by Roberts (1992) described in the North East Forest Alliance submission is much more generalised and of limited usefulness in the EIS context.

Any other system which might have been adopted for the description of the vegetation would have had to establish equivalents with the SFNSW Forest Types because of its' history of established usage. This has, for example, been done for the Hager and Benson (1992) system. This is not to deny that there are shortcomings associated with the Forest Types system. Early mapping predates the standard types summarised in Research Note 17 (Forestry Commission of NSW, 1989) and is much more generalised. Not all of these areas have been remapped in greater detail. There is also the problem of resolution. Not all forest types which have conservation significance are recognised in the State Forest classification which was originally developed for other management purposes. This is dealt with by Hager and Benson (1992) where necessary by grouping several of their units under one Forest Type heading. It is considered to be preferable to work within an established classification system in this way rather than to attempt to create an entirely new one. In any case it was beyond the scope of the SEPL EIS to do so.

The North East Forest Alliance submission also suggests that an ecological classification would have been inherently superior. If an ecological classification is taken to be one in which the vegetation types are related to environmental factors and gradients (for example, Austin and Heyligers, 1989) this would have the advantage of encouraging the development of predictive models for the occurrence of particular communities and species. Such a classification and models, while desirable, are considered to be beyond the scope of the present EIS.

It is important to recognise that all classifications are to some extent arbitrary and superimposed on the natural world. There are many alternative classifications and universal agreement on one "true" classification is unlikely. Classifications tend to be hierarchical. That is, broad categories are divided into more specific types which can in turn be further subdivided. In the State Forest system, three major groups (rainforest, wet sclerophyll forest, and dry sclerophyll forest) are each divided into leagues and these in turn into Forest Types. The latter may be considered to be approximately equivalent to an association in the terminology of Beadle and Costin (1952). The use of this term for larger groups on page 72 of the draft EIS was unfortunate. As mentioned, Hager and Benson (1992) have further subdivided some of these types further for conservation assessment purposes.

The problem is to decide what level of detail is appropriate (looked at sufficiently closely, each forest stand will be in some small ways different from any other). The SEPL EIS discussion of flora is based on the belief that the level of detail represented by Forest Types and the Hager and Benson (1992) classification is appropriate at the present time. To make finer distinctions in the recognition of vegetation associations and to advocate their conservation would not be justifiable at this time given the limits to our knowledge of what is already conserved in existing parks and reserves.

Finally, maps of the forest types were not presented in the EIS because the useful level of detail resides with the forest type maps for parts of individual management areas of which there are a great many. Any map which could

have been included in the EIS would have had to be small scale, given the size of the study area, and of limited usefulness.

5.4.2 Conservation Adequacy of Forest Types

In Table 5.6 of the draft EIS, a listing is presented of forest types together with an assessment from Hager and Benson (1992) of their conservation status. This list was based on the SFNSW Forest Types mapped for the study area and listed in the various management plans. Additional vegetation associations were given in submissions by the NPWS and the North East Forest Alliance. While these associations were not mentioned in management plans for the study area, they may be present in areas of limited extent or as part of mapped units of related types. A list of these additional types is given in Appendix 3, Table 2. Also, Appendix 3, Table 3 (an update of the draft EIS Table 9.2 shows a list of types for which the conservation status is given by Hager and Benson (1992) and of which less than 5% of that type is conserved. Hager and Benson (1992) do not give an assessment of conservation status for such types as 115, 116, 119, 128, and 203 which occur mainly outside the study area. The decision has also been made not to include in Appendix 3, Tables 2 and 3 such types as 31 (Paperbark), 32 (Swamp Oak), 107 (Banksia), and 211 (River Oak) which would not be subject to forestry operations.

The NPWS submission outlines various criteria which could be used in assessing conservation adequacy, including the IUCN minimum of 10% of the pre-European extent of any association. It is acknowledged by NPWS that given our present level of understanding we cannot say with certainty what constitutes adequate conservation. Indeed, it is unlikely to be the same for all forest types. The NPWS submission also argues for a conservation minimum of 10% in each of three subregions (north, central, and south). Accordingly, Table 5.6 in the draft EIS has been modified to show in Appendix 3, Table 1 of this Supplement in which subregions the 10% level has not been reached. As will be discussed later in this submission, it is not considered appropriate for SEPL to decide what the conservation policy should be for public lands. It seems clear, however, as indicated in the draft EIS (page 202 and Table 9.2) that priority should be given first of all to types with <1% conservation and secondly to types with <5k% conservation. These types are listed in Appendix 3, Table 3 which is an update of the draft EIS Table 9.2.

5.4.3 Rare Or Threatened Plant Species

A list of rare or threatened plant species was compiled for the draft EIS (Appendix 12). The sources relied upon for this list were management plans and the flora surveys prepared as a preliminary for various management area EIS's. ROTAP searches were requested from NPWS on several occasions but the requested information was not provided. Appendix 12 in the draft EIS and the listing of endangered and vulnerable species abstracted from it (page 203 and Table 9.3) were limited to species known to occur in State forests in the study area.

Information provided by ANCA has enabled this list to be extended and a more complete listing of endangered and vulnerable plant species known to occur in State forests in the study area is presented in Appendix 3, Tables 4 and 5. Further information was also provided by Briggs (1993, in press), NPWS, and

the North East Forest Alliance on endangered and vulnerable species which are likely to occur in the SEPL study area but are not to date known from locations within State forests. These species are listed separately in Appendix 3, Tables 4 and 5.

5.4.4 Conservation Of Plant Species And Forest Types

With regard to endangered and vulnerable plant species the results are summarised in Appendix 3, Tables 4 and 5. There are seven endangered species known to be present in State forests in the study area and a further 22 species present in the study area but not as yet known from locations in State forests. Vulnerable plant species known from state forest locations number 27 and a further 67 species occur in the study area.

The conservation status of forest types is summarised in Appendix 3, Table 3. A total of 34 forest types are estimated to have <1% of their pre-European area in conservation reserves. Twenty of these types are explicitly mapped and discussed in Management Area plans. A further 14 are not mentioned in management plans. Fifteen additional forest types are estimated to have <5% of their pre-European area conserved. Of these 13 are included in management plans and two are not. Forest types may not appear in management plans because of their limited area of occurrence or in some instances they may be present as a part of other mapped units.

It is important to mention the difficulty of knowing how much reliance to place on estimates of conservation status. Most parks and reserves have not been subject to the level of detail of survey and mapping which has been carried out in State forests. While it is possible to argue that in the absence of detailed knowledge it is better to err on the side of too much rather than too little, there may be a high opportunity cost involved in doing this in terms of other uses foregone. Detailed surveys of what forest types are already conserved should be a matter of high priority.

Detailed conservation strategies and proposals for endangered and vulnerable species and poorly conserved forest types on public land are considered to be matters for SFNSW, since they can best deal with these questions in the context of a range of other proposed and ongoing activities in the forests under their management and control. Rather, the draft EIS has tried to present and highlight information useful in the development of a conservation policy such as the aforementioned lists of endangered and vulnerable plant species and of forest types which are considered to be inadequately conserved in terms of area or geographic spread.

With regard to private land the situation is somewhat different. It is suggested that as a general principle areas where populations of endangered or vulnerable species or forest types with <5% of their areas reserved should be avoided. This is particularly desirable if such areas are to be converted to agriculture or other more intensive types of land use after logging. Given the large number of plant species potentially involved and the technical difficulty of identifying these species it is probably unrealistic to expect this can be competently done with the aid of a manual alone. Prior to a decision being made about the acceptability of an area of private land for logging, a botanical survey targeting the listed species, Appendix 3 Tables 4 and 5, and the listed forest types, Appendix 3 Table 3, will be carried out by a qualified botanist in those cases where preliminary discussions with NPWS or ANCA suggest it is necessary.

5.4.5
Impact on Forest Structure

The draft EIS followed Specht (1970) in recognising the main elements of forest structure as tree height and spacing. This is not to ignore epiphytes, understorey and ground cover as also contributing to forest structure. The effects related to these components of the ecosystem were addressed in dealing with the effects on plant species.

As is indicated in the draft EIS, thinnings will be the main source of roundwood for the SEPL operation. Thinning prescriptions will vary with the forest type and the existing stem density at each site. Thus, thinning will vary as a proportion of sawlogs taken and, hence, the incremental impact attributable to the SEPL part of the operation will also vary. Because of this variation it is difficult to be precise about impact. In general, the effect of several thinnings over a rotation will be a more open stand with fewer and younger trees (designated habitat trees and their replacements will, of course, remain). This results from the objectives of stand management: to concentrate growth in stems to be grown to sawlog size and to have adequate but not excessive regeneration to grow on and replace sawlogs taken and to ensure a continuing supply.

The NPWS submission on the draft EIS asserts (Section 3.4) that the SEPL operation will result in a greater number of snig tracks being created and a greater frequency of disturbance. In most situations it is unlikely that there will be an increase in the number of snig tracks required over and above the number normally used in a sawlog only operation. Frequency of disturbance may increase in some instances where sawlog and thinning operations are separated in time such that a second disturbance event interrupts recovery. It is understood that, normally, sawlog and thinning operations will be integrated and occur together.

5.4.6
Impact On Plant Species

Binns (pers. comm. and unpublished ms, 1993) has combined data from 688 logged and unlogged sample plots from flora surveys of management areas in the SEPL study area during 1991-92. These data have been analysed to provide some preliminary answers to two questions:

1. Are there similar numbers of plant species in logged forest compared to unlogged areas?

2. To what extent do the floras of logged and unlogged forests differ?

His findings may be briefly summarised as follows:

1. At the scale of the 0.1 ha plots floristic richness of logged plots was consistently equal to or greater than that of unlogged plots.

2. This was also the case at the broader regional scale though this may have been due to the fact that logged plots sampled a greater range of physical environments than did the unlogged plots.

3. In terms of the presence or absence of particular species, something like 5-10% of the flora present in unlogged areas may be absent from logged areas. Given certain limitations in the sampling and the properties of the

data it is impossible to say with certainty whether these differences are due to the logging itself. Specifically, there may be differences in the physical environments represented in logged and unlogged plots which could account for the presence or absence of certain species. Secondly, there is the problem of species of low frequency of occurrence. The presence or absence of such species could be due to sampling variation alone.

Several broad conclusions are also drawn by Binns from the results of his study:

1. An estimated 25-30% of the total plant species sampled occur primarily or solely within habitats which will be unaffected by logging. This is likely to be conservative because there will be other areas accessible for logging which will be unavailable for other reasons.

2. Logged areas have an important conservation role to play because floristic richness remains high and logging may actually help to maintain disturbance adapted species.

5.4.7 Other Impacts

Effects of Fire

Fire has been a part of the environment of the forests in the study area for a sufficiently long period of time for plant species to have evolved a variety of adaptations to it. The fire regime (frequency, intensity, and season of fire) to which species have adapted, however, is not the same for all forest types. In general the drier forest types will experience fire more frequently than the wetter types. If there are changes of a sufficiently large magnitude to the fire regime (e.g., frequency) normally experienced by a forest type, then a number of changes may take place. Among these are decreases in the population numbers of some species (Clark, 1988) or even elimination of species such as obligate seed regenerators where the interfire period is less than the time required for plants to grow to reproductive maturity (Benson, 1985).

It is acknowledged (Section 7.7) that there may be some increase in the risk of fire as a result of the proposed operation, particularly at a local scale. Since fire can adversely affect timber production, it is in the manager's interest to control fire outbreak. Under these circumstances it is considered unlikely that the incremental increase in fire risk related to the SEPL proposal will be translated into an actual increase in fire frequency sufficiently large and persistent to result in ecosystem changes.

Psillids

Submissions by both the North East Forest Alliance and the Wingham Forest Action group mention the problem of psillid outbreaks particularly in areas of moist forest regeneration. Psillids occur naturally in these forest types as well as more widely in other forest types in NSW. There are natural oscillations in psillid population numbers, however, when outbreaks occur successively over several years extensive tree damage or mortality may result.

It is not understood why an increased frequency of outbreaks should be occurring (Stone, 1991 and pers. comm.). SFNSW has initiated a research program to investigate possible causes. An interaction with Bell Miners has

been postulated but remains unproven. Drought and fire may be implicated; certainly outbreaks seem to be symptomatic of stressed trees. It is not possible to say at this stage whether forestry management practice is leading to more frequent psillid outbreaks or whether the SEPL proposal would in any way contribute to the problem. If outbreaks are symptomatic of stressed trees, the thinning of stands may assist in reducing the problem by relieving stress due to overcrowding in areas which receive this treatment. While anecdotal evidence suggests the problem is becoming more widespread, there are no quantitative data to support this (Stone, pers. comm.).

5.5 Fauna

The major submissions concerning fauna came from the Australian Nature Conservation Agency, the NSW National Parks and Wildlife Service, NEFA/NCEC and Dr H Parnaby. Many of the issues raised in the latter three submissions referred to operations in State forests beyond the scope of the designated sources and indicate a general misunderstanding of the scope and context of the draft EIS. Recommendations in the NPWS submission relate to matters which are the responsibility of the SFNSW or other State authorities and are not dealt with in detail in this Supplement.

5.5.1 Fauna Description and Listings

In this section, references to Appendix 14 are references to Appendix 14 in the draft EIS.

The submission from NPWS draws attention to omissions and inconsistencies in fauna listings for the supply zones in the draft EIS (Sections 5.6, 5.7 & Appendix 14) and criticises the range of sources used to compile the listing.

The list of vertebrate species known or likely to occur in the SEPL study area was derived using existing EISs, Fauna Impact Statements, SFNSW management plans and general texts prepared by experts in their particular fields (including the RAOU Bird Atlas, the definitive text on herpeto fauna by Cogger (1992) and a variety of other general sources).

In general, species were included or excluded in the potential fauna inventory also on the basis of their general habitat requirements. It is not reasonably practicable to review all published research papers the distributions of all of the species which may occur in the SEPL study area. Generally, a relatively conservative view has been adopted so that species which have relevant habitat requirements (for forest features) or which are likely on the basis of general distributional information to dwell within the SEPL supply zones were included. Where species may have occurred at their distributional limits in the vicinity of the SEPL supply zone, closer attention has been paid to their specific habitat requirements. Where possible additional information on distributional data has been investigated to determine whether or not the species is likely to be present. For example the Broad-headed Snake is confined to sandstone habitats around Sydney, with its northern-most record being in the vicinity of Colo. This species, therefore, has been excluded from the inventory (although it is discussed in Appendix 14 - Table 3B, for completeness).

The fauna report for the draft SEPL EIS was prepared on the basis of an ESZ which extended to the north only as far as the Clarence River (Ulmarra Shire).

The section was not part of the original ESZ. Consequently, no consideration of the native fauna which are confined to the part of New South Wales between the Clarence River and the Queensland border was included in the original report. As noted in Section 2.1 above, for the purposes of this Supplement the northern boundary of the ESZ is as shown in Figure 1.1. Consequently, information on native fauna which occur in the Casino, Murwillumbah, Urbenville and Tenterfield Management Areas is not included.

The various inconsistencies and variations in species totals noted by the NPWS have been reviewed and are corrected in this Supplement.

The NPWS Submission (Appendix 3) provides details of the range of native fauna which are considered as occurring in the SEPL supply zones, species which were inadvertently omitted from the original tables in the draft EIS, or species which are considered by the NPWS not to be present within the ESZ. Other species are discussed which are confined to the north-eastern extremity of New South Wales, and only occur in areas to the north of the Clarence River. These species are not relevant to the SEPL proposal.

Responses with respect to the fauna included in Appendix 3 of the NPWS Submission are discussed briefly later in this Supplement. Of the nine points listed in Section 4.1 of the NPWS Submission, the following brief comments apply.

1. The NPWS note that 12 vertebrate species which are included on Schedule 12 of the NPW Act 1974 had been omitted from consideration in the draft EIS. These species have been reviewed, but many of them are specifically relevant to the northern extremity of the ESZ (north of the Clarence River), which is not included in the study area. Therefore, these species are not relevant to this Supplement or the final EIS.

2. Of the additional seven species considered by the NPWS, one had already been considered, two do not occur in the revised ESZ (ie south of the Clarence River), and the remainder have been included (Appendix 4, Table 2).

3. The 19 species considered by the NPWS as not occurring within the boundaries of the SEPL ESZ have been reviewed and corrections made, where relevant (Appendix4, Table 3). Dual listing of a few species due to confusions in nomenclature has been corrected.

4. The definition of forest-dependent fauna species has been somewhat widened and a revised version of Appendix 14 - Table 1 has been prepared, indicating species dependent on forest habitat features. Inconsistencies between the text and Appendix 14 - Table 1 have been corrected. This revised version is at Appendix 4, Table 1.

5. Habitat preferences for the various species in Appendix 14-Table 1 have been reviewed and clarified (Appendix 4, Table 1).

6. The distributional data for endemic or nearly endemic species within the SEPL ESZ have been reviewed, and Appendix 14 - Table 2 has been corrected. The revised information is at Appendix 4, Table 2.

7. The profiles of endangered fauna which are listed in Schedule 12 of the NPW Act 1974 and which are included in Appendix 14 - Table 3B have been reviewed, using additional information from species recovery plans

and other sources of information. In many cases, there are no data to indicate either detailed abundance or specific distributional limits of a species in terms of NSW area, on a regional or local basis. The revised information is at Appendix 4, Table 3B.

8. The use of generalised texts to provide some indication of Australia-wide status distribution and abundance of species is considered appropriate, given that these text have been generated by experts in the various fields. Additionally, the distribution and abundance figures provided in these general texts provide the only objective determination of national status for most species. For many species listed on Schedule 12 of the NPW Act 1974, there is simply no objective or detailed distribution or abundance data available within NSW. It also needs to be noted that the distribution and abundance of fauna in NSW (and the assessment of 'endangeredness') is in many instances an artefact of arbitrary and artificial man-made boundaries. The NSW border does not constitute an ecological boundary for any species.

9. Appendix 14-Table 3B and Appendix 15 have been reviewed and corrected where relevant (Appendix 4, Table 3B).

10. Appendix 14-Table 4 has been reviewed, and species which are dependent on certain attributes of 'old-growth' forests have been supplemented or corrected where appropriate. The revised information is at Appendix 4, Table 4.

11. It should be noted that there will be no harvesting activities conducted in 'old-growth' forests, nor indeed in any forest, specifically and solely for the provision of roundwood to SEPL (see Section 2.1 above). Furthermore, several of the attributes ascribed by the NPWS to 'old-growth' forests are not exclusive to these types of communities. Stable micro-climates occur in rainforests and in many other locations which are not characterised as 'old-growth' forests. High moisture levels are not exclusive to 'old-growth' forests. Dry season and stream flows are not exclusively provided by 'old-growth' forests. The abundance of particular seeds and fruits is likely to be just as high in rainforest which is not to be logged, and in some instances in regrowth forest with a rainforest understorey, as in 'old-growth' forest. In some instances, indeed, these resources may be higher in other forest communities. High levels of nectar, pollen, plant exudates and high nutrient canopy foliage are also not necessarily characteristic of 'old-growth' forest. The vigorous growth associated with regrowth forests and lightly logged forests is likely, in many instances, to provide higher levels of at least some of these attributes than 'old-growth' forests which tend to be dominated by mature trees.

12. The migratory birds included in Tables 5.1 and 5.2 have been reviewed. JAMBA and CAMBA species which are of relevance are included in Appenix 4 Table 5, and additional species have been included in Appendix 4 Table 6.

13. Whilst no specific reference was made to the "potential loss of essential food resources" with regard to "coastal and lower elevation forests of the study area in providing food resources to over-wintering migratory and nomadic nectivorous and insectivorous bird species", it needs to be remembered that the SEPL proposal is not a standard forestry timber harvesting operation. This proposal involves the removal of silvicultural residues from State forests, it does not involve primary logging activities.

As discussed elsewhere, silvicultural thinning through the forests occurs primarily in regrowth forests, and is designed to improve the rate of growth of trees which are retained. It is thus a relatively low intensity activity and is considered unlikely to significantly reduce the food resource for nectivorous and insectivorous bird species. Indeed, in the medium term following the removal of the excess stock of small trees (which would ultimately be competitively excluded anyway), it is considered that the potential for vigorous forest growth provides the likelihood that food and nesting resources for these migratory and nomadic bird species will be enhanced rather than reduced.

In its submission, NEFA/NCEC referred to claimed deficiencies in the listing and description of a number of fauna groups in the draft EIS.

- INVERTEBRATES
  The information available at present on the invertebrates of the native forests of Australia is totally inadequate to consider this group in any detail. Conservation of the native invertebrate fauna relies on the mosaic of reserved lands and of various management practices throughout the forests of Australia. This approach is the responsibility of the NPWS and SFNSW.

- AMPHIBIANS
  The amphibian fauna of the ESZ has been described in the draft EIS, and all the relevant species are considered in Appendix 14. The SEPL draft EIS does not rely solely on the Grafton-Casino and Wingham EISs (as implied by NEFA/NCEC). The claim by NEFA/NCEC that "there is no attempt to identify those species of restricted distribution" in the draft EIS is incorrect (see Appendix 14).

  Tortoises are not amphibians.

- REPTILES
  The reptile fauna of the ESZ has been described in the draft EIS, and all the relevant species are considered in the amended Appendix 14.

- Birds and mammals have also been considered in detail in the SEPL draft EIS.

The assertion by NEFA/NCEC that the Draft SEPL EIS, in discussing wildlife corridors, "displays its ignorance of ecology" is inaccurate. This type of comment clearly illustrates the bias of the NEFA/NCEC submission, and reinforces doubts about the credibility of many other emotive claims made throughout the document. The draft EIS does not suggest, as is claimed, that "forest dependent frogs, reptiles, mammals and many invertebrates are able to disperse as effectively as birds". The relevant comment in the draft EIS is that species other than the rainforest pigeons are likely to be able to utilise scattered rainforest and other remnants. A number of bird species and the megachiropteran bats certainly are relevant in this regard.

The attacks on the NPWS in the NEFA/NCEC same section of the submission are inaccurate. Furthermore, they are of no relevance to the SEPL proposal.

The NEFA/NCEC submission claims that the SEPL operation is likely to disrupt "animal corridors". The SEPL operations addressed in the draft EIS involve the salvage of silvicultural residue from State forests, not primary logging operations. These activities are to be conducted in a scattered mosaic within

expansive tracts of native forest. It seems unlikely that silvicultural operations in previously logged forest or forest areas currently being logged for another purpose, scattered throughout the State forests, will seriously disrupt animal movement corridors.

A submission from NSW Fisheries pointed out that the statement in the draft EIS (Summary, p vii and Section 5.4.3, p71) that the trout cod (*Maccullochella macquariensis*) is found in the Richmond River is incorrect. This endangered fish species is not found in that river or any eastern drainage and is not present or expected to be present in the supply zone.

5.5.2 Habitat and Hollow-bearing Trees

The submissions from ANCA, Parnaby and NPWS point out the importance of habitat trees in providing important refuge and nest hollows for a variety of animals. Habitat trees and hollow-bearing trees are recognised as being of considerable importance to native fauna generally and are of concern with respect to endangered fauna in particular. The retention of hollow-bearing trees is a standard prescription for State forest operations in NSW, as discussed in detail through the draft EIS for the SEPL proposal, and in the EISs being prepared for SFNSW. Additionally, it is recognised in SFNSW protocols that there is a requirement for the retention of trees on harvesting compartments to provide for the recruitment of new habitat trees to replace older specimens as they die and fall to the forest floor. Recent determinations by the State Minister for Planning under section 9 of the TI(P) Act, e.g. for the Wingham FMA (Minister for Planning 1993) and for the Kempsey Wauchope FMA (Minister for Planning 1994), contain conditions:

- specifying a minimum number of habitat trees to be retained per hectare in specified forest types,
- the retention of sufficient habitat recruitment trees to maintain the required density of habitat trees in perpetuity, and
- the retention and protection of clusters of vegetation about habitat trees, including understorey layers and ground logs present before harvesting.

ANCA also notes that recent observations "indicate that the retention of recruitment habitat trees may not have been adequately planned for in at least some State forest areas". It is not clear whether these comments apply to the forests of the north-east of NSW or perhaps to those of south-eastern NSW, where this criticism has been applied in the past. In any case, the retention both of habitat trees and of adequate recruitment trees to replace them, is an issue for SFNSW and their harvesting protocols throughout the State forests of NSW. These protocols are relevant both for areas which are to be harvested primarily for sawlogs and for silvicultural operations, although it must be reiterated that most silvicultural operations are conducted in regrowth or planted forest (ie in forest which has already been disturbed). It should also be noted that the SFNSW frequently retains considerably higher numbers of hollow-bearing trees than the minimum numbers required (Fanning 1993; Smith *et al* 1992).

Thinning operations will largely involve the removal of small trees to promote both growth rates and size increases of retained trees. This process will therefore not significantly reduce either the number of tree-hollows or the number of potential recruitment trees for habitat for native fauna. On the other

hand, where 'cull trees' are to be removed these may contain tree-hollows, the removal of which will reduce the availability of this resource for hollow dependent fauna. Again, the protocols for retention of suitable numbers of hollow-bearing trees and an adequate supply of mature trees to replace them which are to be applied with respect to the removal of 'cull trees' are the responsibility of SFNSW in conjunction with the requirements of the planning legislation. It is not the role of SEPL to impose protocols on State forest operations.

The draft SEPL EIS discusses the fauna and fauna habitats of the study area, and considers the potential impacts of silvicultural operations on fauna by reviewing the impacts of intensive harvesting operations. Parnaby notes that the EIS "does not provide detailed data specifically on impacts of harvesting silvicultural residue", but then states that "the potential impacts of such harvesting on fauna has not been studied". It is for this reason that the impacts of standard harvesting on native fauna are used to assess the relative impacts likely from the salvage of silvicultural residue.

The ANCA Submission seeks justification for statements in the draft EIS that 'cull trees' are the only designated source of roundwood likely to contain hollows suitable for native fauna and that the population viability consequences of removing some of these hollows will be minor. It is noted by ANCA that the degree of impact involved in removal of hollow-bearing trees as 'cull trees' will depend "on what proportion of hollow bearing trees was to be removed". Parnaby goes further, claiming that proposal "will lead to local extinctions and local population declines for many hollow dependent fauna".

ANCA's comment concerning the degree of impact is acknowledged. However, Parnaby's claim is not accepted, since the larger part silvicultural residue which will be obtained from the State forests will consist of relatively small young trees, which do not support hollows. As discussed above, and as noted in the draft EIS, the relevant protocols for these silvicultural operations with respect to retention both of habitat trees and of recruitment trees to replace them, will be imposed by SFNSW.

With regard to cull trees being the only designated source likely to contain suitable hollows, the other dedicated source from State forests (thinning in regrowth or plantations) consists predominantly of the removal of young trees involving the felling of suppressed and smaller co-dominant trees, none of which are likely to have reached an age where they can be expected to have produced significant hollows. Thinning is unlikely to be undertaken in regrowth areas over 40 years of age because of diminished benefits in enhancement of productivity compared with younger regrowth.

It is noted by NPWS that there are portions of regrowth forest throughout the LSZ where "critical habitat components (such as tree hollows) are approaching or have dropped below minimum retention levels". While this phenomenon is the responsibility of SFNSW, and is in no way under the control of SEPL., the roundwood which would be removed from regrowth forests for supply to SEPL will be the younger suppressed and co-dominant stems removed to increase growth rates of the retained stems. This will not affect the number of existing hollow bearing trees or recruitment of future replacements. As evidenced by the Minister for Planning's determination for the Wingham Management Area (Minister for Planning 1993), prescriptions for maintaining numbers of habitat and recruitment trees are included in the conditions applied to native forest harvesting following the assessment of the EISs prepared by SFNSW.

The NPWS suggests that the most effective mitigation measure in relation to impacts on old growth values would be to exclude cull tree operations from the proposal. Exclusion of the use of culls would reduce the opportunities SFNSW will have to improve the productivity of areas, which will be logged anyway, to meet future sawn timber needs. It would also continue the situation of an economic resource being burned or wasted. Given that no logging in 'old-growth' forest will be conducted in order merely to supply the SEPL proposal and that protocols to ensure the retention of an adequate supply of habitat trees as well as the other features of 'old-growth' forest are being prescribed and implemented through the planning process, it seems unlikely that a significant additional adverse impact in a regional sense will occur as a result of the use of 'cull trees'.

5.5.3 Additional Impacts due to Proposal

ANCA questions a statement said to be in Section 7.5.5 of the draft EIS that "The harvesting of designated sources of roundwood from SFNSW operations which are primarily designed to extract sawlogs will involve only marginal additional impact for native fauna." In fact the statement refers to "designated sources of roundwood from State forests which are already managed by silvicultural treatment", ie regrowth areas and plantations. NPWS also expressed similar concerns about statements in the draft EIS that the SEPL project will have minimal impact on fauna because it targets younger wood in preference to culls. As has been discussed elsewhere in the draft EIS and this supplement, the additional SEPL roundwood resource will primarily be small and young trees, not large older trees. At locations where integrated sawlog/cull operations are proceeding (generally in old growth forest), it is considered that little additional impact on understorey or other features of the forest will be imposed by the extra traffic and timber movements required to remove the roundwood material.

However, in the case of thinning in regrowth forest which has been previously logged for sawlogs or in plantations, the volume of pulpwood will exceed the volume of sawlogs extracted and the silvicultural operation will be the primary source of impact, as noted by the ANCA. This disturbance, (ie the silvicultural operations) is primarily intended to provide an outcome with regard to forest structure with the provision of roundwood for SEPL. being a secondary outcome.

As discussed in detail elsewhere in this Supplement and in the draft EIS, thinning operations are designed primarily to remove a proportion of young trees in regrowth forest in order to promote the rate of growth of the retained trees (those seen as of particular potential value for sawlogs or as future habitat trees). A silvicultural operation in regrowth forest will involve the re-opening of existing and past tracks through the forest, and logging operations to remove a proportion of the small trees to enable the retained trees to increase in growth rate. There will be a consequent mechanical damage to understorey vegetation, and in some instances the removal of 'cull trees' (ie old defective trees), although this will be limited by habitat tree retention and protection requirements.

In terms of relative impacts upon native fauna and fauna habitat features in State forests, it is clear that the initial sawlog operation (which removes a substantial proportion of the mature trees of the forest and involves the initial disturbance to understorey vegetation and soil) is the primary contributor to a reduction in fauna habitat value. By comparison, silvicultural operations are conducted in areas which have already been or are currently being subject to

these disturbances and predominantly involve the removal of a proportion of trees which are of relative low value for native fauna (compared to habitat trees) and, as noted elsewhere in this report and in the draft EIS, many of which would eventually be competitively excluded.

Thus, silvicultural operations are generally imposed upon an already disturbed forest, not on undisturbed 'old-growth' forest and any impacts on native fauna will involve impacts on already disturbed communities and ecosystems. However, by virtue of increasing the rates of tree growth and reducing the densities of small trees through the forests, silvicultural treatments have the potential to improve habitat quality, at least in respect of certain high-value, low-density habitat features (such as 'tree-hollow' density, large tree boles, decorticating bark, understorey density and ultimately canopy). Also, it is considered likely that silvicultural operations which remove a proportion of competition between trees in regrowth forests will release the more vigorous trees for more rapid growth and may thereby favour some of the other features of value to certain fauna species, e.g. structural and floristic diversity, abundance of nectar, pollen and plant exudates and high nutrient levels in canopy foliage.

Provided that adequate habitat trees (and future recruits) are retained and protected, that the minimum area required to be disturbed for satisfactory silvicultural outcomes is established and that silvicultural operations are not uniformly imposed over broad tracts of forest (but rather implemented in a mosaic pattern in both temporal and spatial terms through State forests), it is suggested that the impacts of the supply of silvicultural residues as roundwood for SEPL will be relatively limited.

The NPWS submission criticises the decision not to include discussion in the draft EIS of the impacts on native fauna of forest operations in general and the reliance on SFNSW EISs for assessment of this aspect. It also makes similar comments in relation to the mitigation of impacts on fauna..

As discussed in Sections 2.1 and 2.2, this EIS is not intended to be a complete evaluation and justification for forest operations in general in north-east NSW but concentrates on the additional impacts of obtaining pulpwood from the designated sources. Section 2.4.3 discusses the reasons for relying on the SFNSW EISs.

The draft SEPL EIS uses the information which has been gathered for the State forest EISs to assess the likely or potential impacts of silvicultural thinning operations on the fauna in this area. These EISs, notwithstanding their alleged deficiencies, provide more detailed consideration of the impacts of logging operations than most other previous surveys in north-eastern NSW. These and other published research findings on the impacts of timber harvesting on native fauna have been used to consider the potential impact of the SEPL proposal on native fauna in the supply zones. It must be recognised however, that the SEPL operations will be of substantially less intensity than normal saw log harvesting operations.

NPWS also criticises the reliance on the SFNSW EISs for several reasons:

- they do not assess the "cumulative impact of more than doubling the current extraction of roundwood from north east forests in NSW".

- they do not examine the impacts on increased pressure on sensitive species from greater simplification of forest ecosystems and increased disturbance to various components of the forest structure or the impacts on fauna of "concentrating operations in the LSZ".

The State EISs assess the effects of the proposed management of State forests including the effects of harvesting wood products. Taken together, they will provide a cumulative picture of forest operations across all the SFNSW Management Areas in the supply zone. While SEPL would dispute the notion that the SEPL proposal represents a doubling of roundwood removals, and therefore impacts, from the north-east forests of NSW (all wood removals, including sawlogs, are in the form of roundwood but the end use varies according to piece size and quality), there will be additional impacts from the proposed increase in roundwood removal for the supply of chips to SEPL. These additional impacts are discussed in Section 2.2 and, where appropriate, in the relevant fauna, flora or other section.

Parnaby also criticises the draft EIS for reliance on SFNSW EISs the stating that it does not give a regional perspective. Since there are no specific data on the potential impacts of removal of silvicultural residues known from the SEPL study area, the draft EIS has relied substantially on discussion of the impacts of standard timber harvesting on native fauna, including data collected for the SFNSW EISs and FISs and has attempted to relate those data to the substantially less intensive silvicultural operations.

In taking this approach, the Draft SEPL EIS does provide a regional perspective on the proposed operations. Given the size of the study area, it is impossible not to provide a regional perspective. The draft EIS and the SEPL Proposal rely substantially on the assessment of forestry impacts over several SFNSW Management Areas, and the draft EIS integrates the effects of the proposal over a very considerable area. The draft EIS discusses the requirements for forest management in a temporal and spatial mosaic, and discusses regional issues such as wildlife corridors, migration 'corridors', the retention of sufficient resources (high densities of tree-hollows, large logs etc), and the regional extent of conserved and protected forest throughout the landscape.

NPWS advises that the cumulative effect referred to may require SEPL to seek further licensing under the provisions of Section 92 of the NPW Act. While SEPL will seek whatever licences it is required to under legislation, it is pointed out that all operations on State forests are subject to the control and direction of SFNSW, which specifies the location of work (including areas from which felling is excluded), the access routes to and from the location, the intensity of harvesting, the trees to be felled and those to be retained, the utilisation standards of the logs produced and the specifications of environment protection measures to be adopted. It would appear, therefore, that it will be SFNSW which may require further licensing from the NPWS, rather than SEPL. With respect to private property logging operations, it is noted in the draft EIS and re-iterated in this Supplement, that SEPL requires detailed fauna assessments including, where necessary, the preparation of FISs, as required under the EF(IP) Act as part of its pre-logging investigations.

With respect to silvicultural operations in regrowth forests and plantations, the activity, as discussed elsewhere in this report, involves the removal of a proportion of trees in a stand of regrowth forest and their 'salvage' as roundwood for woodchips. These are essentially trees which would be lost to the forest system in the long run as a result of competitive exclusion by the more vigorous trees in the forest canopy. Rather than contributing to a "greater simplification of

forest ecosystems", it is suggested that the removal of excessive trees (which would die anyway) and the increased rate of growth of the remaining trees, as well as a level of opening up of the understorey and midstorey through the forest, may promote forest complexity rather than reduce it in the medium to longer term (ie beyond 3 to 5 years after silvicultural treatment). The levels of disturbance to canopy, understorey, groundcover and litter layers are discussed in the draft SEPL EIS, and (as considered elsewhere) are regarded as of relatively limited significance compared to the original disturbance resulting from sawlog operations. Canopy disturbance will be temporary, given that the retained trees are the most vigorous specimens, which will fill in any canopy openings that occur as a result of thinning operations.

Some submissions expressed the fear that thinning to produce pulpwood could lead to the management of regrowth and plantations on short pulpwood rotations. All SFNSW forest planning and management in the region is based on the production of quality sawlogs over a long rotation and the thinning operations referred to in this EIS are planned to achieve this objective.

Disturbance to understorey and groundcover in silvicultural thinning operations will involve the temporary disturbance related to the use of machinery for removal of the excess tree stock. This again is considered likely to be a temporary effect, and will not be of the same intensity as understorey disturbance during the original sawlog operations. Indeed, given that these operations are to occur in regrowth forests, the fact that understorey and groundcover have regenerated demonstrates recovery after disturbance. With respect to litter layers, the felling of a proportion of the trees for silvicultural purposes will result in an increase in the supply of small tree heads, leaves and branches, which will contribute to litter layers through the forest. As there is no requirement for post-logging burns to stimulate tree growth following silvicultural activities, the quantity of litter layer is likely to increase rather than decrease as a result of silvicultural operations.

The NPWS submission also advises that prescriptions proposed to mitigate effects on endangered (schedule 12) and other sensitive species have been designed to cater for current forest management practices where virtually no removal of culls occurs. As discussed elsewhere, both in the draft EIS and this Supplement, SEPLs preference is for younger material than is provided in culls and the majority of the likely increase in roundwood to be taken will be from regrowth forests and plantations. However, if market conditions enable the maximum licenced export level of 500 000 tonnes per year to be achieved, the increased volume will need to include larger volumes of wood from culls. The setting of prescriptions to mitigate the effects of forest operations in State forests is a matter for State authorities, however, not SEPL or other purchasers of wood from State forests. Operations providing roundwood for supply of wood chips to SEPL will have to comply with whatever prescriptions are in force in the areas in which they work.

NPWS criticises the inclusion of woodland in the description of fauna habitats in Section 5.6.2 of the draft EIS. This forest type was included for completeness sake and is not an indication that SEPL will intentionally target any material from these communities. Woodlands generally are of relatively low productivity in terms of timber resources, and with the exception of the clearing of private property for agricultural purposes, practically no activity would take place in this type of habitat on public lands. On the other hand, on private properties where woodland is being cleared anyway, there seems little point in permitting potential roundwood material to simply be stockpiled and burned. This approach has the

potential to reduce the requirement for roundwood material from potentially more sensitive habitats, such as high fauna value forest communities.

The NEFA/NCEC submission claimed, in the summary, that the draft EIS misrepresented the national significance of the fauna of north-east NSW. No discussion of the claim or evidence for it is given in the body of the submission

The NEFA/NCEC submission asserts that the draft EIS is "subjective and uncredible [sic]", because of "the claim that roads are immaterial in facilitating the ingress of feral predators". In the first instance, the EIS makes no such claim. Second, the alleged 'support' for the NEFA/NCEC attitude (in the two following paragraphs) does not substantiate the contention that roads are required for feral predators to enter forest areas. The SEPL proposal does not involve the specific introduction of roads into previously unroaded areas being concerned with the use of silvicultural residue, primarily from previously logged regrowth forest or from standard logging operations. In either case, no additional roading will be required.

5.5.4
Schedule 1 to ESP Act - Endangered and Vulnerable Species

Individual species

A list of vertebrates included on Schedule 1 (endangered and vulnerable) of the ESP Act is included in the ANCA Submission to the draft EIS. The relevance of the SEPL proposal, ie the operations to obtain roundwood from designated sources for the supply of chips to SEPL, for the conservation of each of these species is discussed in some detail below. Most of the relevant species were considered in the draft EIS. All of the species, except for the Eastern Freshwater Cod, are also listed in Schedule 12 of the NPW Act.

Eastern Freshwater Cod *Maccullochella sp.*
This is an endangered species (as noted by ANCA), and the reasons for its decline are regarded as including "habitat degradation through loss of riparian native vegetation and increased catchment erosion and siltation". This species occurs in the tributaries of the Richmond and Clarence Rivers in north-east NSW, and occurs only in the northern extremity of the ESZ.

Features of the SEPL proposal which are relevant to the conservation of the Eastern Freshwater Cod are associated with the relatively low intensity of silvicultural operations, and the consequent low likelihood of significant increases in catchment erosion and siltation (see draft EIS and Sections 5.3.1 and 5.3.3 above). Additionally, silvicultural operations in State forests will not involve any clearing of native riparian vegetation along significant streams. On private property operations, SEPL imposes a protection zone along riparian corridors (see draft EIS). Consequently, it would appear unlikely that significant adverse impacts will be imposed upon the Eastern Freshwater Cod by the proposed SEPL operations.

Broad-headed Snake *Hoplocephalus bungaroides*
The Broad-headed Snake is an endangered species, and is included on both Schedule 1 of the ESP Act and the EF(IP) Act. This species is restricted to the Sydney area, and is noted as occurring from Colo (north of Sydney) to Nowra in the south. It apparently does not occur within the SEPL supply zones, including the ESZ (the Action Plan for Australian Reptiles - Cogger *et al* 1993), although the northern limit of its distribution approaches the southern boundary of the

ESZ. Consequently, the SEPL proposal is of no relevance to the conservation of the Broad-headed Snake.

Eastern Bristlebird *Dasyornis brachypterus*

The Eastern Bristlebird inhabits woodland vegetation with a grass tussock or heath understorey, and areas of open forest woodland with grass tussocks, generally close to rainforest which provides a fire refuge (Garnett 1992). This species could potentially be affected by silvicultural operations in State forests. The SFNSW fauna surveys for logging operations will identify areas of the Eastern Bristlebird, and impose strict protocols to avoid impacts of this species. Where relevant, it would be appropriate for silvicultural operations which provide roundwood material for SEPL to avoid Eastern Bristlebird sites or, if relevant, for SEPL to contribute to 'recovery plans' for this species.

Red Goshawk *Erythrotriorchis radiatus*

The Red Goshawk inhabits tropical to warm temperate well watered forests and woodland in northern and eastern Australia, and is found only in the very northern extremity of the ESZ. Garnett (1992) notes that the species is extremely endangered, and that the reasons for its decline are related to the clearing of forests for agriculture, and potentially to other activities such as changes to fire regimes, egg collection and shooting. There is no evidence to indicate that forestry operations impose significant adverse impacts on this species.

It appears unlikely that silvicultural operations in State forests would impose adverse impacts on this species, and thus 'recovery plans' in these circumstances do not appear warranted. Where significant clearing of forests on private property is proposed in areas potentially containing this species SEPL will ensure that surveys target the species and will avoid this source of roundwood at known locations of the Red Goshawk.

Swift Parrot *Lathamus discolor*

The Swift Parrot occurs along the Great Dividing Range throughout eastern Australia, although it breeds only in Tasmania. It is a forest-dependent species which requires flowering eucalypts and an abundance of nectar as a food source. Reasons for the decline of the Swift Parrot (Garnett 1992) include the clearing of feeding resources and breeding trees for agriculture and the harvesting of eucalypts for woodchips and sawlogs (particularly in Tasmania where the bird breeds, and in Victoria and south-east NSW). With respect to the south-east forests of NSW and Victoria, Garnett proposes modified timber harvesting practices for retention of the box-ironbark open forests in which the Swift Parrot is recorded. However, these harvesting operations are substantially more intensive than those conducted in north-eastern NSW. It should also be noted that Garnet (1992) suggests the possible use of "judicious thinning" (ie silviculture) to enhance habitat for the Swift Parrot in south-eastern NSW and Victoria.

Coxens Fig Parrot *Psittaculirostris diophthalma*

Coxens Fig Parrot has been recorded on only two occasions within the SEPL supply zones (in the ESZ). The draft EIS indicated the ESZ as extending north to the Queensland border. However, for the purposes this final EIS, the northern boundary of the ESZ is as shown in Figure X2, ie it now extends only as far north as approximately the Clarence River . The Coxens Fig Parrot occurs predominantly to the north of this area, and the species has been recorded only twice within a few months at one coastal location in the Central Coast NSW (NPWS data). As this appears to be an isolated episode, it is

considered unlikely that there would be any adverse impact on Coxens Fig Parrot from the proposed SEPL operations.

The Black-breasted Button-quail *Turnix melanogaster*
As for Coxens Fig Parrot, the Black-breasted Button-quail is restricted in its distribution in NSW essentially to the far north, near the border with Queensland. It thus lies outside the modified ESZ, and is of no relevance to the SEPL proposal.

Regent Honeyeater *Xanthomyza phrygia*
The Regent Honeyeater is regarded as an endangered species (Garnett 1992). It inhabits temperate eucalypt woodland and open forest but also occurs in woodland areas, in farmland, in urban areas containing mature eucalypts and along forest edges. It has a particular association with ironbark and box eucalypts, although it also occurs in riparian forests with Swamp Mahogany and River Oak.

The reasons for the decline of the Regent Honeyeater (as for many other bird species) appear to principally include habitat destruction and fragmentation as a result of forest and woodland clearing for agriculture. Other speculative impacts on the conservation status of this species include harvesting of timber for firewood and fence posts, eucalypt dieback, and declines in habitat quality and habitat regeneration as a result of grazing.

The majority of management actions which are considered by Garnett (1992) for the security of the Regent Honeyeater involve appropriate management of resources and habitat on private lands in south-eastern NSW and in Victoria. Modification to timber harvesting practices, and burning and grazing, to permit retention and regeneration of mature box/ironbark open forests on the inland slopes of the Great Dividing Range is also considered appropriate. Generally speaking, it would appear that silvicultural operations in north-eastern NSW are unlikely to pose significant adverse impacts on the Regent Honeyeater. However, any protocols for conservation of the Regent Honeyeater involving the SFNSW will be adhered to

As for the Red Goshawk, pre-harvesting fauna surveys on private property operations which are proposed to supply roundwood material to SEPL should involve specific searches for the Regent Honeyeater, where suitable habitat is located. At sites where this species is found to be present in potential roundwood sources, SEPL will avoid obtaining material from these locations, or contribute to the generation of 'recovery plans' for the Regent Honeyeater.

Eastern Quoll *Dasyurus viverrinus*
The Eastern Quoll is considered by NPWS to be extinct in north-eastern NSW. There have been no confirmed records of this species from mainland Australia for some time, and despite the highly intensive and extensive fauna surveys conducted over the last few years in north-eastern NSW, both by the SFNSW and for the NPWS, no further sightings of this species have occurred. As a consequence, SEPL operations will have no adverse impact upon the conservation status of the Eastern Quoll and 'recovery plans' for this species are not relevant to the SEPL proposal.

Brush-tailed Rock-wallaby *Petrogale penicillata*
The Brush-tailed Rock-wallaby is considered vulnerable (Kennedy 1992). This species occurs essentially along the Great Dividing Range from south-eastern Queensland into central Victoria, but has contracted significantly in range and appears still to be declining. It inhabits rock piles, steep cliffs, boulder scree

slopes and rock outcrops, usually with a cover of some shrubland or stunted trees. Reasons for the decline of the Brush-tailed Rock-wallaby include predation by foxes, and may also include changes in fire regimes, and competition with domestic and feral herbivores (particularly goats). Standard forestry operations do not appear to have contributed significantly, or at all, to the decline of the species.

It is considered entirely unlikely that the SEPL proposal will have any adverse impact upon the conservation of Brush-tailed Rock-wallabies. Indeed, the opening up of the forest understorey by silvicultural operations in proximity to populations of the species may potentially increase the food resource for this species.

Hastings River Mouse *Pseudomys oralis*

The Hastings River Mouse occurs in eastern NSW and south-eastern Queensland, with populations substantially concentrated through the SEPL supply zones. This species is regarded as nationally endangered, and is currently the subject of detailed investigation by ANCA and the NPWS. The Hastings River Mouse recovery team involves representatives of SFNSW and surveys throughout State forest areas are conducted in likely or known Hastings River Mouse habitats prior to harvesting operations. Specific protocols are in place or are implemented at potential Hastings River Mouse sites by SFNSW throughout their forestry activities. Thus, SFNSW are implementing the appropriate survey and research, and implementing 'recovery management plans' for the Hasting River Mouse.

Silvicultural operations will not be initiated by SFNSW in habitat appropriate to this species, and it is considered unlikely that the SEPL proposal will involve any impact upon this species or its conservation throughout the State forests of NSW. As for private property which may be subject to clearing or timber harvesting activities supplying roundwood to SEPL, the Hastings River Mouse will be targeted as a species or a potential species at appropriate locations. Appropriate detailed fauna survey techniques will be implemented where appropriate to test for the presence of this species. Where surveys indicate there may be adverse effects on a population of this species, SEPL will avoid obtaining material from these locations, or contribute to 'recovery management plans'. It is noted that ANCA advises that the implementation of new and changing management prescriptions for the Hastings River Mouse are likely, as recommended by the recovery team.

General Issues

As noted above, the SFNSW EIS program will continue until suitable and adequate EISs are prepared for forestry operations through the State forests of north-eastern NSW and SEPL will not be able to source any roundwood from State forest areas not available for cutting prior to the satisfactory completion of EISs and FISs. ANCA recommends that future FISs for State forest operations consider fish species (which are included in Schedule 1 of the ESP Act). However, these FISs are prepared on behalf of SFNSW, not SEPL, and are created under the New South Wales EF(IP) Act (fish are not considered in this legislation). Nevertheless, fauna surveys and assessments for potential operations in the NSW State forests, as well as on private property, could readily include consideration of the Eastern Freshwater Cod, where relevant.

ANCA also makes the point that the ESP Act protects plants to the same extent as animals whereas NSW legislation does not, other than through reservation. However, it should be noted that conditions being applied to logging operations

in State forests through approvals under section 9(1) of the TI(IP) Act (Minister for Planning.1994), include requirements for pre-logging surveys to identify poorly known, rare, vulnerable or endangered plant species and for their protection where necessary.

5.6 Rare, Threatened or Endangered Species

Issues dealing with individual species and with species listing have been discussed above in the relevant sections of this chapter.

Both Commonwealth and State legislation concerning endangered, vulnerable, rare or threatened species or ecological communities applies to the operations to supply roundwood to SEPL..

- The Endangered Species Protection Act 1992 (Commonwealth) requires Ministers and agencies to consider the implications of their decisions on plant or animal species or on ecological communities listed in a schedule attached to the Act. The Act requires surveys to be undertaken and, where appropriate, species recovery plans to be prepared. It applies to the SEPL proposal because of the need for approval, under the Export Control Act 1982, to export woodchips.

- The National Parks and Wildlife Act 1974 (NSW) prohibits the taking and killing of protected fauna (s98) and endangered fauna (s99) listed in a schedule to the Act. A licence or authority to take or kill protected or endangered species may be issued under s120 of the Act.

- The Endangered Fauna (Interim Protection) Act 1991 (NSW) amended other legislation so that, where activities are likely to significantly affect endangered fauna, an FIS can be required. This would be prepared with an EIS if such is required by planning legislation or separately with an application for a s120 licence under the NPW Act if no EIS is required.

The Australian Nature Conservation Agency drew attention in its submission to incorrect statements in the Summary of the draft EIS concerning ways in which the obligations of the Minister for Resources under the ESP Act may be met with regard to the SEPL proposal. Several protocols are relevant to forests which are to supply roundwood material for the SEPL proposal and each will be applied where appropriate.

In the case of operations on private property (as noted in the draft EIS), an assessment of environmental impacts, including assessment of the potential impacts on native flora and fauna, is conducted for each individual operation. This assessment is used by SEPL, inter alia, in determining whether or not roundwood will be sourced from that location, and this determination relies heavily on the assessment of impacts on native species. Where a pre-logging assessment indicates there will be an adverse effect on a rare or endangered species, SEPL will not proceed to obtain roundwood from that location other than in accordance with an approved recovery plan or licence under NSW legislation, whichever is appropriate.

Information on species obtained from the pre-logging assessment will provide the basis for decisions on whether logging will proceed at all and, if it does, the extent to which action under the Commonwealth ESP Act, the State EF(IP) Act or both is required. Fauna Impact Statements and Section 120 licences, as

required under State legislation, are and will continue to be obtained where relevant for private property operations. In cases where it is likely either of these requirements will be necessary, ANCA will be consulted prior to such a pre-logging survey being carried out to ensure that the requirements of the ESP Act, if any, are met at the same time.

For operations on State forests, the responsibility for conducting the assessments of impacts on native flora and fauna and for obtaining Section 120 licences lies with SFNSW rather than with SEPL. Nevertheless, SEPL, as the company requiring Commonwealth approval for export, will be responsible for action necessary to meet any requirements under the ESP Act, including consideration of species or communities included on Schedule 1 of the Act and contributing to the preparation of species 'recovery plans' when required under the Commonwealth legislation.

The ANCA submission draws attention to SEPL's responsibilities under the ESP Act with the statement "To meet the requirements of the ESP Act, SEPL must ensure that those operations for which it has been designated do not threaten with extinction, or significantly impede the recovery of, a species or ecological community listed under this Act."

As noted above, as the company requiring Commonwealth approval for export, SEPL will be responsible for action necessary to meet any requirements under the ESP Act relating to operations supplying it with roundwood or woodchips. The commitment given by SEPL above regarding pre-logging assessments is also relevant. However, the point needs to be made that it is the land owner in the case of private land or the managing agency in the case of public land that decides whether or not a particular operation will proceed and in what manner, irrespective of whether SEPL participates or not..

ANCA recommends that, to assist in meeting its responsibilities under the ESP Act, SEPL should consult State conservation agencies, SFNSW and ANCA to determine whether listed species or ecological communities occur in the vicinity of proposed logging operations in State forests which will supply roundwood for SEPL chips. SFNSW will continue to conduct EISs and fauna/flora surveys throughout the State forests, and appropriate surveys will have been conducted at relevant locations for endangered species (as listed both on Schedule 1 of the ESP Act and on Schedule 12 of the NPW Act) as part of the SFNSW EIS process.

It should also be noted that recent determinations by the Minister for Planning under the TI(IP) Act (Minister for Planning 1993 and 1994) have included conditions to protect rare and endangered species, significant plant communities and poorly known and sensitive species. It can confidently be expected that determinations made after the completion of the remaining SFNSW EISs will contain similar conditions. Logging in State forests will be subject these conditions.

For State forests, SEPL will seek periodic discussions with SFNSW to establish the locations in which its suppliers of roundwood will be required to work in the next one to two years. NPWS and other State conservation agencies, SFNSW and ANCA will be consulted on the results of fauna and vegetation surveys undertaken by SFNSW for those locations and on any action necessary to be taken or being taken to meet the requirements of the ESP, EF(IP) or NPW Acts. The outcome of these consultations and action taken under the relevant legislation would be advised to DPIE for export licencing purposes.

For private property, it appears that the practice of individual property assessments as part of the approval process all operations will need to continue, at least for the time being. Private property operations involving provision of roundwood to SEPL or its suppliers are already subject to detailed pre-logging assessments and FISs where appropriate. As noted above, where a pre-logging assessment indicates there will be an adverse effect on a rare or endangered species, SEPL will not proceed to obtain roundwood from that location other than in accordance with an approved recovery plan or licence under NSW legislation, whichever is appropriate. Nevertheless, it must be re-iterated that operations on private lands and in State forests are not primarily designed to provide roundwood material for SEPL and may still proceed irrespective of SEPL participation.

5.7 Private Property

5.7.1 Overview

Scope and Extent of Proposed Private Property Operations

The impacts of private property operations has been the subject of many comments in the public submissions. In order to place these comments and the following discussion of the points raised in the submissions in their proper context, it is appropriate to review again the scope and extent of the proposed operations for removing roundwood from private lands for supply of chips to SEPL.

SEPL expects roundwood to be available from two private land sources:

- Logging of land managed by the land owner for long term production of wood either as well stocked native forest or as wider spaced agroforestry, and

- Land being cleared by the landowner for conversion to pasture or other agricultural use.

The respective impacts of each source are discussed separately below.

Many submissions seem to overlook the relatively small amount of roundwood proposed to be accepted from these sources and the relatively widespread nature of these private property operations in time and space and, therefore, overestimate or misunderstand the potential impacts.

The quantity of roundwood to be obtained annually from private property sources can vary by plus or minus 25% about the average of 10 000 tonnes referred to in the draft EIS (p58). This variation is necessary to meet seasonal logging conditions and land owners needs but will average the stated amount over a period of several years. The likely amount exported is expected to range from 9 000 tonnes in 1995 to 7000 tonnes in 2000 (draft EIS, Table 3.2). This can be compared with the total approved export quantity of 500 000 tonnes (<2%) and the expected export amount of approximately 400 000 tonnes (<2.5%).

This amount will be harvested from approximately 200 ha, about 120 ha (60%) of which it is expected the owner will clear after logging (draft EIS, p168). Total

area of private property forest in the LSZ is estimated at about 1 200 000 ha (SEPL pers. comm). Therefore, on a regional perspective, the annual average proportion of timbered private land which will be affected is less than 0.02% and that which is cleared and from which roundwood is taken for SEPL is about 0.01%. It is also relevant that these are the rates at which SEPL's private property pulpwood has been supplied for some years and the EIS is not seeking any increase in this.

The above information indicates the relatively minor extent of forested private land involved. It also indicates the extent of error of those submissions which were based on the assumption that large scale clearing and forest destruction would result if pulpwood continues to be available to SEPL at close to current levels from clearing operations and private land forestry. However, for private property clearing or selective logging operations from which no roundwood is supplied for SEPLs purposes, including those supplying other roundwood users, the preparation of this EIS, and the commitments given in it, have no effect on whether they proceed, on their scale or location.

General Issues Raised in Public Comments

Several submissions were critical of the absence in the draft EIS of identification of specific properties to be logged and discussion of the environmental qualities of those properties. It was also stated that the draft EIS lacked a regional context and a cumulative impacts analysis.

It is acknowledged that the draft EIS did not have the information on clearing private land necessary to assess potential impacts on individual private properties proposed for logging. As stated in the draft EIS (p47), private land owners intentions regarding harvesting (clearing or selective felling) during the period to 2003 were not sampled and thus this information is not available. In any case, its value would be questionable because of the high chance of owners intentions changing over that period of time.

It is proposed to survey and assess, on a case-by-case basis as part of the pre-logging investigation, any potential impacts on the environment arising from the logging operations. The surveys to be carried out, the authorities to be consulted and the processes to be followed to obtain necessary approvals for private property logging are discussed below in Section 5.7.4. These assessments will provide the information to allow the impacts to be placed in a regional context and a cumulative analysis to be conducted, to the extent that these would be valid given the extremely small proportion of the private forested land in the supply area from which roundwood for the supply of chips to SEPL will be taken (see Section 5.7.3 below).

Submissions also contended that the SFNSW EIS's are not a substitute for an assessment of the environmental impacts on private property. This point is acknowledged but the information contained in these EISs will form a valuable basis for designing the pre-logging investigations for private lands in the same areas.

The Great Lakes Council raises the issue of development consent for private property logging and for woodchipping activities at local sawmills. Development approval is a planning matter regulated by State law and not an issue for this EIS.

5.7.2 Logging on Private Property

Logging operations on private land, as distinct from clearing, consist of integrated selective harvesting operations for both sawlogs and pulpwood and are expected to involve about 60ha annually, yielding about 4000 tonnes of roundwood for supply of chips to SEPL. Logging methods are similar to those in State forests and will have similar impacts to State forests sawlog harvesting operations but varying in intensity.

The intensity of the effects will vary with the intensity of canopy removal, the extent of which will depend on the intended future use of the forest, i.e whether as a closed canopy wood production stand or as an open canopy agroforestry system. The former will require the creation of gaps sufficiently large and disturbed for adequate regeneration but generally occupying not more than 25% of the site. Agroforestry systems, however, require much greater tree removal and the establishment of pasture grasses. The choice of system, and therefore the intensity of logging and impacts, is a matter for the land owner to decide.

A submission from a community organisation, which includes private forest land holders, makes the point that available uses for lower quality logs and thinnings are very limited and, beyond the economic range of pulpmills in Tasmania and Victoria or of landscaping markets in larger urban areas, there is no market for hardwood chips other than the export market. The same submission contends that the planning and environmental controls now in place are sufficient to regulate the use of pulpwood from private land.

Impacts on specific components of the environment are discussed elsewhere in the relevant sections of the draft EIS and this Supplement. The approvals process relating to private property logging is discussed in Section 5.7.4 below.

5.7.3 Clearing on Private Property

A number of submissions expressed the view that "woodchipping" (presumably the sale of roundwood to SEPL) provides an incentive for or susidises land clearing. The implication in these submissions is that, in the absence of a pulpwood market, the rate of clearing of private land would be substantially less than it would be if the opportunity to sell pulpwood existed. The economics of land clearing for pasture establishment are discussed in Section 7.2 and show that a comparison of the costs of clearing with the returns for the pulpwood produced does little to support the subsidy theory.

The fact that SEPL has had approval to export chips from this source for a number of years provides an opportunity to test the subsidy theory. As discussed above, it is expected that land clearing from which roundwood for SEPL chips is obtained will be about 120 ha annually, which is the same rate as in recent years. The total area of private property forest in the LSZ is estimated at about 1 200 000 ha (SEPL pers. comm), so that current and future clearing from which roundwood is taken for SEPL is and will remain about 0.01% of the forested private land in the LSZ. While no figures for the total area of private land being cleared in the LSZ or the study area are available, a visit to the area will indicate that far more than 120ha a year is currently being cleared.

A number of submissions, including those from NPWS and NEFA/NCEC indicate a concern with "the cumulative effect of individual private property

operations". It is suggested that, at a clearing rate of 0.01% per year, the cumulative impact of these operations will not be large. Nevertheless, if each of the properties being cleared happened to contain sensitive habitat or species, the cumulative effects could be significant. However, the clearance and approval processes discussed in Section 5.7.4 below will provide safeguards against such a situation arising.

Given that private property land clearing will continue, and the NFPS (p27) acknowledges that private forest owners may wish to clear native forest for a range of economic purposes, the salvage of useable resources from these operations appears appropriate. Furthermore, SEPL involvement in a clearing operation results in a more detailed analysis and assessment of potential impacts than is the norm in these cases. SEPL can and does avoid operations in sensitive sites and requires retention of riparian corridors and other features such as habitat trees which may otherwise be cleared. Indeed, given the potential oversupply from this source and, therefore, the ability of SEPL to reject environmentally unsound clearing, it is suggested that the professional attention given to environmental concerns will improve the situation.

It was suggested in one submission that landowners should be required to make a legal commitment to manage the land involved for long term forest production before being permitted to sell roundwood for export chips. While the legal form such a commitment should take and the means of enforcing compliance are unclear, such a condition is likely to have the practical effect of removing land clearing from the sources of roundwood for supply to SEPL and removing the possibility of SEPL influencing the environmental standards of the clearing operation.

5.7.4 Approval Processes

Logging operations or clearing on private land may require a number of approvals from a variety of government authorities at all levels of government depending on the location and physical characteristics of the land and the use to be made of any wood produced from the operation. Some of these arise from direct application of legislation or regulations to the action (e.g. licence to take or kill endangered fauna under s120 of the NSW NPW Act) and some indirectly through the requirements of other legislation (e.g. application of the Commonwealth Endangered Species Protection Act 1992 because of need for export approval under the Exports Control Act). Others arise from the location (e.g. application of EP&A Act if local government area has an Local Environment Plan in force) and/or the physical characteristics of the land (e.g. the application of the Soil Conservation Act 1938 if the land is Protected Land because of its location in a notified catchment and slope above a specified steepness).

As discussed in Section 9.13.2 of the draft EIS, the above approval process for private property operations is unwieldy and generally time consuming. It had been hoped that this EIS could have been used to present information applicable to a range of private properties in a way which would have avoided the need for individual property assessments. However, because of the unpredictability of private land becoming available for logging or clearing and the scattered nature of the properties concerned, it is clear that, as pointed out by ANCA in its submission, information is not available which would permit the discontinuation of the practice of individual property assessments as part of the approval process.

SEPL will therefore continue the practice of seeking export approval on the basis of individual property assessments and State approvals. The steps in gaining these approvals and preparing supporting information for an application for export approval for roundwood from a particular private property for supply of chips for SEPL can be summarised as follows:

- Identification of a particular private property as a potential source of roundwood, generally by an approach from the land owner
- Preliminary consultation, on basis of locality and existing information, with NPWS, CaLM, AHC, ANCA, local government authority to establish likely factors for particular attention in surveys
- Pre-logging survey and analysis of results, involving appropriate professionals as necessary
- Consultation with approving authorities and preparation of supporting documentation
- Approvals/licences/conditions gained from State authorities
- Proposal, as modified to meet State approvals etc submitted to DPIE for export approval.

The detailed assessments will need to provide the necessary information to enable the various clearances and approvals the land owner or SEPL will need to obtain prior to logging being able to proceed. In order to be able to appropriately target likely factors which should be given particular attention in the pre-logging surveys and establish the professional expertise required, consultations will be held with NPWS, CaLM, AHC, ANCA,and the local government authority concerned. A preliminary inspection of the land and its locality, together with a review of known data, will be made by a trained resource manager to provide the basic information necessary for the initial consultations with these authorities.

Environmental and other factors to be surveyed or considered in the pre-logging assessments are:

- Soils and erosion potential
- Water quality
- Vegetation and flora species
- Habitat and fauna species
- Rare Threatened or Endangered species
- Wilderness and World Heritage areas
- National Estate places and values
- Aboriginal cultural heritage.

A number of commitments have been made elsewhere in this Supplement in relation to the above factors and the pre-logging assessments. For convenience these can be summarised as follows:

- will consider the effects on wilderness
- companies supplying roundwood to SEPL will not harvest wood for this purpose from areas on the RNE or the Interim List
- areas will be examined for the presence of cultural heritage sites

- detailed archaeological surveys where consultation with NPWS indicates these are necessary
- Aboriginal sites listed by the NPWS or the AHC that are located on private land will not be affected by any wood chip production activity
- Aboriginal relics and sites discovered by pre-logging surveys or during logging activities will be treated in accordance with current legislative requirements
- where consultation with NPWS indicates it to be appropriate, liaison will be established with Land Councils
- views and suggestions of Aboriginal people be taken into consideration prior to completion of purchase agreements
- studies of soil characteristics and erosion potential as necessary
- pre-logging assessment and design of harvesting plans and environmental protection measures will take into account the guidelines and planning approval conditions referred to by CaLM
- areas where populations of endangered or vulnerable species or forest types with less than 5% of their areas reserved will be avoided
- a botanical survey targeting the listed species (Appendix 3, Tables 4 and 5) and the listed forest types (Appendix 3 Table 3) and a fauna survey targeting rare and endangered species will be carried out, by a qualified professionals, if indicated by preliminary discussions with authorities
- ANCA will be consulted prior to such fauna and botanical surveys being carried out to ensure that the requirements of the ESP Act, if any, are met at the same time
- where a pre-logging assessment indicates there will be an adverse effect on a rare or endangered species, SEPL will not proceed to obtain roundwood from that location other than in accordance with an approved recovery plan or licence under NSW legislation, whichever is appropriate
- Fauna Impact Statements and Section 120 licences, as required under the State legislation will be obtained, where required.

6.0 RESOURCES

6.1 Use of Lower Grade Logs

Submissions were received from sawmillers and a community based organisation representing private forest owners and rural community members working in or supplying services to the forest industry and its dependants. These submissions supported the SEPL proposal, seeking its continued availability as an outlet for wastes and lower grade logs.

It was pointed out that the available uses for low quality logs and thinnings are very limited. There is little domestic use of hardwood chips in Australia beyond the economic range of pulpmills in Tasmania and Victoria or of landscaping markets in larger urban areas. Until local production is developed of higher volume products, such as pulp/paper, ethanol or the composite timber products referred to below in section 8.3, hardwood chips have no other substantial market than overseas. This greatly restricts the ability of private land forest growers to sell thinnings and residues from regeneration fellings other for export woodchips.

A submission from a sawmiller makes the point that the northern NSW pulpwood industry, although small, is an important factor in the viability of sawmilling operations within the region. It provides an important source of income and allows the industry to use a lower standard of log to produce more of a higher value added product (sawn timber), knowing that the additional waste produced in doing so is saleable.

Other submissions were critical of the ability to use lower quality logs claiming that woodchipping provides an incentive to increase the overall rate of harvesting in lower quality old growth forests by allowing to logging be more economic than would be the case if sawlogs only were taken.

While this is likely to be so in certain classes of forest, it is not accepted that this is necessarily a bad thing as implied by the submissions. The implication is that more old growth forest will be cut than would be economically viable if sawlogs only could be taken. This assumes that all old growth will be available to be harvested and ignores the setting aside of areas under the TI(IP) Act pending completion of studies and consideration of the need to place additional areas of these forest types in conservation reserves. It also ignores the fact that by allowing economic access to more of the poorer quality areas, the overall volume of available sawlogs is increased and pressure is reduced thereby on the size of the area that can be reserved from harvesting.

6.2 Utilisation Standards

Several conservation organisations make the point that the utilisation standards for sawlogs or pulplogs could be manipulated to increase the volume going to woodchips at the expense of sawlog supplies. There are also claims that sawlogs are currently chipped.

There is no evidence to support the latter claim as a routine ongoing practice. As the market for sawn timber fluctuates the standard of log which can be sawn also varies, so that the log which can be used as a sawlog at one particular time may not be able to be used at others. Therefore, at certain times a log, which at other times could be sawn economically, will be only pulpwood grade and would be chipped. However, as all sawlogs attract a price premium over pulpwood, there are strong incentives for the grower to maximise sawlog output from harvesting operations.

There are claims by small sawmillers and others that small thinnings now being harvested would eventually attain sawlog size if allowed to grow on. This is essentially not correct. Substantial research evidence clearly shows that total sawlog production in regrowth stands is significantly increased by thinnings of the type now producing pulpwood. Conversely, if the same areas are left to grow unthinned, suppressed trees do not thrive and may die with a consequent decrease in total production. SFNSW requires that small logs from thinning of regrowth or plantations, which are of sufficient size and quality to produce sawn timber, be made available to sawmills as ex-quota logs.

The Armidale Branch of the NPA submission states that the "claimed proportions of sawmill, logging and silvicultural residues can be and are manipulated to include extra cull/salvage trees removed not for genuine silvicultural reasons but to get extra volumes for the chipmill". The evidence advanced for this is "Table 3.1 (p26) shows salvage roundwood (i.e. culls, head/butt) from the Dorrigo and Urunga districts as 57 000 and 45 000 tpa respectively - hardly negligible quantities, and notably larger than figures for thinnings from regrowth which are claimed to be the main future source of supply."

The connection between these two statements is tenuous in the extreme. The size of the estimated potential sources of roundwood (Table 3.1, draft EIS p26) bears no relationship, other than as an indication of availability, to the amount which it is intended to take as roundwood for chips. SEPL's intentions in this regard are shown in Table 3.2 (draft EIS p29). The statements also ignore the information repeated several times in the draft EIS and in this Supplement that SEPL's preference and, therefore to a large extent, requirement is for young wood to improve the quality of the export chip mix in order to meet commercial requirements. It defies logic that SEPL would therefore manipulate the proportions of wood from the various sources available to it to "include extra cull/salvage trees", (which as older wood are not preferred), so as to "get extra volumes for the chipmill" when the volume of wood potentially available from its preferred roundwood sources (see draft EIS Table 3.1) exceeds the likely intake from those sources (see draft EIS Table 3.2).

In the NEFA/NCEC submission, reference is made to alleged unauthorised private property pulpwood going directly into chippers at sawmills not controlled directly by Allen Taylor and Company. The operators of such mills are under contractual obligation not to supply chips from such operations to SEPL and are requested to supply a monthly signed statement to this effect. It should be noted that these mills process salvage quality sawlogs for the production of low grade sawn material, with very low recovery rates and chip recovery is correspondingly high. In addition, all mills are required by regulation under the Forestry Act to keep up to date

log books showing the source and quantity of all logs delivered to the mill. These records are inspected periodically.

6.3 Transport

EIS Discussion

The NEFA/NCEC submission claims the draft EIS discussion of transport issues to be inadequate and confused. The claimed inadequacy is said to relate to the discussion being confined to the designated sources only and the additional impacts arising from their use. This issue has been discussed at length in Sections 2.1 and 2.2. above.

The draft EIS is also claimed to deal only with the transport of chips from the chippers to the port loading facility and to ignore the carrying of roundwood from State forests to the chippers. This is not correct as the changes in traffic patterns within the State forests are discussed in Section 7.14 and those districts identified in which there will be increases and decreases in loaded truck movements per annum. Discussion can only be at the broad level used in the draft EIS since scheduling of operations over the next 10 years within general areas of supply is not practical at this stage.

The NEFA/NCEC submission also points out an discrepancy between Table 3.3 and Figure 3.4 in which the same loaded truck movements and associated tonnages are described as daily figures in the Table and weekly figures in Figure 3.4. They are in fact weekly figures and Table 3.3 should be interpreted accordingly.

Road Damage

The Uralla Shire Council drew attention to its concern at the possibility of increased wear and damage to Main Road 73 (Walcha to Uralla) which is within the supply area. No pulpwood is currently or is expected to be hauled on this road in the foreseeable future. Should this occur in the during the period covered by the EIS, it is unlikely to be in tonnages significantly above the present general use of this road. There is further discussion of costs and funding for roads in Section 7.3.

Rail Transport of Chips

The EPA submission noted that all transport is by road and that rail had been considered but was not viable at present. Other submissions referred to this issue also. The EPA suggested that further effort should be made to explore the environmental benefits of using rail transport. Section 4.3.4 in the draft EIS discusses the reasons why rail transport from the chipmills to the shiploader at Kooragang Island has not been viable to date. This information does not suggest there is likely to be any change of circumstances which would alter this situation but the matter will be kept under review.

Transport Noise

The EPA also advised that noise needs to be taken into consideration in or near urban areas and in locations where there may be unacceptable loss of

amenity due to noise. Truck movements in urban areas will be restricted and will be strictly controlled to outside a 6pm to 6am curfew. In other areas, noise and dust levels created by the proposal over and above other traffic movements are expected to be minimal. Noise and dust at the Tea Gardens chipmill are regulated by Great Lakes Council's development controls.

6.4 Other Issues Raised

Mills compliance with Regulations

The compliance with Local Government and other planning or environmental management regulations by sawmills supplying woodchips to SEPL is a matter for the relevant State and local government authorities. As stated in the draft EIS, most of the volume of pulpwood from designated sources will continue to be processed by the dedicated chipmills at Tea Gardens and at Kooragang Island. Both these facilities operate under approvals from relevant State and local government bodies and will comply with the conditions attached to these approvals.

Continued Market for Sawmill Residues

Some submissions, while generally supporting the woodchip industry and the SEPL proposal, were concerned that increased use of roundwood from thinnings and silvicultural residues would reduce the opportunities for sawmillers to economically dispose of their current and future wastes as chips. One proposed that the use of roundwood should continue to be permitted only when sawmill wastes are used to the maximum extent possible, others that the present proportion of sawmill residues to logging and silvicultural residues (65:35) should be maintained by increasing the volume of sawmill residues as the volume of roundwood increases.

While SEPL will continue to meet its obligation to use sawmill residue chips to maximum extent possible, the proportion of sawmill residue chips to be included in the export mix will be the result of a trade off between several factors:

- a decline in the availability of sawmill residue chips as a result of sawlog quotas having been reduced for all North Coast sawmills
- transport costs for substitute sawmill residue chips from further afield
- the need to include a higher proportion of younger wood from regrowth and plantation thinnings to achieve market quality requirements.

The proposal aims, notwithstanding the reductions to sawlog quotas, to maintain the current tonnage of sawmill residue chip exports. It will not be possible, however, to maintain the current proportion of sawmill residue chips as the volume of roundwood chips will need to rise as a result of the increase in exports to an estimated 400 000 to 500 000 tonnes in 2003. In any case, the overall viability of the project will almost certainly depend on improved overall chip quality, i.e. increased proportions of younger wood. Therefore, if future levels of sawmill residue chips are to remain constant despite declining sawlog yields, even though their proportion falls,

it is highly likely that, suitable sawmill residues not currently being used will be taken up as roundwood thinnings also increase.

One submission from a sawmilling company, while strongly supporting the maximum use of sawmill residues as a chip source, recommends that silvicultural thinnings should be preferred source of non sawmill chips in order to increase the ability of regrowth stands to produce sawlogs in as short a time as possible.

On the other hand, a submission from the Central Region of SFNSW points out that concentration on use of thinnings to improve chip quality may not achieve SFNSW's forest management and financial objectives. SFNSW would prefer a balance in chip production between thinning of productive regrowth stands and culling to promote stand productivity.

Relationship to Government Tree Planting Programs

One submission asked why large scale clearing of private property is allowed when, simultaneously, Governments are encouraging large scale replanting programs.

SEPL disputes that the agricultural clearing from which it expects to obtain roundwood can be regarded as large scale, given that the projected average annual area of such clearing is approx 120 ha. This compares with the estimated total 2 million ha of timbered areas on private property in the NSW north coast region (SEPL draft EIS, Table 3.5. p48).

With regard to the apparent paradox referred to in the submission, while it is the policy of governments at federal and state levels to encourage the revegetation of land where clearing has resulted in land degradation and other adverse environmental effects, these governments continue to allow the clearing of land for agricultural purposes in most areas. The NFPS, endorsed by the Commonwealth and State governments, acknowledges (NFPS p27) that private forest owners may wish to clear native forest for a range of economic purposes. Given that private property operations and land clearing will continue, the salvage of material and resources from these operations appears appropriate. SEPL has argued in the draft EIS and elsewhere in this Supplement that its retrieval of pulpwood (and sawlogs) from areas being cleared does not provide a.compelling incentive for that clearing and that the pre-operational clearances to be obtained by the company and the land owner will provide safeguards against serious environmental damage.

Likely Roundwood Increase v Potential Availability

One submission has pointed out an apparent discrepancy between the likely roundwood intake (Table 3.2) and the proposed increases shown in Section 3.1.

As stated in Section 3.1 (p22), volumes from roundwood sources are projected, under the most likely demand scenario, to increase from 122 000 tonnes in 1991 to between 172 000 and 272 000 tonnes in 2003, i.e. to increase by between 50 000 and 150 000 tonnes. However, it is pointed out in the submission that Table 3.2 (p29) shows the likely roundwood intake under the same scenario as increasing by 58 000 tonnes over the same period, i.e only at the lower end of the range of increases

and well short of the 150 000 tonnes increase allowed under the licence limit of 500 000 tonnes.

While the submission is correct, as far as it goes, Table 3.1 (p26) shows the estimated potential sources of roundwood from State forest as 459 000 tonnes per annum, well above the volume needed to achieve the maximum projected increase. The apparent discrepancy arises therefore from comparing an estimated increase in likely roundwood intake with an estimated range of potential increase which is possible given the size of the estimated potential sources available to meet those increases.

7.0
SOCIO-ECONOMICS

As noted under Scope of Assessment in the Introduction, many of the comments made by NEFA/NCEC and others appear to assume that the role of this EIS has been to prepare a complete evaluation and justification for the timber industry in north-east NSW, whereas, in accordance with the designation from the Minister for Resources, its scope is more limited. The criticisms listed in the "socio-economic" section of the "summary of concerns" in the NEFA/NCEC submission are largely unfounded, with little justification being provided to support the claims made. Each of these is addressed below .

Submissions from the Great Lakes Environment Association (GLEA) and the NSW Environment Protection Authority (NSW EPA) raised some other socio-economic issues, as well as some of those raised by NEFA/NCEC. These are also addressed below.

One submission doubted the relevance/accuracy of statistical information used in the draft EIS, citing as a basis the use in 1993 of 1986 Census figures, two years after the 1991 Census. While some preliminary statistics from a Census become available from the Australian Bureau of Statistics relatively quickly, detailed results of other aspects may take several years to be processed. The figures used were the most up to date available at the time.

7.1
Supposed "subsidy" from State forests to industry

No such subsidy is quantified in the NEFA/NCEC submission, so it is difficult to comment on the assertions presented. It would appear that a few selective quotations from the PAC (1990) report have been used as the foundation for implying that the sale of roundwood, to SEPL, is "uneconomic" for State forests. Detailed responses to the PAC report have been prepared by the (then) Forestry Commission of NSW, which have clearly demonstrated that :

- many of the PAC's recommendations were already in the process of being implemented (e.g., growing stock valuation, asset disposal, log pricing, options for hardwood plantation establishment, amongst others) when the PAC report was made public, and

- the PAC was incorrect and/or misinformed in a number of key areas, such as those relating to claims that the Commission is "inefficient". In contrast, the Commission's response provides evidence of a continuing commitment to improved performance, and demonstrates that productivity has increased by 78% since 1975/76.

The way in which SFNSW reports performance is entirely consistent with Treasury guidelines on government trading enterprise monitoring - and indicates that SFNSW has improved performance by an average of 25%-28% per annum since 1985/86. More importantly, the discussion in the PAC report (para. 4.6 to 4.9) regarding debt burden is incorrect. Prior to 1987/88, 50% of all Commission revenues were returned to Treasury (without credit to the "debts" applied to SFNSW), and capital works were funded essentially from General Loan Funds on which notional interest was charged in the accounts.

Moreover, it must be appreciated that SFNSW would be operating in the areas accessed by SEPL even if the SEPL operation did not exist - any income derived from the sale of resource to SEPL will therefore be additional to that received from sawmillers, with little (if any) commensurate additions to costs. In contrast, the draft EIS explains that the ability to commercially thin regrowth forests (via sale of pulpwood to SEPL) provides up to 25% improvement in forest productivity, thus actively enhancing (rather than diminishing) the returns derived for the community by State Forests' management.

SFNSW operates as a commercial enterprise of the public sector - income received from these commercial operations represents income to the community of NSW. It is clear from the published financial reports of SFNSW (e.g., in the Annual Report) that a net return is obtained, for the community of the State, from management of this public asset. Whether SFNSW is required to pay an "income tax" or not is irrelevant - any such tax paid to the State Government would not increase the public sector returns derived from SFNSW's management of the forest asset. If paid to the Commonwealth Government, an "income tax" payment would represent an additional deduction to State income that would not otherwise exist.

7.2 Use of private property resource

The draft EIS sets out quite clearly the detailed approval process that must be complied with for any sale of resource derived from the clearing of forest on private property. The draft EIS also compares the likely revenue obtained from the sale of such resource, with the total costs involved in pasture establishment on cleared land. It is clear that it is neither easy, nor profitable, to clear forested land for the purposes of selling pulpwood.

CEPA has reported anecdotal evidence from a local government valuer in the LSX that the price/value of timbered (ie uncleared) land in the area ranges from $400 to $800 per hectare, whereas the price/value of cleared land is $1500. This increase in value (between $700 and $1100) would seem to be a greater incentive for clearing than the $150 to $250 received for pulpwood salvage. The extent of agricultural clearing, from which no sawlogs or pulpwood are being salvaged, now occurring in the supply zone suggests that additional revenue from the sale of pulpwood is not an important factor in landowners' decisions to clear.

Decisions to clear private property will continue to be made, with detailed approval processes in place if consent for the sale of the cleared material is to be given. A market for such material can be viewed as a means of reducing the waste that would otherwise occur if clearing were to proceed anyway, rather than as an incentive to undertake clearing.

7.3 Transport issues

The draft EIS details the penalties imposed on truck drivers who do not adhere to the required regulations governing operations. All transport activities are therefore undertaken within operational requirements as to payload, speed, etc. All heavy transport movement will impose costs on roads - the costs on forest roads are borne by SFNSW, with such expenditure being covered by total royalty income. Costs imposed on other roads (maintained by local and/or State

government) are planned to be covered by the charges levied on all heavy transport for use of public roads. The extent to which specific local areas incur additional costs is not a function of any lack of contribution by trucks, but rather represents a shortfall in the way in which road-use charges are distributed to the agencies responsible for road upkeep.

Contrary to the unfounded statements made in the NEFA/NCEC submission, considerable research has been conducted into the costs imposed by heavy vehicles on road maintenance requirements. Recent research into average annual road maintenance, and the relationship of heavy transport loads to such expenditure, has suggested that total expenditure is not as high as some might expect. The National Road Transport Commission (NRTC, "Road Wear Assessment on Urban and Rural Local Roads", Dec. 1993) has established that, for unsealed local rural roads, the relationship can be described as :

$$A = 494 + (0.039 \times C)$$

where :

A = average annual maintenance expenditure per lane per km (in 1988/89 values)

C = cumulative equivalent standard axles per lane per year.

Inserting data into this equation indicates that even if some roads were to carry 680 loaded trips per year (maximum level indicated in Table 7.2), and assuming 6 axles per truck, then annual maintenance expenditure resulting from this traffic would be $653.12/lane/km. This would represent the marginal costs, in addition to costs imposed by other heavy traffic.

7.4 Australia's international trade in wood products

NEFA/NCEC quote historical data (1989/90) for the balance in trade in wood and wood products, although the draft EIS quotes the (then) latest available data for 1990/91. ABARE reports (1993) that total exports in 1992/93 were valued at $776.7 million, with woodchips accounting for 54% of this total value. The continuing trade deficit in 1992/93 is estimated to be $1.66 billion.

While NEFA/NCEC claim that the deficit is "due to the low value of woodchips", even a cursory examination of the components of imports and exports would reveal that the deficit that exists in this trade is due to the fact that Australia cannot produce the commodities that are required by our economy - neither in total volume terms, nor in terms of particular products. Imports of pulp and paper account for 65% of the total value of imports in 1992/93 - the establishment of further paper manufacturing capacity in Australia would make a much greater contribution toward a reduction in the trade deficit, than would a reduction in the limited timber exports that Australia does manage to produce. However, attempts to establish such capacity (e.g., Wesley Vale in Tasmania, Daishowa at Grafton, etc.) have been met with significant opposition from conservation groups.

Some comment is also required on incorrect conclusions reached by the GLEA concerning Australia's export trade in woodchips.

Apparently based on some comment by Clark (unreferenced in submission), GLEA has assumed that Australia's woodchip trade has "declined". However,

available data (ABARE, 1993; and ABS, 1993) on the volume and value of hardwood woodchips exported from Australia indicates that the total volume has built up enormously over the last 20 years. Over the last seven years, around 5 million m^3 of woodchips have been exported from Australia each year, with approximately 88% being hardwood and 12% softwood. Figure 1 illustrates these data. In value terms, exports of woodchips have grown even more strongly - as indicated in Figure 2, prices received for hardwood and softwood chip have risen steadily over the observed period.

More recent data indicate that Australia currently exports between 1.2 and 1.4 million tonnes (green) of woodchips per quarter. Woodchips from NSW provide 18% of the total volume of hardwood chips exported from Australia - relevant data for the nine months to December 1993 are presented below. Tasmania is the largest single source of woodchips exported from Australia, providing 48% of the total.

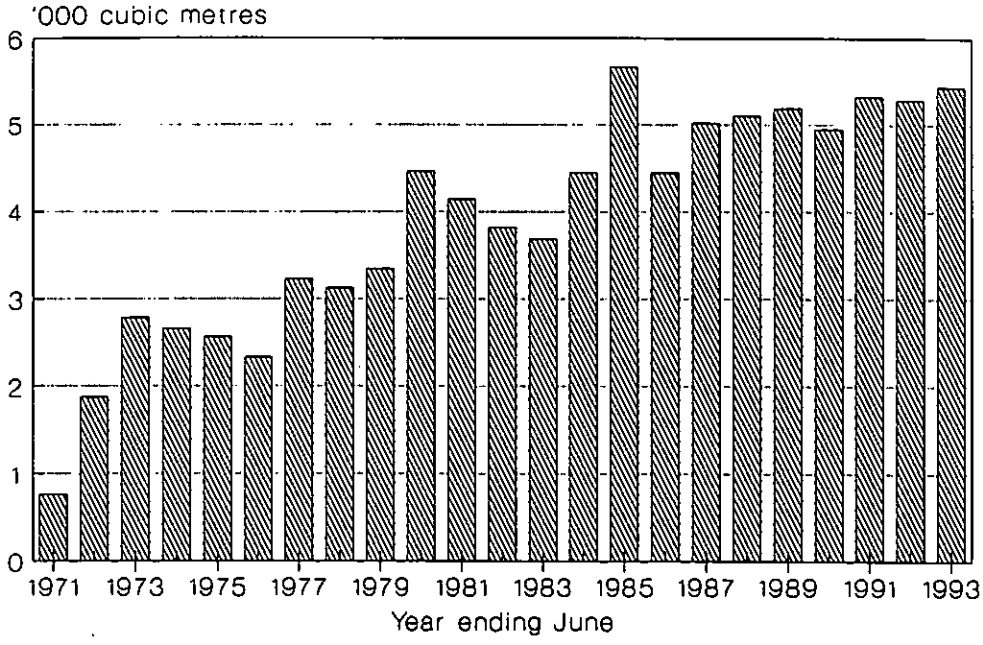
Australian exports of hardwood woodchips
(nine months ending Dec. 1993)

Source	Volume (green tonnes)	Value ($ mill.)
NSW	708 702	55.130
Australia	3 901 841	303.446

Most of Australia's woodchip exports are sent to Japan, which in 1992 imported a total of 13.26 million m^3 of hardwood pulpwood. This total volume of imported hardwood raw material represented 65% of all hardwood used by Japanese mills in 1992, with hardwood contributing around 55% of all pulpwood received by Japanese mills (JPA, 1993). Total sourcing of all pulpwood used by mills in Japan is indicated in Figure 3, and it is apparent that the supply of imported hardwood has increased substantially over recent years.

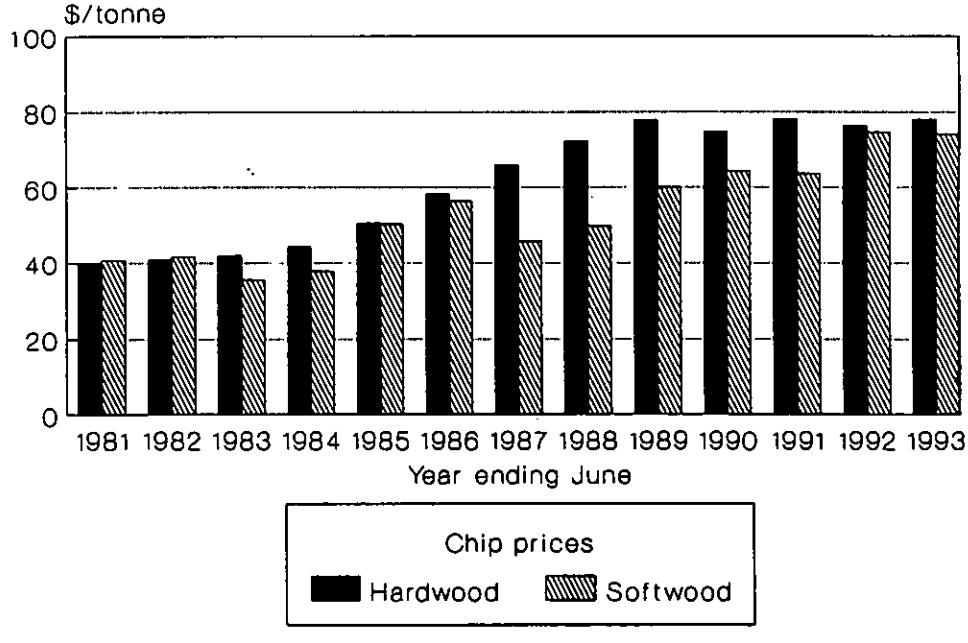
This increase in hardwood usage for pulp and paper manufacture is more closely examined in Figure 4, which also shows Australia's contribution to the total supply of hardwood pulpwood imported into Japan. In contrast to claims that Australia's market is "declining", these data indicate that Australia's woodchip exports to Japan are expanding in both volume and unit value terms. Figure 4 indicates that total exports to Japan have remained very steady, in volume terms, over the period 1986 to 1992. During this period, the demand for hardwood chips has increased significantly - but Australia has not been able to increase its supply to meet this increased demand.

FIGURE 7.1
TOTAL EXPORTS OF WOODCHIPS FROM AUSTRALIA



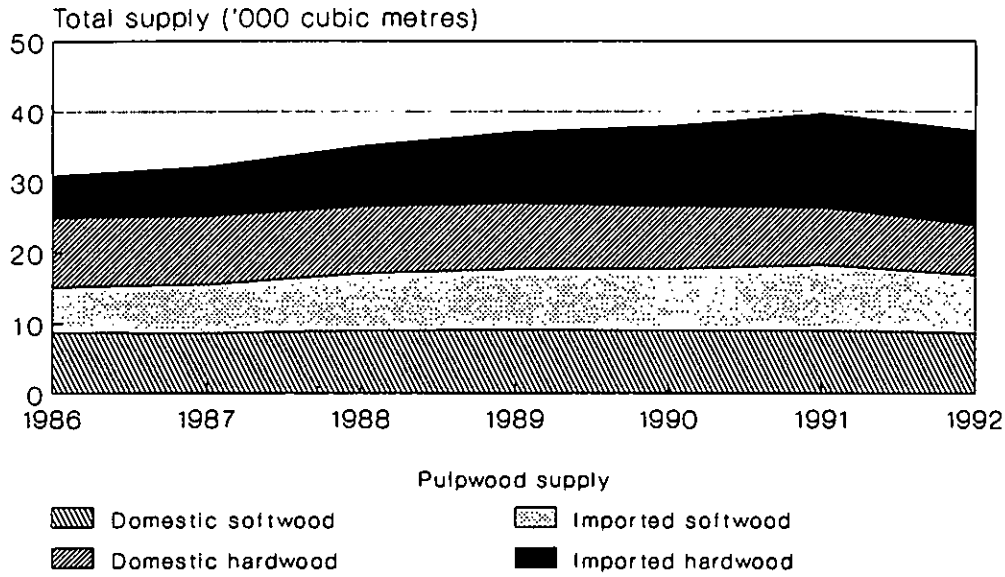
Source : ABARE (Sept. 1993)

FIGURE 7.2
WOODCHIP PRICES - HARDWOOD AND SOFTWOOD



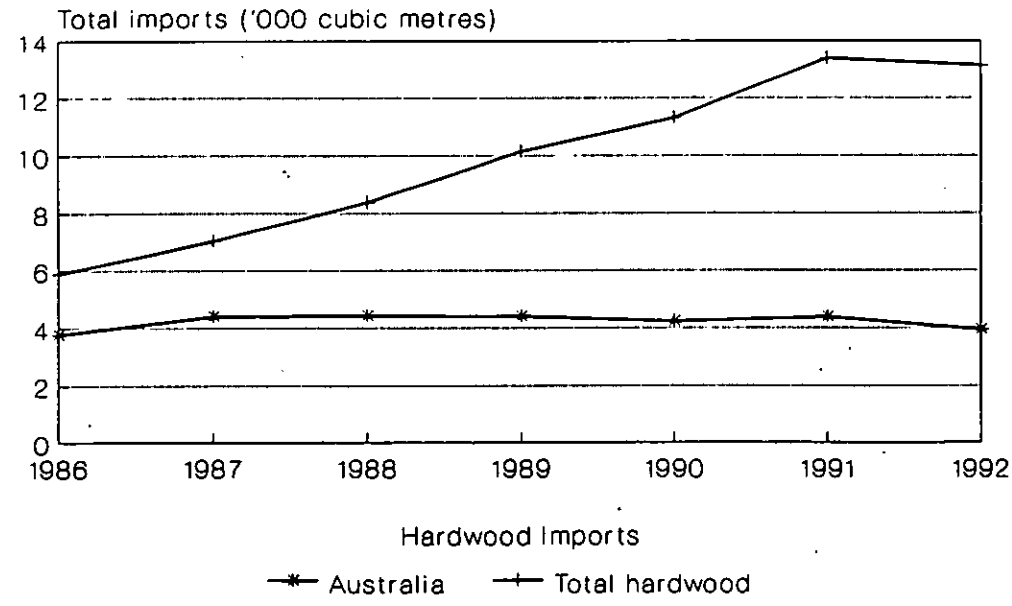
Source : ABARE (Sept., 1993)

FIGURE 7.3
SOURCE OF PULPWOOD SUPPLY TO MILLS IN JAPAN



Source : JPA, 1993

FIGURE 7.4
ROLE OF AUSTRALIA IN SUPPLY OF HARDWOOD PULPWOOD TO JAPAN



Source : JPA, 1993

The need to increase Australia's exports of a more "value-added" commodity is recognised - see earlier comments in response to the NEFA/NCEC submission. While the RAC Inquiry (RAC, 1992) may have suggested the use of an export tax on woodchips, this has been refuted by the Inquiry set up specifically to examine prospects for value-adding in forest products (IC, 1993). The IC recommended that "all Commonwealth, state, territory, and local government controls on exports of logs and woodchips be abolished". This Inquiry also concluded that it "has been unable to identify any benefits associated with the present export controls", and that an expansion of Australia's woodchip exports to Japan was an opportunity that should be examined.

7.5 Direct economic impacts of SEPL operations

The NEFA/NCEC submission contains reference to the HDA export woodchip operation at Eden, apparently with the intent of demonstrating the returns available from such operations. Data purporting to represent SEPL's financial performance is also quoted by NEFA/NCEC. Recent inquiries into the forest industries (e.g., RAC, 1992; IC, 1993) have specifically examined the export woodchip industry and have found no evidence of excessive company profitability at the expense of Crown revenues.

Having no access to the source data on which this reference is presumably based, no comment can be made as to the veracity of such claims. However, it must be stressed that the HDA operations are not relevant to any consideration of the SEPL proposal, being based on integrated logging management, and with only relatively little use of sawmill residue chips. Royalties charged for resource supplied from integrated operations cannot be equated to royalties charged for silvicultural residues, where small dimension thinnings must bear a proportionally much higher extraction cost.

Several points made elsewhere should also be considered in relation to the royalties paid by mills supplying SEPL :

- Australian woodchip supply exceeds demand, by a very wide margin
- Northern NSW woodchips have less desirable pulping qualities than chips from S.E. NSW
- At the direction of the State Government, SEPL located its export facility at Newcastle, which is not well located in relation to the chip resource, and requires higher transport costs
- SFNSW gains considerable benefits in the sale of material that otherwise would need to be thinned (to waste) to achieve equivalent increases in sawlog productivity.

The draft EIS presented data on SEPL's output, and selected operational costs, for the year 1990/91 (the latest data available at the time of preparing the draft EIS). Data provided by SEPL for 1992/93 indicate that :

- Total output for the year (sales) exceeded $27.6 million
- Purchases of chips, including delivery to SEPL, cost $21.2 million
- Other costs (e.g., stockpiling, ship loading) totalled $1.2 million.

The balance between sales and these itemised costs was made up of taxes paid, and profits. There is therefore no "exaggeration" involved in these figures - they are not estimates, but a reported financial statistic from SEPL. The fact that payments for chips represents a high proportion of SEPL's total sales value simply reflects that fact that by far the largest part of SEPL's costs is represented by the purchase of chips. It is acknowledged that the export of woodchips is a fairly low value-adding activity - there is little margin between input costs and sale prices. The extent to which SEPL can derive increased profit will demonstrate an increased level of value-adding being achieved. However, the more important element is that this export trade, despite involving relatively little value-adding, adds $27.6 million to total annual output levels, that would not otherwise exist.

The Guidelines issued by the Commonwealth, under which this draft EIS has been prepared, did not contain any requirement for the completion of a formal cost benefit analysis. No such analysis has been made by NEFA/NCEC, not is there any suggestion in this submission as to the definition/scope of such an analysis. The requirements of the EIS were to examine only a part of the SEPL operation - and did not involve any examination of State Forests' operation - so the relevance of any cost benefit analysis would be minimal, even if the scope were very carefully specified.

7.6
Direct employment impacts of SEPL operations

In arbitrarily deriving relationships between volumes processed and jobs, NEFA/NCEC appear to ignore the fact that sawmill chips are derived at a number of locations. The economies of scale therefore available at one central facility (Tea Gardens) cannot be "translated" across a number of separate sawmills. The estimate of 122 persons employed as a result of the SEPL operation is based on an actual count of positions - with a total of 64 jobs being reported, alone, by the sawmills involved in the supply of chips.

NEFA/NCEC may disagree with results of such surveys, but there are no foundations for their claims of "exaggeration". Reference is made by NEFA/NCEC to other studies (neither of which have any relevance to the SEPL EIS, being concerned with State Forests' management of certain areas rather than with specific elements of a processing operation) to justify such "exaggeration". However, an objective examination of the detailed references NEFA/NCEC provided for the sourcing of multipliers used, will demonstrate the differences in original data used.

A discussion paper on the nature of Input/Output Analysis, and of the use and derivation of multipliers, has been prepared in relation to the Eden integrated management project. A copy of this paper is at Appendix 2. Examination of this material, and of all the references used, would greatly assist an understanding of the use of various estimates to describe the "flow-on" effects which result, for regional economies, from direct additions to economic activity.

7.7 The role of Government grants

Any short-term mitigation of adverse socio-economic impacts caused by cessation of SEPL operations, that might be occasioned by the use of public grants, would be welcomed. However, such action :

- would represent a direct subsidy from the public purse to conservation goals and values
- ignores the fact that sustainable employment is generated by on-going profits, not by on-off grants that can only provide short-term (unsustainable) employment
- would impose long term costs on the regional community (and on the Australian economy) in the form of opportunity costs associated with the foregoing the possibility of later development and restructuring within the industry, aimed at reducing the trade deficit that NEFA/NCEC acknowledge as being a severe problem
- would prevent the economic use of waste generated by forest harvesting operations and by sawmills, seriously affecting industry profitablity.

Studies conducted in Far North Queensland (Morison, et al, reported in OLG, 1991) have examined the longer term impacts of the cessation of logging in National Estate forests (see below in discussion on tourism) and have demonstrated that long term costs are imposed on regional economies when logging ceases. These long term costs would not be avoided by the provision of short-term subsidies.

7.8 Tourism

The important role of tourism in regional economies, especially in coastal areas, is unquestioned. However, some aspects of the comments made by NEFA/NCEC need closer examination.

Firstly, there is no basis for making the assumption that "increased conservation" will necessarily equal "increased tourism". There is certainly no evidence to suggest that marginal increases in reserved areas of forest will result in any marginal increases in tourism activity. Large areas of National Park already include representative forest areas, and there are also flora reserves and other conservation areas within SFNSW. Levels of visitation may not be increased at all by additional forest conservation - but could be dramatically increased by improved access and interpretive facilities within existing conservation areas. Indeed, tourism information officers in the far North Coast region have stated (during personal interview) that the prohibition of logging operations within the areas of forest that currently remain accessible to the industry could not be expected to result in any expansion of tourism based on National Parks and "ecotourism" opportunities in this area. While these conclusions are simply opinions, they are no less subjective than the assumption that tourism will be increased by further forest conservation. Basic research must be conducted to determine whether demands for an "eco-experience" are being met from current resources, or whether demand would increase as a result of either improved access and/or interpretive facilities, or additional areas being reserved. In the absence of any such data, no valid

assumptions can be made about the relationship between increased conservation of State forests and increased levels of tourism activity.

Indeed, the National Ecotourism Strategy (CDT, 1994) states that "ecotourism activity is not confined to protected areas but occurs in terrestrial and marine environments under private ownership ... and on other multiple-use areas, such as State forests." It is therefore difficult to regard the continued operation of remaining areas of State forests, under multiple-use management, as restricting the potential of the region for ecotourism.

Secondly, it cannot be assumed that any expansion in tourist activity will necessarily replace the activity lost if logging were to be prevented. Not only must it be assumed that increased conservation means increased tourism, but also that tourism-based activities can indeed adequately substitute for forestry within a regional economy. If tourism is proposed as a replacement for forestry in an economic sense, it is being assumed that tourism can (and will) provide an equivalent degree of employment demand, and of economic activity to support other sectors of the economy, as is currently provided by the timber industry. Detailed studies conducted in the "world heritage" areas of Far North Queensland (OLG, 1991) concluded that the development of tourism, to offset jobs lost from the timber industry as a result of world heritage listing, would be "unlikely to occur quickly enough, and in sufficient volume, to offset the loss of jobs in the timber industry." This conclusion was reached despite having considered the possible establishment of a 250-bed resort and two interpretation centres, involving costs of over $114.5 million, based on the forests from which logging access was to be barred. This research suggests that even major (and costly) expansion in tourism facilities would not generate sufficient employment to replace that lost from the timber industry.

This study also demonstrated that employment and output multipliers associated with sawmilling were higher than those for tourism activities, in the Far North Queensland region. This means that if tourism is expected to replace forest-based activities, then output will have to be stimulated to a **greater** extent if a real substitution (ie, no net loss) is to be made.

Thirdly, and perhaps most importantly for regional economies, there is no basis for assuming that an expansion in ecotourism, and continued production from State forests, are incompatible. This assumption is implicit in the general perception by some groups that logging and tourism are mutually exclusive. Again, opinion expressed by tourism information officers, in regions with large areas of native forest, was that continued logging operations in State forests are in no way restrictive on expansion of tourism opportunities based on forests. The RAC Inquiry (RAC, 1992) also concluded that there was no basis for statements that logging and recreation activities are truly mutually exclusive (pU.16), and stated that no assumption can be made as to whether the absence of logging will enhance environmental quality in forests (p404).

Without fundamental research into factors influencing demand for ecotourism, and the likely dimensions of activity based on ecotourism within regional economies,there can be no justification for denying the industry access to native forest timber resource for reasons relating to "ecotourism promotion". Successful development of rural regional communities will include both production forestry, and ecotourism, as natural allies in strategies for the future.

7.9
Pulpwood royalties

There is no "market rate" in pulpwood royalties, as implied by GLEA. Royalties are set by SFNSW, for each zone of supply, based on the quality, demand for and costs associated with growing, extracting, and transporting the resource. Royalties charged for the supply of hardwood pulpwood in Eden are much higher than those charged to the mills supplying SEPL, as the operation in Eden is based on a different resource, under different management. The "average" rate quoted by GLEA is just that - the arithmetic average of total unit income received.

7.10
Comments from the NSW EPA

The submission from the EPA makes some general comment on the economic content of the SEPL EIS, which does not appear to recognise that the total SEPL operations was not the proposal addressed by the draft EIS. This EIS does in fact make a clear assessment of the implications of the proposal not being approved - but this does not equate to a closure of the SEPL operation, only to the loss of a part of the resource which SEPL wishes to access. The EPA acknowledges that the draft EIS "has achieved a reasonable economic analysis", and that "much useful information is provided", but the accompanying reference to the "big picture" again appears to assume that the entire SEPL operations are being reviewed via this EIS.

The EPA's comments on trade are addressed in responses already provided above.

8.0
ALTERNATIVES

Submissions contended that the treatment of Alternatives in the draft EIS was inadequate as it discussed only a limited range of the resource and manufacturing alternatives available. Other potential alternatives raised in these submissions are discussed below.

8.1
Exclusion from Areas of High Conservation Values

The NEFA/NCEC submission claims that the draft EIS fails to consider "the alternative of excluding woodchipping from old growth forest, wilderness, areas with Wild and Scenic River, National Estate or World Heritage values and the habitats of threatened and endangered plant communities and rare and endangered plant and animal species." While the draft EIS may not have considered such an exclusion, it did not need to do so since, apart from removal of culls from old growth forest which may be being logged for sawlogs, the SEPL proposal never at any time contemplated that there would be harvesting which would produce pulpwood in any of these areas. Therefore the supposed alternative to which this claim refers did not exist in the first place.

This comment also ignores the information provided in the draft EIS that no harvesting will occur in recognised areas of high conservation values ie in National Parks and other secure reserves, in wilderness areas or, until the EIS process is completed, in the areas of old growth forest in State forests set aside by the TI(IP) Act for investigation of their conservation values. It also ignores the legislative prohibitions and restrictions on logging in such areas.

Wingham Forest Action criticised the draft EIS as not seriously considering alternative land uses but notes that such land use decisions are made by governments not by SEPL, as was discussed in the draft EIS.

8.2
Other Resource Alternatives

Eucalypt Plantations

A number of submissions pointed to plantations, presumably of eucalypts, as a viable alternative. These submissions appear to overlook the fact that the SEPL proposal is partly based on thinning eucalypt plantations and that of the additional 58 000 tonnes per year of roundwood expected to come from State forests, 42 000 tonnes is expected to come from plantation thinnings (draft EIS Table 3.2). If the submissions were seeking to have further plantations established as a replacement source for culls and regrowth thinnings, these could not reach a thinnable age to provide a yield within the period covered by the EIS, ie in the 10 years to 2003.

Walcha-Nundle pine plantations

The use of wood from the Walcha-Nundle pine plantations to supply chips to SEPL in place of the eucalypt chips the subject of the SEPL proposal was not considered in the draft EIS since the export market available to the Company for

is for eucalypt woodchips not softwood chips. The use of pine chips is therefore not a feasible alternative and would not meet the objectives of the proposal.

Recycled Paper and Non-wood Fibres

The use of recycled paper or non-wood fibre crops such as kenaf, bagasse or wheat straw were not considered in the draft EIS since, although they may be alternative sources to producing the equivalent amount of pulp as the roundwood which is the subject of the SEPL proposal, the market available to SEPL is for eucalypt woodchips. These other sources therefore are not a feasible alternative.

The RAC Forest and Timber Inquiry examined the use of these sources. It reported (RAC 1992) that the use of waste paper in paper making is increasing although the costs limit the amount of recycling that can be achieved economically. The overall rate of waste paper input to paper making in Australia is predicted to rise to 53.3% in 1994/95.

On non-wood fibres, RAC reported that they would be unlikely to displace hardwood pulp in most papermaking operations. High transport costs from the areas most suitable for growing kenaf or bagasse (northern Australia) create a cost disadvantage relative to fibre from the native forests or pine plantations. Product superiority has not been proven. Growing non-wood fibres may also have environmental impacts, such as high nutrient requirements and potential nutrient run-off to streams, which could limit their acceptability

8.3 Manufacturing Alternatives

Several submissions, principally that from NEFA/NCEC, suggested the draft EIS should have considered the use of the roundwood from the designated sources for products other than export woodchips e.g. composite timber products (laminated veneer lumber, Valwood, Scrimber and medium density hardboard), ethanol or local pulp/paper production. If an economically viable market can be established for any of these products and the wood from the designated sources is suitable, then these products will compete for the resource with current purchasers like SEPL, which as pointed out in a submission from the SFNSW Central Region, does not have any long-term agreement for the purchase of pulpwood. Until a market for such products develops, they are not feasible alternatives to the export of eucalypt chips.

In considering these alternative uses for roundwood from the designated sources, it should be kept in mind that harvesting and transporting this roundwood would have very similar, if not identical, environmental impacts whatever its end-use.

9.0
REFERENCES

References used additional to those already quoted in the draft EIS.

Ch 4 - CULTURAL VALUES

Aboriginal Cultural Heritage

Bowdler, S., 1983, Aboriginal sites on Crown-timber lands of New South Wales, NSW Government Printer, Sydney.

Bruce, R., R. Lane and D. White, 1989, A computerised national register: the Register of the National Estate, in J. Flood, I. Johnson and S. Sullivan (eds) Sites and bytes, recording Aboriginal places in Australia , Australian Government Publishing Service, Canberra, pp 157-163.

Haigh, C., n.d., Some special Aboriginal sites, in National Parks and Wildlife Service, The Aborigines of New South Wales , NSW Government Printer, Sydney, pp 81 - 83.

Ch 5 - ENVIRONMENTAL SUSTAINABILITY

Climate

RAC, 1992. Forest and Timber Inquiry - Final report., Vol. 2A Resource Assessment Commission, AGPS, Canberra. March 1992.

Soils and Erosion Issues

CaLM 1993, Guidelines for Mitigation of Erosion and Land Degradation for Permanent Clearing on Protected Land, NSW Department of Conservation and Land Management, June 1993.

Minister for Planning 1993. Timber Industry (Interim Protection) Act 1992, Determination under Section 9(1) in relation to Wingham Management Area, March 1993.

Hydrology, Water Quality and Aquatic Systems

Balloch, D. (1994a, in prep). The aquatic environment:: description and assessment of the impact of the Proposal. Environmental Impact Statement, Grafton Management Area. Prepared by Margules Groome Pöyry Pty Ltd for State Forests of New South Wales.

Balloch, D. (1994b, in prep). The aquatic environment: description and assessment of the impact of the Proposal. Environmental Impact Statement, Grafton Management Area. Prepared by Margules Groome Pöyry Pty Ltd for State Forests of New South Wales.

Cornish, P.M. (1991, in prep). The effects of logging and forest regeneration on water yields in a moist eucalypt forest in New South Wales, Australia. State Forests of New South Wales, Research Division.

Lacey, (pers. comm., unpublished data) State Forests of New South Wales. Studies conducted in Glenbog and Yambulla State Forests, Eden Management Area

Vegetation

Austin, M.P. and Heyligers, P.C. 1989. Vegetation survey design for conservation - Gradsect sampling of forests in NE NSW Biol. Cons. 50:13-32.

Beadle, N.C.W. and Costin, A.B. 1952. Ecological classification and nomenclature. Proc. Linn. Soc. NSW 80:62-70.

Benson, D.H. 1985. Maturation periods for fire sensitive shrub species in Hawkesbury sandstone vegetatiion. Cunninghamia1: 339-50.

Binns, D. 1993. Do logged forests have any value for flora conservation - a preliminary look at NE NSW (unpubl. disc. paper).

Briggs, J. and Leigh, J.H. (in prep.) Rare or Threatened Australian Plants List. CSIRO.

Clark, S.S. 1988. Effects of hazard reduction burning on populations of understorey plant species on Hawkesbury sandstone. Aust. Jour. Ecol. 13:473-484

Forestry Commission of NSW1989. Forest Types in NSW Res. Note 17.

Hager, T.C. and Benson, J.S. 1992. Assessment of the Conservation Status of Forest Plant Communities in NE NSW Rept. to the Heritage Commission.

Roberts,G.W. 1992. Vegetation Systems of north-east New South Wales from LAND-SAT Imagery, NSW NPWS.

Specht, R.L. 1970. Vegetation. In Leeper, G.W. (ed.) The Australian Environment. CSIRO.

Stone, C. 1991. Insect attack of Eucalypt plantations and regrowth forests in NSW- A discussion paper. Forestry Commission of NSW.

Werren,G.L. and Allworth, D. 1982. Australian Rainforests; a Review. Monash Publication in Geography No 28, Monash University.

York, A., Binns, D. , and Shields, J. 1991. Flora and fauna assessment in NSW state forests - survey guidelines. version 1.1a. For. Comm. NSW

Fauna

Cogger H.G. 1992. *Reptiles and Amphibians of Australia.* AH and AW Reed, Sydney.

Cogger H.G, Cameron E.E., Sadlier R.A., Eggler P. 1993. *The Action Plan for Australian Reptiles.* Paragon Printers, ACT.

Garnett S. 1992. *The Action Plan for Australian Birds.* Pirie Printers, Canberra.

Minister for Planning. 1993. Timber Industry (Interim Protection) Act 1992, Determination under Section 9(1) in relation to Wingham Management Area, March 1993.

Minister for Planning. 1994. Timber Industry (Interim Protection) Act 1992, Determination under Section 9(1) in relation to Kempsey Wauchope Management Areas, March 1994.

Ch 7 - SOCIO ECONOMICS

CDT, 1994. National Ecotourism Strategy. Commonwealth Department of Tourism, March 1994.

IC, 1993. Adding further value to Australia's forest products. Industry Commission draft report, Canberra, May 1993.

OLG, 1991. Alternative employment creation and timber supply industries in North Queensland. A paper by J. Morison, S. Driml, and D. Hudson, contained in "Australian Regional Developments - 16. Understanding and Applying Input-Output Methods." Office of Local Government (DILGEA), AGPS, Canberra, 1991.

RAC, 1992. Forest and Timber Inquiry - Final report. Resource Assessment Commission, AGPS, Canberra. March 1992.

CH 8 - ALTERNATIVES

RAC, 1992. Forest and Timber Inquiry - Final report. Resource Assessment Commission, AGPS, Canberra. March 1992.

APPENDIX 1

Appendix 1

LIST OF SUBMISSIONS RECEIVED AND SUMMARY OF ISSUES RAISED

	Issue		A	B	C	D	E	F	G	H
	Submission									
1	Uralla Shire Council	Uralla					gii			
2	Colong Foundation for Wilderness	Sydney	clo	c		jiii				
3	NSW Environment Protection Authority	Bankstown				g	giii, iv	b,l		
4	Clarence Environment Centre	Grafton	acd m	af				m		
5	MJ Holland	Bowraville	acd m	f				m		
6	Gus Booyong	Elands	acd m	cf				k		
7	Leo Genereux	Mount George	ac m	c						
8	Bren Davies	Elands		c				k	g	
9	Manning Environment Centre	Upper Lansdowne	cd m	a				k		
10	North Coast Environment Centre	Grassy Head	ad	acef				k		
11	Secretary, Nambucca Valley Conservation Assn	Bowraville	am	c				k		
12	Matthew Dickinson	Armidale	m	cef				k		
13	Warren Gibbs	Wootton	mo			b		k		
14	Geoffrey W Frewin	Forster	dl						b	
15	R Cummings	Tamban via Eungai Creek	adl m	cef	aiii					
16	Graham Beston	Wingham	l				a		eg	
17	Sally ODonnell	Pillar Valley	cm	ce	aiii,iv					
18	B A Spence	Taree	cm	a						
19	Julie Newton	Wingham	l							
20	Fenning Timbers Pty Ltd	Walcha					nd			a
21	Mr C W Richardson	Wingham				jiii				
22	Cara Joss	Elands	acd lm	cf	aiii,iv		ab			
23	Noel McCabe	Viewmont	l			g	n			
24	J Mozsny	Viewmont	ac m	ac						
25	NSW Forest Products Association	Surry Hills					n			a
26	Australian Conservation Foundation	Sydney	o	ace		jiii		b		
27	Jennifer Allison	Elands						g	b	
28 &66	Dr Harry Parnaby	Camperdown	o	a		eii,fi-ii,fv, lm				
29	Upper North Arm Landcare Group	Bowraville	acd m	cef						
30	National Parks Association - Three Valleys Branch	Yarrahappinni	d	cef	aiii,iv			k		
31	Greg Viney	Kundabung	ac					g	b	
32	Wilderness Society - Hunter Branch	Newcastle	acd lm	acef	aiii,iv	fv	bg			

	Issue		A	B	C	D	E	F	G	H
	Submission									
33	Russell Westmore	Cooks Hill	ac	c						
34	Paula Kelly	Repton	l	ac					g	
35	Monica Saltarelli	Repton	a							
36	Mark J Spencer	Coffs Harbour						g	b	
37	Mark Evans	Tighes Hill	a	c				g		
38	Marcel Weingartner	Berlin, Germany							b	
39	Prem Giri	Nambucca Heads	a					g		
40	Fiona Goad	Hamilton North	ac	c				g		
41	WJ & PD Latona	Johns River	d	c				g		
42	Bellingen Environment Centre	Bellingen	f			hiv			g	
43	John Weate	Tuncurry		c						
44	Australian National Conservation Agency	Canberra	o			eiv,fvi, jiv,vi,ln				
45	Australian Heritage Commission	Canberra		c	ai-iii,bx					
46	Chris Battle	Repton							b	
47	Craig J Churcher	Repton						g		
48	Bushwalkers NSW		m	b			e	ag		
49	Annette Seabrook	Newcastle	a	c				g		
50	Susan de Sain	Balmoral	ac	c				g		
51	Bree Cunningham	Dudley	a	c				g		
52	Philip Margolis	Newee Creek	adc	c			a			
53	Diana Oliver	Broken Head	acd m	c						
54	National Parks Association - Armidale Branch	Armidale	cdg lmo	c		ji,jii,jv	abj kq			
55	Macleay Industry Development Office	Kempsey				civ	kln			
56	Wilderness Society	Armidale	acjl	acf		g				
57	President, Nambucca Valley Conservation Assn	Bowraville	alm o	c		hi-iii jiii	bn	h		
58	Carolyn Deutsch	Bowraville	ac	acf		gm	o		b	
59	Christine Heal	Gidgegannup WA							g	
60	Desnee McCosker	Coffs Harbour	acd m	acf	aiii,iv			g	bh	
61	Ms Jenny Skillen	Buttaba	ac	c				g		
62	Sally Jamieson	Mayfield	ac	c				g		
63	NSW Fisheries	Pyrmont				fvii, hviii,jiii				
64	Department of Conservation and Land Management	Sydney				cii,iii, jviii,,x,xi				
65	Wingham Forest Action	Elands	km no	acf	aiii,iv	ci,ghii,iii, v			a	
67	National Parks Association of NSW	Sydney	clo	c						
68	State Forests (Central Region)	Taree	e				hm			
69	Great Lakes Environment Association	Forster	adf o	cf	aiii,iv	jii,jxi		a		
70	Department of Water Resources NSW	Grafton				jvii				
71	Great Lakes Council	Forster				jxii,xiii,xiv				
72	Australian Museum	Sydney	e			jii,v,vii				

	Issue	A	B	C	D	E	F	G	H
	Submission								
74	North East Forest Alliance/ Lismore North Coast Environment Council	abc fm o	cf	aiii,iv. ,bviii, xi,	ci,d ei,ii,iii fi,iii,iv g,hi-vii, ji,ii, iii,k	abc efgi	ab cd efj	ab cd efg h	
75	NSW National Parks & Wildlife Service Hurstville	o	cde f	bi-vii	aciv,ev, vi,vii jii, jiii,v,ix o				
76	Forest Protection Society - Gloucester Branch Gloucester								b

Issues Identified (including codes for table above)

A EIS inadequate/inadequate Public Consultation

a Makes erroneous claims/misrepresents/fails to properly assess natural Environment

b Makes erroneous claims/misrepresents/fails to properly assess Socio-economic Environment

c Requirements of Impact Act & Procedures not fulfilled

d Management must be line with National Strategy for ESD

e Limited reasons for distinction between LSZ and ESZ, over 50% thinnings beyond LSZ by 2000.

f Inadequate public consultation, EIS display over holidays

g Need for project (i.e. to improve chip quality) spurious

h Danger that operations will become clear-felling

j This is woodchipping, so environmental impacts will be the same as Eden or Tasmania

k Fig 2.2 Missing from draft EIS

l Project will remove old growth forests

m Only considers part of SEPL operation

n Does "crown timber" and "Crown Timber Supply Zone" include crown lands other than State forests

o Relies on deficient State EISs

B Reserves/Areas of High Conservation Values

a Inadequate conservation reserves

b Wilderness areas impacted

c No approvals for exports from designated sources until CRAs undertaken and comprehensive etc reserve system established.

d Areas identified as wilderness by NPWS should be excluded until future management resolved

e Proposed action should not be undertaken in areas identified for reservation under NPWS Act or areas existing, nominated or being considered for WHA listing and buffer areas for WHA.

f No licence until world heritage assessed.

C Cultural Values

a National Estate Places/Values

- i Operations on private property may indirectly affect adjacent places on RNE
- ii insufficient info to assess effects of private property operations on places in RNE
- iii AHC not assessing nominations pending regional assessment of N Coast, concentrate forest operations to areas not affecting NE places directly or indirectly
- iv No licence until National Estate identified

C **Cultural Values (cont'd)**

b Aboriginal Cultural Heritage
- i Unwarranted assumption that new impacts are unlikely in previously cut-over areas
- ii Confusion over relevance of NPWs Act to protection on private property and other areas
- iii Confusion on site protection afforded under NPWS Act and RNE
- iv No clear mechanisms to identify and determine management requirements for private property or SFNSW sites.
- v Proposals/commitments in s9.10.2 of draft EIS (p209) do not meet identified need for further work
- vi NPWS Act aboriginal protection functions omitted from s6.2.1 of draft EIS
- vii No specialist archaeological/heritage report in appendices
- vii The archaeological research should be updated in final EIS
- viii No discussion of the implications of the Native Title Act, 1993
- ix No identification of Aboriginal groups' cultural associations with study area and consultation with such groups
- x Mitigation measures for Aboriginal places (draft EIS s9.10.2) apply only to Crown land

D **Environmental Sustainability**

a List should be prepared of State forests and forest types from which operations should be excluded or only undertaken under stringent conditions

b No assessment of added or of cumulative impact of predicted increase in round wood on fauna (S92 of NPWS Act may require licensing of proponent)

c Soils and Erosion Issues
- i discussion of Geology/Soils inadequate
- ii CaLM guidelines for Mitigation of Erosion and Land Degradation for Permanent Clearing on Steep Protected Land relevant as well as SEMGLs
- iii SEMGLs need to be interpreted for conditions at particular site.
- iv crown land safeguards (SEMGL) do not apply to PP.

d Rainforest logging still occurs contrary to EIS statement

e Vegetation
- i no description of regional, national or state significance
- ii no regional overview of vegetation systems,
- iii no information on conservation status
- iv thinning regrowth is a major disturbance to vegetation
- v EIS does not specify safeguards for rare or threatened plants
- vi thinning where unacceptable spp occur in compartment likely to alter spp composition
- vii action should be excluded on all areas where ESP Act Sched 1 spp occur

f Fauna
- i terrestrial vertebrate info inadequate, wrong,
- ii no regional overview
- iii invertebrate discussion only token,
- iv national significance misrepresented
- v population declines and local extinctions not discussed
- vi endangered and threatened species could be affected
- vii Trout Cod not found in Richmond River

g No discussion of global warming, UV-B or effects of these on impacts of operations, incorrectly quotes RAC

h Hydrology, water quality and aquatic systems
- i degree of predicted impacts too low, spatial scales arbitrary and meaningless
- ii catchment hydrology changes and water yield impacts underestimated
- iii stream sedimentation discussion inadequate
- iv no description of regional water quality in major rivers of supply zones
- v no apparent attempt to assess aquatic ecosystems; not covered in NSW EISs
- vi stream surveys inadequate
- vii discussion of predicted effects of fire and roads unsatisfactory

D Environmental Sustainability (contd)

j Private property -
- i no description of environment
- ii no regional context or cumulative impacts analysis, NSW EIS's do not substitute on private property
- iii planning and management inadequate to identify and protect conservation values
- iv ESP Act requires surveys and, where appropriate, recovery plans
- v provides incentive for clearing, landowners should make legal commitment to manage for long term forest production before permitted to sell for export chips
- vi information is not available which would permit the discontinuation of individual property assessments
- vii should be condition of export licence that private property logging should conform to same standards and procedures as State forests
- viii general protection guidelines need interpretation for individual sites
- ix private property logging will have to comply with NPWS Act requirements
- x CaLM approval procedures for Protected Land logging may be basis for adaption.
- xi training required for SEPL contractors and staff in field identification of env factors
- xii fauna info from SFNSW EIS's limited for private property, no assessment of cumulative impact
- xiii assessment of impacts generalised, regional wide, not of use to Local Government Councils in assessing private property proposals
- xiv mills without development consent for chipping prevent levying of road charges for haulage from private property to mill and then to Raymond Terrace.

k Nutrient, loss through logging threatens long term productivity/resource security

l Impacts on Habitat Trees and habitat mosaics

m Silvicultural thinning will mean significant removal of hollow bearing trees or future replacements

n ESP Act now in force, scope includes ecological communities

o Insufficient info or data to assess impacts of cull operations on OGF, confusion over proportion of culls in 500 000t; proposed action should not be undertaken in OGF.

E Resources

a Woodchipping allows otherwise uneconomic logging

b Abuse of sawlog/woodchip categories; sawlogs chipped,

c Residues classed as silvicultural or logging at whim

d Silvicultural thinnings should be preferred source of non sawmill chips

e State Forests management not ecologically sustainable as required by Corporate Plan and National Strategy

f Mills inadequately identified, compliance with Council requirements not assessed and adequacy of mills waste management not assessed

g Transport
- i confused, inadequate, only discusses expected increases ,marginal impacts
- ii Concern at road damage
- iii use of rail not road
- iv transport noise in urban areas

h Discrepancy between likely roundwood intake (Table 3.2) and proposed increase shown in Section 3.1.

j Table 3.1 shows larger quantities of salvage than regrowth thinnings for Dorrigo and Urunga districts - therefore more salvage will be taken than regrowth

k Use of small logs reduces take to smaller sawmillers

l Use of regrowth further reduces sawmills' opportunity to sell current wastes

m SFNSW preference for balance between thinning and culling

n Round wood use should only be permitted when sawmill wastes used to maximum extent possible; current level of sawmill chips to other sources (65%) should be maintained

o Why allow (large scale) clearing of private property when Governments encouraging large scale replanting programs

E Resources (cont'd)

p SEPL has no guaranteed pulpwood supply from SFs

q False claims by w/c industry that it does not provide incentive to increase overall harvesting

F Socio-economics

a Royalties not discussed, no assessment of realistic return on Public asset

b Woodchipping susidises land clearing

c Economic benefits misrepresented; financial returns shown but not associated costs

d Employment stats unsubstantiated, inflated, baseless multipliers; Structural Adjustment Package not considered

e Recreational values and impacts on not covered

f No attempt to determine env degrade costs (water yield/quality, soil loss, spp reductions)

g Export of woodchips nationally uneconomic/should value add in Australia

h 1986 Census figures used 2 years after 1991 census

j No assessment socio-eco impacts (and means of mitigating) of stopping woodchipping

k Woodchipping displaces more favourably economic labour intensive sawmilling

l Insufficient info to measure costs and benefits

G Alternatives

a Inadequate - only resource/manufacturing alternatives considered

b Plantations viable alternative

c Composite timber production

d Ethanol production

e Local pulp/paper production

f Walcha-Nundle pine plantations

g Alternative fibres for pulp

h Use of recycled paper

j Inadequate - ignores alternative of exclusion of woodchipping from areas with high conservation values

H Support for the Proposal/Industry

a Allows use of lower standard of input to sawmills as additional waste is saleable

b Limited uses for lower quality logs and thinnings, no other market for hwood chips than export

APPENDIX 2

Appendix 2

MULTIPLIERS FOR FORESTRY PROJECTS

A. Introduction - the derivation of multipliers

Multipliers are factors, or vectors, which describe the magnitude of the transactional linkages that exist between all sectors of a defined economy. They can be used to provide a simple and concise summary of the economic impact of marginal changes in the output (sales) of a particular industry sector, via changes imposed on indicators such as wages and employment. Multipliers are generally derived from Input-Output (I/O) tables compiled for that economy (whether at a national or smaller level). These tables provide a description of the financial linkages existing between each sector of the defined economy, and all other sectors, via numerous transactions. An Input-Output table essentially consists of a matrix, with every sector of the defined economy being assigned both a row and a column in that matrix, and each cell of the matrix then describing the relationship between the relevant industry sectors, in buying inputs and selling outputs.

A mathematical manipulation of these data allows the calculation of vectors which describe the actual effect, on each sector, of changes in demand for the output of one particular sector. The sum of the vectors in any one column provides the "multiplier" for that industry - i.e., the vector describing the relationship between expansion in that sector, and in the total economy. A Type I (or simple) multiplier describes the relationship between the initial stimulus and all production-generated (indirect) effects, while a Type II (total) multiplier considers both production-generated and consumption-generated (induced) effects.

The Australian Bureau of Statistics compiles national I/O tables, and other researchers have developed tables for some States and regions. Multipliers are therefore not only industry-specific, but also "area" specific - reflecting both the economic structure of the region examined, and the role of the selected industry within that economy.

The derivation of multipliers via the I/O approach thus requires large data collection studies to be conducted, which can be expensive and time-consuming, and with the final accuracy of results very dependent on the survey data collected from individual firms operating within that economy. Examples of such studies include the detailed analysis of the Hunter Valley economy conducted by the Hunter Valley Research Foundation (HVRF, 1979). Because of the need for significant amounts of original research to construct region-specific I/O tables, other studies have used more empirical methods, such as the GRIT (Generation of Regional Input-Output Tables) technique developed by Mandeville, Jensen, and West. These studies construct I/O tables (from which multipliers can be derived) by making adjustments to national tables, so as to reflect specific structural characteristics of the region examined. Multipliers obtained from GRIT methodologies have been used extensively in Australia, such as the series of impact assessments relating to economic developments at Gladstone (Mandeville and Jensen, 1979), and to the role of irrigated agriculture within the regions of NSW (Powell, 1985).

I/O analysis is generally accepted as being the most accurate technique available for the calculation of multipliers. However, given the very significant time (and thus cost) requirements in obtaining data in I/O analysis, other methodologies are also used for the derivation of multiplier estimates. In addition to the GRIT techniques, these include economic base theory, and Keynesian income determination. All methods can produce valid estimates, but care must be taken when comparing multipliers, to ensure consistency.

B. Relevant Multiplier Studies

Specific studies have been conducted within NSW, relating to particular regions (e.g. HVRF, Powell), or to particular industries (Powell). Other studies have examined the impacts of the timber industry within a defined area, and can thus provide industry/region specific multipliers. However, few of these studies are directly appropriate for use in the context of economic impact assessment of the native forest industry in Eden - one relates to the softwood industry based around Oberon (Dwyer Leslie, 1990), other relate to proposals for a pulp and paper mill to be established in East Gippsland (CIE, 1989: NIEIR, 1989), while other studies have derived estimates for hardwood timber activities in other regions (Kable, 1981).

The Victorian Government has compiled a listing of multipliers available for assessment of output, income, and employment impacts of the timber-based industries throughout Australia (DCLFV, 1985). This listing contained no multipliers that were directly relevant to the hardwood timber industry in NSW. The Ferguson Inquiry (Ferguson, 1985) in Victoria provided some indication of the estimated impact of timber-based industries in rural regions characterised by little alternate sources of economic activity.

The need to derive multipliers that are specific to both the industry being examined (the activities based on the native hardwood resource), and also to the region (the area around Eden, NSW), makes this studies of limited use. However, the various studies referred to here do at least provide some guide against which multiplier estimates prepared for Eden can be assessed.

C. Basis for selection of multipliers for Eden economic studies.

The basis for the selection of multipliers relevant to the forest-based industries of the Eden region has been described at length in earlier studies (HDA, 1986; FC NSW, 1988). Effectively, these multipliers were derived by a combination of empirical data and adaptation of multiplier estimates developed by other researchers.

The empirical data were obtained in relation to the actual operations in the Eden area. This approach was possible because the industry was already in existence and thus "real" data could be obtained to quantify industry linkages with other sectors. Total multipliers derived could also be checked against comparable data derived for close (and very similar) regional economies, as developed by the Ferguson Inquiry. As a result of this "combination" approach, values were selected for output and for employment multipliers. These estimates all represent total (or Type II) effects on the regional economy:

Income/Output	1.58
Employment	
— in forests	2.32
— in mills	2.00
— in administration	1.80

It is recognised that there are limitations in the use of I/O Analysis as a basis for the assessment of regional economic impact of a specific industry. However, it is also generally accepted that the overall economic effect of a specified industry is wider than the direct effects, as a result of the multiplier, or "flow-on" effects. The use of multipliers is thus an accepted part of the assessment of regional economic impacts of development and/or industries, and as such is used in the process of environmental impact assessment. Other criticisms relate to the selection of particular multipliers. In an attempt to portray the range

of data that has been developed for use as estimates of multipliers in relation to the forestry and timber industry, a partial listing has been prepared. This list is produced below, together with a reference to the source of the data. This list excludes:

- Type I multiplier estimates, as these do not allow any consideration of the induced effects which are accepted as being the major part of total impact (Jensen and West, 1983).

- Multipliers derived from studies conducted in areas concerned only with softwood production (the Dwyer Leslie study, and much data from South Australia).

Compared to the data presented below, the multipliers selected for use in the assessment of regional economic impact relating to hardwood forestry operations in the Eden region must be considered appropriate, and even conservative. As would be expected, smaller multipliers are derived for smaller areas (e.g., Shire v region v State), and also for higher value-adding operations (e.g., a pulpmill) which depend more on capital, as a factor of production, than on other intermediate inputs and labour.

Region	Year	Source	Multipliers presented/used		
Tasmania (State)	1980/81	DCFLV, 1985	Forestry & logging -	Employment IIA	2.91
				Income IIA	2.16
			Log sawmilling -	Employment IIA	2.70
				Income IIA	2.73
			Resawn & dressed timber	Employment IIA	3.23
				Income IIA	3.29
			Woodchips, export	Employment IIA	12.21
				Income IIA	8.06
SW of WA (region)	1975/76	DCFLV, 1985	Forestry & logging	Employment IIA	3.22
				Income IIA	2.61
			Wood/Paper Products	Employment IIA	3.49
				Income IIA	4.42
E Gippsland (Region)	n.s.	CIE, 1989	Pulp mill	Employment (?II)	1.61
			For State	Employment (?II)	3.30
				Income (?II)	2.12
Orbost (Shire)	n.s.	NIEIR, 1989	Pulp mill	Employment (?II)	1.40
E Gippsland (Region)	n.s.	Ferguson, 1985	Forestry & logging	Employment IIA	2.32
				Income IIA	2.50
			Log sawmilling -	Employment IIA	2.00
				Income IIA	1.98
Grafton (Region)	n.s.	Kable, 1981	Timber industry (total)	Income IIA (Keynsian income determination)	2.04

References

CIE, 1989. Economic Impact of a pulp mill development in East Gippland. Report prepared by the Centre for International Economics, Canberra, 1989.

DCFLV, 1985. Review of Sector Multipliers - forestry, logging and wood processing. A paper prepared for the Forest and Forest Products Industry Council by the Economic Group, Department of Conservation, Forests and Lands, Victoria, 1985

Dwyer Leslie, 1990. Oberon: Rural Community Development Study, Year One Report - Overview. A report prepared for the Forestry Commission of NSW by Dwyer Leslie Pty Limited, Canberra, September 1990.

FC NSW, 1988. Forestry Operations in the Eden Management Area - Environmental Impact Statement. Report Pr4epared by the Forestry Commission of NSW, Sydney, 1988

Ferguson, 1985. Report of the Board of Inquiry into the Timber Industry. Inquiry conducted under the Chairmanship of Prof Ian Ferguson, Victoria, 1985

HDA, 1986. Draft Environmental Impact Statement for the Eden (NSW) Export woodchip Operation for the period 1989-2009. Report prepared by Harris Daishowa (Australia) Pty Ltd, April 1986.

HVRF, 1979. New Input-Ouput tables for the Hunter Region, NSW. Report prepared for the Hunter Valley Research Foundation, Newcastle,NSW, by Steve Garlick, November 1979

IC, 1993. Adding further value to Australia's forest products. Industry Commission draft report, Canberra, May 1993.

Jensen & West, 1983. The Nature of Australian Regional Input-Output multipliers. A paper by R.C.Jensen and G.R.West, in "Prometheus", Vol 1, No 1, pp 202-221, June 1983.

Kable, 1981. An estimate of the economic multiplier generated by the timber industry on Grafton and region. A report by J.C.Kable, Head of the Department of Management, Queensland Institute of Technology, October 1981.

Mandeville & Jensen, 1978. The Impact of Major Development Projects on the Gladstone/Calliope, Fitzroy, Queensland and Australian Economies: An application of Input-Output Analysis. Report to the Department of Commercial and Industrial Development and Comalco Limited, prepared by D.T.Mandeville and R.C.Jensen, Department of Economics, University of Queensland, Brisbane 1978.

NIEIR, 1989. A Pulp and Paper Mill in East Gippsland: Implications for Orbost Shire Council. A report for the Shire of Orbost, prepared by the National Institute of Economic and Industrial Research, Melbourne, June 1989.

OLG, 1991 Alternative employment creation and timber supply industries in North Queensland. A paper by J. Morison, S. Driml, and D. Hudson, contained in "Australian Regional Developments - 16. Understanding and Applying Input-Output Methods." Office of Local Government (DILGEA), AGPS, Canberra, 1991.

Powell, 1985. The Economic Impact of Irrigated Agriculture on the NSW Economy. Report prepared for the NSW Irrigators' Council Limited, Leeton, NSW, by Dr R.A.Powell, et al, 1985.

RAC, 1992. Forest and Timber Inquiry - Final report. Resource Assessment Commission, AGPS, Canberra. March 1992.

APPENDIX 3

Appendix 3

TABLE 1
CONSERVATION STATUS OF FOREST TYPES FOUND IN THE SEPL STUDY AREA

Community types recognised by the NPWS (Hager & Benson, 1992) are included with indications of the areas contained in each tenure, the proportion of each community currently conserved, the priority rating for each community, and an indication of which sub-areas (north, central, south) have not achieved 10% reservation.

Forest Type	NPWS Equivalent	NPWS	Forestry Commission	Percent Conserved	Rating	Sub areas		
						N	C	S
36	EF115	21	17	LT10-LT25	3			x
	EF116a							x
	EF116b							
	EF117							x
37	EF118	4	17	LT5-LT10	3	x	x	x
38	EF247	1	5	LT10-LT25	3		x	x
	EF372							
39	EF140				1	x	x	x
40	EF211	6	1	LT10-LT25	3			x
41	EF201	8	2	LT25-GT25	5	x		
42	No Equiv.							
46	EF102	3	19	LT5-LT10	3	x	x	
	EF145	1						
47	EF103	15	28	LT10-LT25	5		x	x
48	EF100	10	17	LT1-LT5	2	x	x	x
	EF147	0	0				x	
49	EF138	3	8	LT1	1	x	x	x
51	EF105	1	3	LT10	3	x	x	
52	No Equiv.							
53	EF101	28	41	LT10-LT25	3			x
54	EF104	1	2	LT10-LT25	3		x	
60	EF109	5	12	LT1-LT5	2	x	x	x
	EF203a	0						x
	EF203b	3				x	x	
61	EF210	0	3	LT5-LT10	3	x	x	x
	EF251	1						
62	EF110	11	13	LT10-LT25	3		x	x
	EF348	1	0	LT25-GT25	5			
	EF378					x		
	EF382							
64	EF139	1	2	LT10-LT25	3	x		x
65	EF146	1	5	LT10-LT25	3		x	x
	EF615	4						
70	EF121	4	6	LT5	2	x	x	x
72	EF141	0	3	LT1	1	x	x	x
74	EF123	6	7	LT1-LT5	2	x	x	x
	EF205	1						
76	EF140	0	0	LT1	1	x	x	x
80	EF143	0	3	LT1	1	x	x	
82	WL115	1	3	LT1	1	x	x	x
84	EF609	0	3	LT1	1	x		
85	WL116	4	1	LT5-LT10	3	x		x
87	EF144	0	1	LT1	1		x	x
	EF124	0	2	LT1		x	x	
92	EF111	12	7	LT5-LT10	3	x	x	x
93	EF112	1	0	LT5	2		x	x
	EF120a	1					x	x
	EF120b	1				x	x	
101	EF345	1	1	LT1	1	x	x	x
105	EF250	1	1	LT5-LT10	4			x
106	EF228							
110	EF330	0	0	LT1	1		x	x

Forest Type	NPWS Equivalent	NPWS	Forestry Commission	Percent Conserved	Rating	Sub areas N	C	S
111	EF323	1	1	LT5-LT10	3	x	x	x
	EF324	4						
	EF325	0	0	LT1	1	x	x	
117	EF206	9	1	LT5	2	x	x	x
	EF207	0						
121	EF133	0	1	LT5-LT10	4			x
	EF134	1						
122	EF349	3	0	LT1-LT5	2	x	x	
	EF351	0			1			
	EF352	0			1			
	EF353	1			2			
	EF354	0			1			
	EF355	1			2			
	EF356	1			2			
	EF357							
	EF360							
	EF381	0			1			
123	EF134	1						
124	EF341	1	0	LT5-Lt10	3	x	x	x
126	EF204	3	1	LT1	2	x	x	x
	EF209	2						
136	EF301	1	1	LT25-GT25	3	x	x	
137	EF376	0	0	LT1	1	x	x	
138	EF312	1	2	LT1	1	x	x	x
140	EF302a	1	1	LT10-LT25	3			
	EF302b	1					x	x
	EF303	1			x	x		
141	EF335	0	0	LT11		x	x	x
142	EF365	0	0	LT11		x	x	
	EF366	1						
	EF367	0						
151	EF313	1	2	LT10-LT25	5		x	
152	EF316	2	3	LT1-LT5	2	x	x	x
153	EF317	2	1	LT1-LT5	2	x	x	
	EF375	0	2	LT5-LT10	3	x	x	x
154	EF314	1	2	LT5-LT10	4		x	x
155	EF314	1	2	LT5-LT10	4		x	x
	EF379	1					x	x
159	EF308	1	2	LT1	1	x	x	
	EF309	0						
160	EF317	2	1	LT1-LT5	2	x	x	
161	EF107	1	1	LT1-LT5	2	x	x	
	EF108	2						
163	EF358	12	23	LT25-GT25	5			
	EF3599							
	EF360	6						
	EF361	1						
164	EF368	1	1	LT1	1		x	x
165		(mainly south coast)						
167	EF346	0	5	LT1	1	x	x	x
	EF347	0				x	x	
168	EF373	1	3	LT5	2	x	x	x
	EF374	0						
	EF364	0				x	x	
169		(mainly south coast)						
172	EF350	0		1				
	WL124							
175	No equiv							
176	EF362							

TABLE 2
CONSERVATION STATUS OF ADDITIONAL FOREST TYPES FOUND IN THE SEPL STUDY AREA BUT NOT RECOGNISED IN STATE FOREST MANAGEMENT PLANS

Community types recognised by the NP & WS (Hager & Benson, 1992) are included with indications of the areas contained in each tenure, the proportion of each community conserved currently, the priority rating for each community, and an indication of which sub-areas (north, central, south) have not achieved 10% reservation.

Forest Type	NPWS Equivalent	NPWS	Forestry Commission	Percent Conserved	Rating	Sub areas		
						N	C	S
30	EF202	8	0	LT10-LT25	3	x	x	
45	EF138	3	8	LT1	1	x	x	x
68	EF203a	0						x
71	EF142	0	3	LT1	1	x		
73	EF125	1	1	LT1	1	x	x	x
81	EF143	0	3	LT1	1	x	x	
83	No equiv.							
97	EF212	1	3	LT1-LT5	2	x	x	
	EF213	3					x	x
	EF253	0	0				x	
98	EF310	0	1	LT1	1	x	x	
109	EF328	0	0	LT1	1		x	x
115	EF228	21	17	LT10-LT25	3			x
116	EF249							
119	EF222							
127	EF250	1	1	LT5-LT10	4			x
128	EF249							
129	EF252	0	0	LT1	1		x	
	EF342	0	0	LT1	1	x	x	
130	EF223	2	0	LT1	1	x	x	x
131	EF327	0	1	LT1	1	x	x	x
158	EF315	1					x	x
	EF343	0	0					x
203	WL118							
207	EF612	0	0	LT1	1	x		
215	EF208	5	0	LT5	2	x	x	x
225	EF240	0	0	LT1	1			x
	EF248	1	0	LT25-GT25	5			
	EF304	1	0	GT25	5			
No equiv.	EF254	0	0	LT1	1	x		
No equiv.	EF255	0	0	LT1	1		x	
No equiv.	EF380	0	0	LT1	1		x	

TABLE 3
FOREST TYPES WITH HIGH CONSERVATION PRIORITY

"1" Rating (<1%)	"2" Rating (<5%)
39 Blackbutt-Spotted Gum	48 Flooded Gum
45 Tallowwood	60 Narrowleaved White Mahogany-Red Mahogany-Grey Ironbark-Grey Gum
49 Turpentine	70 Spotted Gum
71 Richmond Range Spotted Gum	74 Spotted Gum-Ironbark/Grey Gum
72 Spotted Gum-Grey Box	93 Eastern Red Gums
73 Spotted Gum-Sydney Blue Gum/ Bangalay	97 Needlebark Stringybark
76 Spotted Gum-Blackbutt	117 Scribbly Gum
80 Grey Ironbark-Grey Box	122 New England Stringybark
81 Grey Box-Northern Grey Gum	126 Stringybark-Bloodwood
82 Grey Box	152 Messmate-Gum
84 Ironbark	153 Messmate-Silvertop Stringybark
87 Steel Box-Craven Grey Box	160 Manna Gum-Stringybark
98 Dorrigo White Gum	161 Roundleaved Gum
101 Blue Mountain Ash	168 Silvertop Stringybark-Gum
109 Brittle Gum	215 Coast Cypress Pine
110 Brittle Gum-Peppermint	
111 Peppermint (EF325)	
122 New England Stringybark (EF 351,352,354,381)	
129 Rough Barked Apples	
130 Red Bloodwood	
131 Peppermint-Mountain/Manna Gum	
137 Black Sallee	
138 Snow Gum	
141 Candlebark	
142 New England Peppermint	
159 Mountain/manna Gum	
164 Eurabbie	
167 Silvertop Stringybark	
172 Yellow Box-Blakelys Red Gum	
207 Silverleaved Ironbark	
225 Mallee	
EF254 *Eucalyptus ophitica - E. maculata*	
EF255 *Eucalyptus magnificata - E. conica-E. blakelyi*	
EF380 *Eucalyptus camphora* ssp. *relicta*	

TABLE 4
ENDANGERED PLANT SPECIES WHICH OCCUR IN THE SEPL STUDY AREA

Spp known to occur in state forests	Spp not as yet found in state forests
Corchorus cunninghamii *Marsdenia longiloba* *Ochrosia moorei* *Olearia flocktoniae* *Syzygium paniculatum* *Tylophora woolsii* *Uromyrtus australis*	*Acronychia littoralis* *Allocasuarina defungens* *Arthraxon hispidus* *Astrotricha roddii* *Austromyrtus fragrantissima* *Boronia granitica* *Cynanchum elegans* *Davidsonia pruriens var jerseyana* Davidsonia sp. *Digitaria porrecta* *Diospyros mabacea* *Diploglottis campbellii* *Diuris pallens* *Elaeocarpus williamsianus* *Endiandra floydii* sp 1. *Fontainea oraria* *Grevillea beadleana* *Kunzea rupestris* *Lepidium hyssopifolium* *Quassia* sp 1. *Randia moorei* *Zieria prostrata*

TABLE 5
VULNERABLE PLANT SPECIES WHICH OCCUR IN THE SEPL STUDY AREA

Spp known to occur in state forests	Spp not as yet found in state forests	
Acacia ruppii	*Acacia bakeri*	*Fontainea australis*
Amorphospermum whitei	*Acacia bynoeana*	*Goodenia macbarronii*
Angophora robur	*Acacia courtii*	*Grevillea evansiana*
Asperula asthenes	*Acacia flocktonii*	*Haloragis exaltata*
Callitris oblonga	*Acacia pubescens*	*Hicksbeechia pinnatifolia*
Corokia whiteana	*Acianthus ledwardii*	*Homoranthus darwinioides*
Desmodium acanthocladum	*Allocasuarina simulans*	*Isoglossa eranthemoides*
Diurus venosa	*Baloghia marmorata*	*Kennedia retrorsa*
Eucalyptus benthamii	*Bertya ingramii*	*Lasiopetalum longistamineum*
Eucalyptus camphora ssp. *relicta*	*Bertya pinifolia*	*Leucopogon confertus*
Eucalyptus glaucina	*Bosistoa selwynii*	*Macadamia tetraphylla*
Eucalyptus nichollii	*Bosistoa transversa*	*Myriophyllum implicatum*
Eucalyptus pumila	*Bothriochloa biloba*	*Persicaria elatior*
Eucalyptus tetrapleura	*Brasenia schreberi*	*Phaius australis*
Grevillea scortechinii	*Bulbophyllum globuliforme*	*Pimelea venosa*
Melaleuca groveana	*Caladenia tesselata*	*Phebalium sympetalum*
Owenia cepiodora	*Choricarpia subargentea*	*Pomaderris costata*
Phaius tancarvilliae	*Clematis fawcettii*	*Prostanthera cinefolia*
Prostanthera teretifolia	*Corynocarpus rupestris ssp rupestris*	*Prostanthera densa*
Pultenaea campbelli	*Cryptocarya foetida*	*Prostanthera discolor*
Pultenaea stuartiana	*Cryptostylis hunteriana*	*Prostanthera staurophylla*
Sarcochilus fitzgeraldii	*Dichanthium setosum*	*Pultenaea glabra*
Sarcochilus hartmanii	*Dillwynia tenuifolia*	*Quassia bidwillii*
Symplocos bauerienii	*Diuris aequalis*	*Rutidosus heterogama*
Tasmannia glaucifolia	*Diuris* sp 5.	*Sarcochilus weinthalii*
Tasmannia purpurascens	*Endiandra hayesii*	*Sophora fraseri*
Tetratheca juncea	*Eriostemon ericifolius*	*Syzygium hodgkinsoniae*
	Eucalyptus camfieldii	*Syzygium moorei*
	Eucalyptus mckieana	*Tetratheca glandulosa*
	Eucalyptus parramatensis decadens	*Thesium australe*
	Eucalyptus rubida barbigororum	*Thozetia racemosa*
	Eucalyptus scoparia	*Tinospora tinosporoides*
	Euphrasis bella	*Wahlenbergia glabra*
	Floydia praealta	

APPENDIX 4

Appendix 4

TABLE 1
SPECIES INFORMATION OBTAINED FROM EISs & FISs CONDUCTED FOR FORESTRY OPERATIONS IN THE STATE FORESTS WITHIN THE SEPL SUPPLY ZONE

Additional species were also included on the basis of distributional maps (see Cogger 1992, Blakers et al 1984, Swan 1990).

CODES FOR TABLE 1

HABITAT CODES

1	Rainforest	2	Wet Sclerophyll
3	Dry Sclerophyll	4	Woodland
5	Shrubland	6	Grassland
7	Littoral Rainforest	8	Heath
9	Wetland	10	Mangrove
11	Coastal Scrub	12	Riparian
13	Arid Woodland	14	Urban
15	Forest-grassland Ecotone	16	Streamlines
17	Aquatic	20	A wide variety of habitats
21	Rock Outcrops	22	Montane
23	Mallee & Mulga		

TABLE CODES

LSZ	Likely Supply Zone	H	Forest-dependent species
ESZ	Extended Supply Zone	Bold:	Schedule 12 species (NP&W Act 1974)

H Forest-dependent species are defined in this report as those fauna species which are considered to be dependent on eucalypt forest or rainforest for all or a significant portion of their life-cycles. In particular, species requiring eucalypt forest which may be subject to harvesting operations or silvicultural treatment, and/or rainforest, are regarded as 'forest-dependent'. Species which rely solely on woodland habitats are not included, as these communities are generally of little value for timber harvesting.

SOURCES

M Proposed forestry operations in the Mount Royal Management Area. Environmental Impact Statement. FCNSW 1992.

W Wingham Management Area proposed forest management. Environmental Impact Statement. FCNSW 1992.

G Proposed forestry operation in the Glen Innes Forest Management Area. Fauna Impact Statement. Austeco Pty Ltd for FCNSW 1992.

D Proposed forest operations - Dorrigo Management Area. Environmental Impact Statement. FCNSW 1992.

T Proposed forestry operations in Mistake State Forest. Environmental Impact Statement. FCNSW 1991.

C Management Plan for Wauchope Management Area. FCNSW 1988.

F Management Plan for Grafton Management Area. FCNSW 1987.

K Management Plan for Kempsey Management Area. FCNSW 1988.

B Bulahdelah Management Plan. FCNSW.

U Management Plan for Urunga Management Area. FCNSW 1984.

R Dickman CR and McKechnie CA. 1985. Mammals of Mount Royal and Barrington Tops, NSW. *Aust Zool* 21: 531-543.

N Management Plan for Walcha-Nundle Management Area. FCNSW 1987.

L Management Plan for Kendall Management Area. FCNSW 1992.

O Management Plan for Gloucester Management Area. FCNSW 1984.

A Blakers M, Davies SJJF and Reilly PN. 1984. *The Atlas of Australian Birds.* Royal Australasian Ornithologists Union. Melbourne University Press.

* Additional records included because their published distributions fall within the SEPL area.
Distribution maps from: Cogger HG. 1992. *Reptiles and Amphibians of Australia*
Swan G. 1990. *Snakes and Lizards of New South Wales.*
Due to the small scale of these maps, the LSZ and ESZ of the SEPL area could not be separated.

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
MAMMALS					
Platypus	*Omithorhynchus anatinus*		12,16,17	WMCRNLO	DGFK
Echidna	*Tachyglossus aculeatus*		20	WMCNLO	DGFK
Tiger Quoll	***Dasyurus maculatus***	H	**1,2,3,4**	**WMCNLO**	**DGTFK**
Yellow-footed Antechinus	*Antechinus flavipes*	H	1,2,3,4,5	WO	DGF
Brown Antechinus	*Antechinus stuartii*	H	1,2,3	WMCNLO	DGTFK
Dusky Antechinus	*Antechinus swainsonii*	H	1,2 - high elav.	WMCRNLO	GK
Brush-tailed Phascogale	***Phascogale tapoatafa***	H	**3**	**WMCRNLO**	**DGTFK**
Common Planigale	***Planigale maculata***	H	**1,2,3,4,6,9**	**WO**	**G**
Narrow-nosed Planigale	*Planigale tenuirostris*		6		G
Common Dunnart	*Sminthopsis murina*	H	2,3,4,8	MCNLO	DGFK
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	H	1,4,6	N	G
Northern Brown Bandicoot	*Isoodon macrourus*	H	2,3,4,6	WMLO	DGFK
Long-nosed Bandicoot	*Perameles nasuta*	H	1,2,3	WMCNLO	DGFK
Koala	***Phascolarctos cinereus***	H	**2,3,4**	**WMCNLO**	**DGFKU**
Wombat	*Vombatus ursinus*	H	2,3 - grassy	WMCRNO	G
Mountain Brushtail Possum	*Trichosurus caninus*	H	1,2,3	WMCNLO	DGTFKU
Common Brushtail Possum	*Trichosurus vulpecula*	H	2,3,4,15	WMCNLO	DGTFKU
Eastern Pygmy-possum	*Cercartetus nanus*	H	1,4,8	WO	DG
Yellow-bellied Glider	***Petaurus australis***	H	**2,12**	**WMCNLO**	**DGTFKU**
Sugar Glider	*Petaurus breviceps*	H	1,2,3,4	WMCNL O	DGTFKU
Squirrel Glider	***Petaurus norfolcensis***	H	**2,3,4**	**WO**	**DG F**
Greater Glider	*Petauroides volans*	H	2,3	WMCNLO	DGTFKU
Common Ringtail Possum	*Pseudocheirus peregrinus*	H	1,2,3,12	WMCRNLO	DGTFK
Feathertail Glider	*Acrobates pygmaeus*	H	2,3,4,5,8,11	WCNLO	DGFK
Rufous Bettong	***Aepyprymnus rufescens***	H	**2,3,4,15**	**MNO**	**DGF**
Long-nosed Potoroo	***Potorous tridactylus***	H	**2**	**WMCO**	**DGF**
Black-striped Wallaby	***Macropus dorsalis***	H	**2,3,4,(6)**		**G**
Eastern-grey Kangaroo	*Macropus giganteus*	H	3,4,15	WMRNLO	DGFK
Parma Wallaby	***Macropus parma***	H	**1,2,3,15**	**WMCNO**	**DGTFK**
Whiptail Wallaby	*Macropus parryi*	H	2,4,15	N	GF
Common Wallaroo (Euro)	*Macropus robustus*		15-rock sites	WMNO	DGFK
Red-necked Wallaby	*Macropus rufogriseus*	H	2,3,8,15	WMCNLO	DGTFK
Brush-tailed Rock Wallaby	***Petrogale penicillata***	H	**2,3-rocky**	**N**	**GFK**
Red-legged Pademelon	***Thylogale stigmatica***	H	**1,2**	**WCO**	**DGFK**
Red-necked Pademelon	*Thylogale thetis*	H	1,2,15	WMCNLO	DGTFK
Swamp Wallaby	*Wallabia bicolor*	H	1,2,3,4,8,12	WMCNLO	DGTFKU
Grey-headed Flying-fox	*Pteropus poliocephalus*	H	2,3,4,10	CNLO	GTF
Little Red Flying-fox	*Pteropus scapulatus*	H	1,2,3,4,10	NO	GFK
Queensland Blossom Bat	***Syconycteris australis***	H	**1,2,3,4**		
Yellow-bellied Sheathtail-bat	***Saccolaimus flaviventris***	H	**1,4**	**WN**	**G**
Eastern Little Mastiff-bat	***Mormopterus norfolkensis***	H	**3,4**	**WO**	**G**
Little Mastiff-bat	*Mormopterus planiceps*	H	3,4	NO	G
White-striped Mastiff-bat	*Nyctinomus australis*	H	2,3,4	WNO	G
Eastern Horseshoe Bat	*Rhinolophus megaphyllus*	H	1,2,11	WCNO	GK
Golden-tipped Bat	***Kerivoula papuensis***	H	**1,2**		**D**
Little Bent-wing Bat	***Miniopterus australis***	H	**1,2,3**	**WCN**	**GK**
Common Bent-wing Bat	***Miniopterus schreibersii***	H	**2,3**	**WCNO**	**DGK**
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		20	NO	G
Greater Long-eared Bat	***Nyctophilus timoriensis***		**4,12**	**WL**	**G**
Gould's Long-eared Bat	*Nyctophilus gouldi*	H	3,4	WMCN	G
Gould's Wattled Bat	*Chalinolobus gouldii*	H	2,3,4,5,13,14	WNO	G
Chocolate Wattled Bat	*Chalinolobus morio*	H	2,3,4	WMCNO	DG
Hoary Bat	***Chalinolobus nigrogriseus***	H	**2,4,8**		**G**
Large Pied Bat	***Chalinolobus dwyeri***	H	**3,4**	**WN**	**G**

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
MAMMALS cont.					
Large Forest Eptesicus	*Eptesicus darlingtoni*	H	2,3,4	WMCO	DG
Eastern Cave Eptesicus	*Eptesicus pumilus*	H	1,2,3,4	WNLO	G
King River Eptesicus	*Eptesicus regulus*	H	2,3,4	WCM	DG
Troughton's Eptesicus	***Eptesicus troughtoni***	H	**2,3,4**		**G**
Little Forest Eptesicus	*Eptesicus vulturnus*	H	2,3,4,5,6,13	WCO	DG
Great Pipistrelle	***Falsistrellus tasmaniensis***	H	**2 - gullies**	**N**	**DG**
Large-footed Myotis	***Myotis adversus***	H	**1,2**	**WC**	**DG**
Greater Broad-nosed Bat	***Scoteanax rueppellii***	H	**2 - gullies**	**WCO**	**DG**
Little Broad-nosed Bat	*Scotorepens greyii*		4	WNO	G
Eastern Broad-nosed Bat	*Scotorepens orion*	H	2,3,14		G
Eastern Chestnut Mouse	***Pseudomys gracilicaudatus***	H	**2,3,4,8,9,**	**L**	**GK**
New Holland Mouse	*Pseudomys novaehollandiae*		8	WO	G
Fawn-footed Melomys	*Melomys cervinipes*	H	1,2	WMCRLO	DGFK
Grassland Melomys	*Melomys burtoni*		6		
Pale Field Rat	*Rattus tunneyi*		6,12		DG
Hastings River Mouse	***Pseudomys oralis***	H	**2,3,9,16**	**WMCO**	**DGK**
Broad-toothed Rat	***Mastacomys fuscus***		**6,12**	**RO**	
Water Rat	*Hydromys chrysogaster*		12,16,17	MCRO	GFK
Bush Rat	*Rattus fuscipes*	H	1,2,3,4,11	WMCRNLO	DGTFK
Swamp Rat	*Rattus lutreolus*		8,9,12	WMCNLO	DGFK
Brown Rat	*Rattus norvegicus*		12,14	O	G
Dingo	*Canis familiaris dingo*		20	WMCRNLO	DGFK
INTRODUCED MAMMALS					
Fox	*Vulpes vulpes*		2,3,4,12,14,15	MCRNL O	DGK
Black Rat	*Rattus rattus*		3,6,14	WCNLO	DGFK
House Mouse	*Mus musculus*		3,4,6,14	WMCNLO	DGFK
Feral Cat	*Felis cattus*		20	WMCNLO	DGTFKU
Pig	*Sus scrofa*		20	WMRNO	DGF
Horse	*Equus caballus*		4,6	WMRO	GF
Cattle	*Bos taurus*		3,4,6,15	WM	GF
Sheep	*Ovis aries*		6,8		G
Goat	*Capra hircus*		4,5,21	WN	F
European Hare	*Lepus capensis*		4,farmland	O	FU
Rabbit	*Oryctolagus cuniculus*		20	WMCNLO	DGFK
AMPHIBIANS					
Green & Golden Bell-frog	***Litoria aurea***		**6,12**	**O**	
Booroolong Frog	*Litoria booroolongensis*		16,22	NO	D
Green-thighed Frog	***Litoria brevipalmata***	H	**2,3,4**	**CO**	**DGFK**
Green Tree-frog	*Litoria caerulea*	H	20	WNLO	DGFK
Red-eyed Tree-frog	*Litoria chloris*	H	1,2	WCLO	DGTFK
Blue Mountains Tree-frog	*Litoria citropa*	H	2,3,8,21	WMO	D
Bleating Tree-frog	*Litoria dentata*	H	1,2,3,9	WNLO	DGK
Eastern Dwarf Tree-frog	*Litoria fallax*		4,6,9,12,16	WMNO	DGTFK
Yellow-spotted Tree-frog	***Litoria castanea***		**9,12,16**		
Freycinet's Frog	*Litoria freycineti*	H	2,3,8	LO	G
Dainty Green Tree-frog	*Litoria gracilenta*	H	2,3,4,6	O	GFK
* Jervis Bay Frog	*Litoria jervisiensis*	H	2,8,10,12		
Günther's Frog	*Litoria latopalmata*	H	2,3,4,15	NO	GFK
Lesueur's Frog	*Litoria lesueuri*	H	1,2,3,8	WMCNLO	DGTK
Rocket Frog	*Litoria nasuta*		15	NLO	GFK
*** Olongburra Frog**	***Litoria olongburensis***		**9,16**		
Peron's Tree-frog	*Litoria peronii*		9,11,12	WMCNLO	DGTFK
Pearson's Frog	*Litoria pearsoniana*	H	1,2,16	W	G
Peppered Frog	***Litoria piperata***		**12,16**		**G**

COMMON NAME	SCIENTIFIC NAME			LSZ	ESZ
AMPHIBIANS cont.					
Leaf-green Tree-frog	*Litoria phyllochroa*	H	1,9,16	WCNLO	DFK
Desert Tree-frog	*Litoria rubella*	H	2,12,15	N	GF
Glandular Frog	***Litoria subglandulosa***	H	**2,22**	**WCO**	**DG**
Tyler's Tree-frog	*Litoria tyleri*	H	2	W	T
Revealed Frog	*Litoria revelata*		6,9,22		D
Verreaux's Frog	*Litoria verreauxii*	H	2,3,6,9	WMCNL	DGK
Tusked Frog	*Adelotus brevis*	H	1,2,6	WCNLO	DGTFK
Pouched Frog	***Assa darlingtoni***	H	**1,2**		**G**
Eastern Sign-bearing Froglet	*Crinia parinsignifera*		6	N	G
Common Froglet	*Crinia signifera*		9	WMCNLO	DGTFK
*** Wallum Froglet**	***Crinia tinnula***		**6,9**		
Haswell's Frog	*Geocrinia haswelli*	H	2,16	O	
Giant Burrowing Frog	***Heleioporus australiacus***		**4**	**O**	
Fletcher's Frog	*Lechriodus fletcheri*	H	1,2,6,22	WCLO	DGFK
Eastern Banjo Frog	*Limnodynastes dumerilii*	H	2,3,6,8,12	WNO	G
Long-thumbed Frog	*Limnodynastes fletcheri*		5,6	N	G
Ornate Burrowing Frog	*Limnodynastes ornatus*	H	2,3,4	WNO	DGF
Brown-striped Frog	*Limnodynastes peroni*		9,16	WNLO	DGTFK
Salmon-striped Frog	*Limnodynastes salmini*	H	3,4,6	N	G
Spotted Grass Frog	*Limnodynastes tasmaniensis*		9,12	NLO	DGF
* Northern Banjo Frog	*Limnodynastes terraereginae*	H	1,3,4		
Stuttering Frog	***Mixophyes balbus***	H	**1,2**	**WCNLO**	**DGFK**
Greater Barred Frog	*Mixophyes fasciolatus*	H	1,2	WCLO	DGTFK
*** Fleay's Frog**	***Mixophyes fleayi***	H	**1,2**		
Southern Barred Frog	***Mixophyes iteratus***	H	**1,2**	**WCLO**	**DFK**
Loveridge's Frog	***Philoria loveridgei***	H	**1,2,22**		**G**
Sphagnum Frog	***Philoria sphagnicolus***	H	**1,2**	**WCO**	**DGT**
*** Red-crowned Toadlet**	***Pseudophryne australis***	H	**2,3,8**		
Brown Toadlet	*Pseudophryne bibronii*	H	2,3,6	WNLO	GFK
Red-backed Toadlet	*Pseudophryne coriacea*	H	2,3,9	WLO	DGTFK
* Dusky Toadlet	*Uperoleia fusca*	H	2,3		
Smooth Toadlet	*Uperoleia laevigata*	H	3,4,6,9	MNLO	GTFK
Red-groined Toadlet	*Uperoleia rugosa*	H	2,3	NO	
* Tyler's Toadlet	*Uperoleia tyleri*	H	2,3,6,8		
REPTILES					
Eastern Longneck Tortoise	*Chelodina longicollis*		17	WCNLO	DGK
Saw-shelled Turtle	*Elseya latisternum*		9,17		G
Murray Turtle	*Emydura macquarii*		12,17	CN	
Northern Rivers Tortoise	*Emydura signata*		12,17	W	DG
Wood Gecko	*Diplodactylus vittatus*	H	2,3,13	WNO	G
Bynoe's Gecko	*Heteronotia binoei*		20	N	G
Lesueur's Velvet Gecko	*Oedura lesueurii*		3,8,21	NO	G
Tree Dtella	*Gehyra variegata*		4,5,21	N	
Robust Velvet Gecko	*Oedura robusta*	H	2,3,21	WNO	DG
Southern Spotted Velvet Gecko	*Oedura tryoni*	H	3,4,21	N	
Northern Leaf-tailed Gecko	*Phyllurus comutus*	H	1,2	WCLO	DGFK
Southern Leaf-tailed Gecko	*Phyllurus platurus*	H	2,3,8,14	C	DFK
Thick-tailed Gecko	*Underwoodisaurus milii*		4,8,13,21	WCNO	GFK
Border Thick-tailed Gecko	***Underwoodisaurus sphyrurus***		**21-high elav.**	**N**	**G**
Legless Lizard	*Delma plebeia*	H	2,4,15	NO	GF
Excitable Delma	*Delma tincta*		4,13,20	N	G
Burton's Snake-lizard	*Lialis burtonis*	H	2,3,13	WCNLO	DGK
Common Scaly-foot	*Pygopus lepidopodus*	H	2,8,23	WCNO	GFK
Bearded Dragon	*Pogona barbata*	H	3,4	WMCNLO	GFK

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
REPTILES cont.					
Jacky Lizard	*Amphibolurus muricatus*		3,8,21	WMNLO	DGF
Nobbi	*Amphibolurus nobbi*		3,8,23		G
Southern Angle-headed Dragon	*Hypsilurus spinipes*	H	1,2	WCLO	DGFK
Eastern Water Dragon	*Physignathus lesueurii*		12,16	WMCNLO	DGTFK
Mountain Dragon	*Tympanocryptis diemensis*	H	3,4,8	WNO	
Gould's Monitor	*Varanus gouldii*	H	3,13	WNO	G
Lace Monitor	*Varanus varius*	H	1,2,3,4	WCNLO	GTFK
Two-clawed Worm-skink	*Anomalopus leuckartii*	H	3,4		G
* Punctate Worm-skink	*Anomalopus swansoni*	H	3,8		
Three-clawed Worm-skink	*Anomalopus verreauxii*	H	1,2,3,4,11	N	G
Scute-snouted Calyptotis	*Calyptotis scutirostrum*	H	1,2		DG
Red-tailed Calyptotis	*Calyptotis ruficauda*	H	1,2,3	W	GF
Southern Rainbow-skink	*Carlia tetradactyla*	H	3,4	NO	G
Tussock Rainbow-skink	*Carlia vivax*	H	3,4	NO	GF
Three-toed Snake-tooth Skink	***Coeranoscincus reticulatus***	H	1,2		G
* Carnaby's Skink	*Cryptoblepharus carnibyi*	H	2,4,		
Cream-striped Shinning-Skink	*Cryptoblepharus virgatus*	H	2,3,4,8	WNO	GF
Brown-backed Yellow-lined Ctenotus	*Ctenotus eurydice*	H	3,4		G
Robust Ctenotus	*Ctenotus robustus*	H	2,3,4,8	WCNLO	GFDK
Copper-tailed Skink	*Ctenotus taeniolatus*		3,8,21	MNLO	DG
She-oak Slender Bluetongue	*Cyclodomorphus casuarinae*	H	3,4,8,11,12	WO	
Cunningham's Skink	*Egernia cunninghami*	H	3,4,21	WCNO	GK
Major Skink	*Egernia frerei*	H	1,2,3,4,21		GF
Land Mullet	*Egernia major*	H	1,2,21	WMCLO	DGFK
Egernia Mcpheei	*Egernia mcpheei*	H	2,3,4,21	W	G
Eastern Ranges Rock-skink	*Egneria modesta*	H	3,4,15,21	NO	G
Tree Skink	*Egernia striolata*	H	3,4,15,21	MCNLO	GK
Black Crevice-skink	*Egernia saxatilis*	H	3,4,21	NO	F
White's Rock-skink	*Egernia whitii*	H	3,4,6,8,21	WNO	G
Alpine Meadow-skink	*Eulamprus kosciuskoi*		9,22	WO	DG
Eastern Water-skink	*Eulamprus quoyii*	H	1,2,3,4,8,9,16	WMCNLO	DGTK
Blue-speckled Forest Skink	*Eulamprus murrayi*	H	1,2	WCLO	DGTFK
Bar-sided Forest Skink	*Eulamprus tenuis*	H	1,2,3,4	WNO	DGF
Southern Water Skink	*Eulamprus heatwolei*	H	2,3,4,6,8,9	WM	
Three-toed Earless Skink	*Hemiergis decresiensis*	H	2,3,4	O	
Pink-tongued Lizard	*Hemisphaeriodon gerrardi*	H	1,2,3,4	WNO	GF
* Montane Skink	*Lampropholis caligula*	H	2,4		
Dark-flecked Garden Sunskink	*Lampropholis delicata*	H	1,2,3,4,6,8	WMCNLO	DGTFK
Pale-flecked Garden Sunskink	*Lampropholis guichenoti*	H	2,3,4,8	WMNLO	DGF
Beech Skink	*Leiolopisma zia*	H	1,16		DG
South-eastern Slider	*Lerista bougainvillii*	H	3,4,5,8,		G
Tree-base Litter Skink	*Lygisaurus foliorum*	H	2,3,4,8,22	NO	GF
Boulenger's Skink	*Morethia boulengeri*	H	3,4,5,23	N	DG
Short-limbed Snake-skink	*Ophioscincus truncatus*	H	1,2,3,4,8		D
* Southern Forest Cool-skink	*Pseudemoia coventryi*	H	2,3		
* Bold-striped Cool-skink	*Pseudemoia duperreyi*		4,5,8		
Red-throated Skink	*Pseudemoia platynota*	H	3,4,8,22	MCNO	GK
Tussock Cool-skink	*Pseudemoia entrecasteauxii*	H	2,3,4,6	MNO	
Yellow-bellied Three-toed Skink	*Saiphos equalis*	H	1,2,3	WMCNLO	DGTK
Orange-tailed Shadeskink	*Saproscincus challengeri*	H	1,2	WMNLO	DGF
Weasel Skink	*Saproscincus mustelina*	H	2,3,8	WMCNO	DGFK
Eastern Blue-tongued Lizard	*Tiliqua scincoides*	H	3,4,6,8,22	WCNLO	DGTK
Faint-striped Blind Snake	*Ramphotyphlops broomi*		4	N	
Blackish Blind Snake	*Ramphotyphlops nigrescens*	H	2,3,4	WNO	DG

COMMON NAME	SCIENTIFIC NAME			LSZ	ESZ
REPTILES cont.					
Proximus Blind Snake	*Ramphotyphlops proximus*	H	1,4,5	NO	G
Brown-snouted Blind Snake	*Ramphotyphlops weidii*		4,5	O	G
Eastern Childrens Python	*Liasis maculosus*	H	3,4,5,21		G
Diamond Python	*Morelia spilota spp spilota*	H	1,20	WMCNLO	DGTFK
Carpet Python	*Morelia spilota spp variegata*		20	N	G
Brown Tree Snake	*Boiga irregularis*	H	1,2,3,4,8,10	NLO	GTF
Common Tree Snake	*Dendrelaphis punctulata*	H	1,2,3,8,10,12	WCNLO	GTFK
* Keelback Snake	*Tropidonophis mairii*		12		
Common Death Adder	*Acanthophis antarcticus*	H	1,2,3,4,5,8	WCNLO	GTFK
Copperhead	*Austrelaps superbus*		9	WCNO	GFK
White-naped Snake	***Cacophis harriettae***	H	**1,2,8**		**G**
Dwarf Crowned Snake	*Cacophis krefftii*	H	1,2	WCL	GFK
Golden Crowned Snake	*Cacophis squamulosus*	H	1,2,3	WCNLO	DGFK
Small-eyed Snake	*Cryptophis nigrescens*	H	1,2,3,8	WCNLO	GTFK
White-lipped Snake	*Drysdalia coronoides*	H	3,22	N	G
* Mustard-bellied Snake	*Drysdalia rhodogaster*		3,6,8		
Yellow-faced Whip Snake	*Demansia psammophis*	H	3,4,8	WNLO	DGF
Red-naped Snake	*Furina diadema*	H	3,4,6	NO	DG
Black-bellied Swamp Snake	*Hemiaspis signata*	H	1-3,8,9,12,21	WCLO	GTFK
Pale-headed Snake	***Hoplocephalus bitorquatus***	H	**1,2,3**	**NO**	**G**
*** Broad-headed Snake**	***Hoplocephalus bungaroides***		**21**		
Stephen's Banded Snake	***Hoplocephalus stephensii***	H	**1,2**	**CLO**	**GFK**
Eastern Tiger Snake	*Notechis scutatus*	H	1-3,6,9,12	WMCNO	DGFK
Spotted Black Snake	*Pseudechis guttatus*	H	2,3,4,12	NO	G
Red-bellied Black Snake	*Pseudechis porphyriacus*		9,12,16	WMCNLO	DGTFK
Eastern Brown Snake	*Pseudonaja textilis*	H	2,3,4,6,8	WMNLO	GF
Eastern Small-eyed Snake	*Rhinoplocephalus nigrescens*	H	1,2,3,8		D
Rough-scaled Snake	*Tropidechis carinatus*	H	1,2,9,16	WCO	GK
Bandy-Bandy	*Vermicella annulata*	H	2,3,4,23	WCNLO	DGFK
Coral Snake	*Simoselaps australis*	H	3,4,12,23	N	G
Black-headed Snake	*Unechis gouldii*	H	3,4,5,8	NO	
Spectacled Hooded Snake	*Unechis spectabilis*	H	3,4,23		G
BIRDS					
Emu	*Dromaius novaehollandiae*		6,15	B	FA
Great Crested Grebe	*Podiceps cristatus*		9,17	BNOA	FA
Australasian Grebe	*Tachybaptus novaehollandiae*		9,17	WCBNLOA	DFKA
Hoary-headed Grebe	*Poliocephalus poliocephalus*		9,17	CNOA	FA
Australian Pelican	*Pelecanus conspicillatus*		12,24	CBNLOA	FKA
Darter	*Anhinga melanogaster*		12	BOA	FKA
Little Pied Cormorant	*Phalacrocorax melanoleucos*		12,17,24	WCBNLOA	DFKA
Pied Cormorant	*Phalacrocorax varius*		10,12,17,24	CBNOA	FKUA
Little Black Cormorant	*Phalacrocorax sulcirostris*		12,17	WCBNOA	FKA
Black Cormorant	*Phalacrocorax carbo*		12,17,24	WCBNLOA	FKUA
Pacific Heron	*Ardea pacifica*		9,17	WCBNLOA	KA
White-faced Heron	*Ardea novaehollandiae*		9,17	WCBNLOA	DFKA
Cattle Egret	*Ardeola ibis*		6,12	WCBLOA	FKA
Large Egret	*Egretta alba*		9,12,24	CBNLOA	FKA
Plumed Egret	*Egretta intermedia*		6,12,24	CBNLOA	FKA
Little Egret	*Egretta garzetta*		12	CBNOA	FKA
Little Bittern	*Ixobrychus minutus*		9	BNOA	FA
Black Bittern	***Dupetor flavicollis***		**9,12,24**	**BNOA**	**FA**
Australian Brown Bittern	***Botaurus poiciloptilus***		**9**	**BNOA**	**FA**
Nankeen Night Heron	*Nycticorax caledonicus*		9,17	CBNLOA	FKA
Glossy Ibis	*Plegadis falcinellus*		9,10,12,17,24	CBNA	FA

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
BIRDS cont.					
Royal Spoonbill	*Platalea regia*		12,24	CBNLOA	FKA
Yellow-billed Spoonbill	*Platalea flavipes*		9,12	CBNLOA	FKA
Black Swan	*Cygnus atratus*		9,12,17	CBNLOA	FKA
Chestnut Teal	*Anas castanea*		9,10,17	CNLOA	FKA
Black-necked Stork	***Xenorhynchus asiaticus***		**9,12,17**	**WCBNLA**	**FKA**
Sacred Ibis	*Threskiomis aethiopica*		6,9,16,17	CBNLOA	KFA
Straw-necked Ibis	*Threskiomis spinicollis*		6,9,17	WCBNLOA	DFKA
Wandering Whistling-duck	*Dendrocygna arcuate*		9,12,17		F
Plumed Whistling-duck	*Dendrocygna eytoni*		9,17	A	FKA
Freckled Duck	***Stictonetta naevosa***		**9,17**	**N**	**FA**
Mountain Duck	*Tadorna tadornoides*		17,24		F
Shoveller	*Anas rhynchotis*		9,12,17	NA	FA
Pink-eared Duck	*Malacorhynchus membranaceus*		9,10,17,24	NOA	FA
Blue-billed Duck	***Oxyura australis***		**9,12,17**	**O**	**FA**
Pacific Black Duck	*Anas superciliosa*		6,9,16,17	WBNLOA	DFKA
Grey Teal	*Anas gibberifrons*		9,17	WCBNOA	FKA
Musk Duck	*Biziura lobata*		9,10,12,17,24	CNOA	FA
Hardhead Duck	*Aythya australis*		9,12,17	WCBNLOA	FKA
Maned Duck	*Chenonetta jubata*		4,6,17	WMCBNOA	FKA
Osprey	***Pandion haliaetus***		**12,24**	**CBA**	**FKA**
Black-shouldered Kite	*Elanus notatus*		4,6	WCBNOA	DFKA
Crested Hawk	*Aviceda subcristata*	H	1,2	WCBNA	DGFA
Letter-winged Kite	*Elanus scriptus*		4,6,13	NOA	FA
Black Kite	*Milvus migrans*		5,6,13	BNA	FA
Square-tailed Kite	***Lophoictinia isura***	H	**3,4,8,23**	**N**	**GFA**
Black-breasted Kite	***Hamirostra melanosternon***		**4,5,6**		**FA**
Whistling Kite	*Haliastur sphenurus*	H	3,4	WCBNA	GFKA
Brahminy Kite	*Haliastur indus*		4,10,24	A	FA
Brown Goshawk	*Accipiter fasciatus*	H	3,4	WMCBNOA	DGFKA
Collared Sparrowhawk	*Accipiter cirrhocephalus*	H	3,4	WMCBNOA	DGFKA
Grey Goshawk	*Accipiter novachollandiae*	H	2,3	WMCBNOA	DGFKA
Red Goshawk	***Erythrotriorchis radiatus***	H	**1,4,9**		**F**
Little Eagle	*Hieraaetus morphnoides*	H	3,4,5	WMCBNOA	DFA
White-bellied Sea-eagle	*Haliaeetus leucogaster*		9	WCBOA	DFKA
Wedge-tailed Eagle	*Aquila audax*	H	2,3,4,6	WMCBNOA	DGFKA
Spotted Harrier	*Circus assimilis*		6	CBNA	FA
Swamp Harrier	*Circus aeruginosus*		9,12	MCBNLOA	FKA
Peregrine Falcon	*Falco peregrinus*	H	3,4,6,9	WMCBNLOA	GFKA
Little Falcon	*Falco longipennis*		4,6,14	CBNLOA	DFA
Black Falcon	*Falco subniger*		4,6,12	WOA	A
Brown Falcon	*Falco berigora*		4,6,20	WMCBNLOA	DGFKA
Nankeen Kestrel	*Falco cenchroides*	H	20	WMCBNLOA	DGFKA
Australian Brush-turkey	*Alectura lathami*	H	1,2	WMCBNLOA	DGFKA
Stubble Quail	*Coturnix novaezealandiae*		6	BNOA	FKA
Brown Quail	*Coturnix australis*		6,8,9	MBNLOA	FKA
King Quail	*Coturnix chinensis*		6,8,9	MBA	FKA
Painted Buttonquail	*Turnix varia*	H	3,4,8	WCBNA	DFKA
Little Buttonquail	*Turnix velox*		4,6	NA	
Red-chested Buttonquail	*Turnix pyrrothorax*	H	1,4,23	A	FA
Red-backed Buttonquail	*Turnix maculosa*		9,12	CA	FA
Dusky Moorhen	*Gallinula tenebrosa*		9,17	MCBNLOA	FKA
Lewin's Rail	*Rallus pectoralis*		12,16,17	BNA	GA
Buff-banded Rail	*Rallus philippensis*		9,10,17	CBNLA	FKA
Black-tailed Native-hen	*Gallinula ventralis*		9,12,17	CN	

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
BIRDS cont.					
Spotted Crake	*Porzana fluminea*		9,12,17	NA	FA
Marsh Crake	*Porzana pusilla*		9,17	NOA	FA
Spotless Crake	*Porzana tabuensis*		9,17		A
Swamphen	*Porphyrio porphyrio*		9,12,17	CBNLOA	FKA
Common Coot	*Fulica atra*		9,12,17	CBNLOA	FKA
Painted Snipe	***Rostratula benghalensis***		**9,12**	**NOA**	**A**
Banded Stilt	*Cladorhynchus leucocephalus*		9,17,24	N	
Red-necked Avocet	*Recurvirostra novaehollandiae*		9,12,17,24	N	A
Brolga	***Grus rubicundus***		**6,9,12,17,24**		**FA**
Lotus Bird	***Irediparra gallinacea***		**9,17**	**CBA**	**FA**
Bush Thick-knee	***Burhinus magnirostris***		**9,10,15**	**A**	**A**
Masked Plover	*Vanellus miles*		6,9	WMCBNLOA	DFKA
Banded Plover	*Vanellus tricolor*		6	NOA	FA
Red-kneed Dotterel	*Erythrogonys cinctus*		9,12,17	OA	FKA
Red-capped Dotterel	*Charadrius ruficapillus*		9,17	CBA	FKUA
Black-fronted Dotterel	*Charadrius melanops*		9,12	CBNA	DFKA
Black-winged Stilt	*Himantopus himantopus*		9,12,24	CBOA	A
Greenshank	*Tringa nebularia*		8,9,17	NLA	A
Wood Sandpiper	*Tringa glareola*		9,12,17,24		A
Common Sandpiper	*Tringa hypoleucos*		9,10,12,17,24	NA	A
Marsh Sandpiper	*Tringa stagnatilis*		9,12,17	A	A
Latham's Snipe	*Gallinago hardwickii*		6,9,15,17	WCBNLOA	FKA
Black-tailed Godwit	*Limosa limosa*		9,17,24	BOA	A
Sharp-tailed Sandpiper	*Calidris acuminata*		6,9,10,12,17,24	BNOA	A
Curlew Sandpiper	*Calidris ferruginea*		9,17,24	LA	A
Red-necked Stint	*Calidris ruficollis*		17,24	BOA	A
Pectoral Sandpiper	*Calidris melanotos*		6,12,17,24	A	A
Long-toed Stint	*Calidris subminuta*		9,17		A
Superb Fruit-dove	***Ptilinopus superbus***	H	**1,2,10**	**A**	**UA**
Rose-crowned Fruit-dove	***Ptilinopus regina***	H	**1,2,10**	**CBLOA**	**FA**
Wompoo Fruit-Dove	***Ptilinopus magnificus***	H	**1**	**WCBNLOA**	**DGFKUA**
Topknot Pigeon	*Lopholaimus antarcticus*	H	1	WMCBNLOA	DGFKUA
White-headed Pigeon	*Columba leucomela*	H	1	WMCBNLOA	DGFKUA
Domestic Pigeon	*Columba livia*		14,20	CBNOA	GFKA
Spotted Turtle Dove	*Streptopelia chinensis*		14	WCBNLOA	GFKUA
Brown Pigeon	*Macropygia amboinensis*	H	1	WMCBNLOA	DGFKA
Peaceful Dove	*Geopelia placida*	H	3,4,5	WCBNLOA	DGFKA
Diamond Dove	*Geopelia cuneata*		13	CNOA	FA
Bar-shouldered Dove	*Geopelia humeralis*		4,5,8,10	CBNLOA	DGFKUA
Emerald Dove	*Chalcophaps indica*	H	1,2,9,10	WMCBNLOA	DGFKUA
Common Bronzewing	*Phaps chalcoptera*	H	3,4,5	WCBNLOA	GFKA
Crested Pigeon	*Ocyphaps lophotes*	H	2,3,4,6,14	CBNOA	GFKA
Brush Bronzewing	*Phaps elegans*	H	2,4,8,23	WCBNOA	DFKA
Wonga Pigeon	*Leucosarcia melanoleuca*	H	1,2,3	WMCBNLOA	DGFK
Red-tailed Black-cockatoo	***Calyptorhynchus magnificus***	H	**3,4,12,23**	**CBNO**	
Glossy Black-cockatoo	***Calyptorhynchus lathami***	H	**2,3,4**	**WMCBNLOA**	**DGFKUAA**
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*	H	2,3,4,8	WMCBNLOA	DGFKA
Gang-Gang Cockatoo	*Callocephalon fimbriatum*	H	2,3,4,14	WBA	A
Galah	*Cacatua roseicapilla*	H	3,4,6	WMCBNOA	FKA
Little Corella	*Cacatua sanguinea*		4,5,6	B	
Sulphur-crested Cockatoo	*Cacatua galerita*	H	3,4,10,12	WMCBNOA	DGFKA
* **Double-eyed Fig Parrot**	***Psitlaculirostris diophthalina***	H	**1,2,3,4,10**		
Rainbow Lorikeet	*Trichoglossus haematodus*	H	2,3,5,8,10	WCBNLOA	DGFKA

COMMON NAME	SCIENTIFIC NAME			LSZ	ESZ
BIRDS cont.					
Musk Lorikeet	*Glossopsitta concinna*	H	3,4	BNOA	DGFA
Little Lorikeet	*Glossopsitta pusilla*	H	3,4,5,8,12	WCBNLOA	DGFKA
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	H	1,3,4,5	WCBNLOA	DGFKA
Australian King Parrot	*Alisterus scapularis*	H	1,2,3	WMBNLOA	DGFKUA
Red-winged Parrot	*Aprosmictus erythropterus*	H	2,3,4		A
Cockatiel	*Nymphicus hollandicus*	H	3,4,6,12	NA	FA
Swift Parrot	***Lathamus discolor***	H	**2,3,4,14**	**NLO**	**FA**
Ground Parrot	***Pezoporus wallicus***		**8,9,24**	**B**	**FA**
Crimson Rosella	*Platycercus elegans*	H	2,3,4,5,12	WMCBNLOA	DGFKA
Eastern Rosella	*Platycercus eximius*		4	WMCBNLOA	DGFKA
Pale-headed Rosella	*Platycercus adscitus*	H	3,4,5,8		GF
Turquoise Parrot	***Neophema pulchella***		**4**	**NA**	**A**
Red-rumped Parrot	*Psephotus haematonotus*		4,6,12,14	BNOA	GFKA
Oriental Cuckoo	*Cuculus saturatus*	H	1,2,3,10	NOA	GFA
Pallid Cuckoo	*Cuculus pallidus*	H	2,3,4	WMCBNLOA	DGFKA
Brush Cuckoo	*Cuculus variolosus*	H	1,2,3,4,9,10	WMCBNLOA	DGFKUA
Fan-tailed Cuckoo	*Cuculus pyrrhophanus*	H	1,2,3,4,8	WMCBNLOA	DGFKUA
Black-eared Cuckoo	*Chrysococcyx osculans*	H	2,3,5,23		FA
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	H	3,4,13	WMCBNLOA	GFKA
* Little Bronze-cuckoo	*Chrysococcyx malayanus*	H	1,10,14		
Goulds Bronze-cuckoo	*Chrysococcyx russatus*	H	1,10,14		FA
Golden Bronze-cuckoo	*Chrysococcyx lucidus plagosus*	H	2,3,4	WCOA	DKA
Shining Bronze-Cuckoo	*Chrysococcyx lucidus lucidus*	H	2,3,4,15	WMBNLOA	DGFA
Common Koel	*Eudynamis scolopacea*	H	1,2,3,4,12	WMCBLOA	DGFKA
Channel-billed Cuckoo	*Scythrops novaehollandiae*	H	1,2,3,4	WMCBNOA	GFKA
Pheasant Coucal	*Centropus phasianinus*		4,15	WCBLOA	FKA
Powerful Owl	***Ninox strenua***	H	**2,3**	**WMBNLOA**	**DGFKA**
Southern Boobook	*Ninox noveseelandiae*	H	2,3,4	WMCBNLOA	DGFKUA
Barking Owl	*Ninox connivens*		4,12,13	CBNOA	GFA
Barn Owl	*Tyto alba*		4,5,14	BNLOA	GFKA
Masked Owl	***Tyto novaehollandiae***	H	**2,3,4**	**WMNOA**	**DGFKA**
Sooty Owl	***Tyto tenebricosa***	H	**1,2,3**	**WMCNOA**	**DGFKA**
Grass Owl	*Tyto capensis*		6,8,9	L	
Marbled Frogmouth	***Podargus ocellatus***	H	**1**	**BN**	**D**
Tawny Frogmouth	*Podargus strigoides*	H	2,3,4	WMCBNLOA	DGFKUA
Australian Owlet-nightjar	*Aegotheles cristatus*	H	2,3,4,12	WMCNLOA	DGFKA
White-throated Nightjar	*Caprimulgus mystacalis*	H	2,3,4	CBNLOA	DGFKA
Spine-tailed Swift	*Hirundapus caudacutus*		aerial	WMACBNLO	DFUAK
Fork-tailed Swift	*Apus pacificus*		aerial	CBNOA	FA
White Rumped Swiftlet	*Callocalia spodiopygia*		aerial		FA
Azure Kingfisher	*Ceyz azurea*		9,10,12,16	WMCBNLOA	DGFKA
Kookaburra	*Dacelo novaeguineae*	H	2,3,4	WMCBNLOA	DGTFKUA
*** Collared Kingfisher**	***Halcyon chloris***		**10**		
Forest Kingfisher	*Halcyon macleayii*	H	2,3,4	WCNLOA	GFKA
Sacred Kingfisher	*Halcyon sancta*		4,10	WMCBNLOA	DGTFKUA
Red-backed Kingfisher	*Halcyon pyrrhopygia*		4,6,13	N	FA
Rainbow Bee-eater	*Merops ornatus*	H	3,4,6,15	WCBNLOA	DGFKUA
Dollarbird	*Eurystomus orientalis*	H	1,2,3,4,16	WMCBNLOA	DGFKA
Noisy Pitta	*Pitta versicolor*	H	1,4,10	WMCBLA	DGTFKUA
Superb Lyrebird	*Menura novaehollandiae*	H	1,2	WMCBNLOA	DGTFKA
Rufous Scrub-bird	***Atrichornis rufescens***	H	**1,2**	**WCOA**	**GTFKA**
Singing Bushlark	*Mirafra javanica*		6	BOA	FA
Skylark	*Alauda arvensis*		4,6,8,9	B	A
White-backed Swallow	*Cheramoeca leucosternum*		4,6,12,16	WCBNOA	FKA

COMMON NAME	SCIENTIFIC NAME			LSZ	ESZ
BIRDS cont.					
Welcome Swallow	*Hirundo neoxena*		20	WMCBNLOA	DG FKA
Tree Martin	*Cecropis nigricans*		20	WCBNLOA	DGFKA
Fairy Martin	*Cecropis ariel*		20	CBNLOA	GFKA
Richard's Pipit	*Anthus novaeseelandiae*		6	WCBNLOA	DGFKA
Ground Cuckoo-shrike	*Coracina maxima*	H	1,2,3,4	NA	A
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		4,5,8	WMCBNLOA	DGTFKA
White-bellied Cuckoo-shrike	*Coracina papuensis*		4,5,8	WMCBNLOA	GFA
Barred Cuckoo-shrike	***Coracina lineata***	H	1	**CBOA**	**DFA**
Cicadabird	*Coracina tenuirostris*	H	1,2,3,10	WMCBNLOA	GTFKA
Varied Triller	*Lalage leucomela*	H	1	CBOA	DGFKA
White-winged Triller	*Lalage sueurii*		4,23	WMCBNOA	GFKA
White's Thrush	*Zoothera dauma*	H	1,2,3,4	WMCBNLOA	DGTFUA
Blackbird	*Turdus merula*		4,14		DA
Spotted Quail Thrush	*Cinclosoma punctatum*	H	3,4,6	WMCBNLOA	DGTFKA
Rose Robin	*Petroica rosea*	H	1,2,3,4	WMCBNLOA	DGTFKA
Flame Robin	*Petroica phoenicea*	H	3,4,14	WCBNOA	DGFKA
Scarlet Robin	*Petroica multicolor*	H	3,4,14	WMCBNOA	DGFKBA
Red-capped Robin	*Petroica goodenovii*		4,5,6,23	NOA	A
Eastern Yellow Robin	*Eopsaltria australis*	H	1,2,3,4,5,23	WMCBNLOA	DGTFKUA
Jacky Winter	*Microeca leucophaea*		4,6,8	WMCBNLOA	DGFKA
Pale-yellow Robin	*Tregellasia capito*	H	1,2	WCBNLOA	DGTFKA
Hooded Robin	*Melanodryas cucullata*		4,5,23	WCBNOA	DFA
Crested Shrike-tit	*Falcunculus frontatus*	H	2,3,4	WMCBNLOA	DGTFKA
Olive Whistler	***Pachycephala olivacea***		**4,8,11**	**WCOA**	**DGFKA**
Golden Whistler	*Pachycephala pectoralis*	H	20	WMCBNLOA	DGTFKUA
Rufous Whistler	*Pachycephala rufiventris*	H	2,3,5,23	WMCBNLOA	DGFKUA
Little Shrike-thrush	*Colluricincla megarhyncha*	H	1,9,10	CA	GUA
Grey Shrike-thrush	*Colluricincla harmonica*	H	20	WMCBNLOA	DGTFKUA
White-eared Monarch	***Monarcha leucotis***	H	**1,4,10,16**		**A**
Black-faced Monarch	*Monarcha melanopsis*	H	1,2	WMCLOA	DGTFKUA
Spectacled Monarch	*Monarcha trivirgatus*	H	1,2,10	WCBLOA	DGTFKUA
Leaden Flycatcher	*Myiagra rubecula*	H	1,2,3,4,10	WCBNLOA	DGFKA
Satin Flycatcher	*Myiagra cyanoleuca*	H	3,4,14	WMCBNOA	DGFA
Restless Flycatcher	*Myiagra inquieta*	H	3,4,5,9	WCBNLOA	DGFKA
Grey Fantail	*Rhipidura fuliginosa*	H	20	WMCBNLOA	DGTFKUA
Willie Wagtail	*Rhipidura leucophrys*	H	3,4,5,6	WMCBNLOA	DGTFKA
Rufous Fantail	*Rhipidura rufifrons*	H	20	WMCBNLOA	DGTFUA
Logrunner	*Orthonyx temminckii*	H	1	WMCBNLOA	DGTFKUA
Eastern Whipbird	*Psophodes olivaceus*	H	1,2,3,8	WMCBNLOA	DGTFKUA
White-browed Babbler	*Pomatostomus superciliosus*	H	3,4,5,13		GA
Grey-crowned Babbler	*Pomatostomus temporalis*	H	3,4,5	BOA	FA
Clamorous Reed-Warbler	*Acrocephlus stentoreus*		9	CBNLOA	FKA
Tawny Grassbird	*Megalurus timoriensis*		6,8,9	CBNLOA	FA
Little Grassbird	*Megalurus gramineus*		9,12	CBNLOA	FA
Golden-headed Cisticola	*Cisticola exilis*		6	CBNLOA	FA
Rufous Songlark	*Cinclorhamphus mathewsi*	H	2,3,4,15	WBNOA	DFA
Brown Songlark	*Cinclorhamphus cruralis*		5,6	BNOA	FKA
Superb Fairy-wren	*Malurus cyaneus*	H	3,4,5,8	WMCBNLOA	DGTFUA
Variegated Fairy-wren	*Malurus lamberti*	H	1,2,3,4,8	MCBNLOA	DGFUA
Red-backed Fairy-wren	*Malurus melanocephalus*		6,8	CBLOA	FKUA
Southern Emu-wren	*Stipiturus malachurus*		8,9	WCBLOA	FA
Eastern Bristlebird	***Dasyornis brachypterus***	H	**3,4,6,8**	**W**	
Large-billed Scrubwren	*Sericornis magnirostris*	H	1,2	WMCBNLOA	DGTFKUA
Yellow-throated Scrubwren	*Sericornis citreogularis*	H	1	WMCBNLOA	DGTFKUA

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
BIRDS cont.					
White-browed Scrubwren	*Sericornis frontalis*	H	2,3,4,5,8,16	WMCBNLOA	DGTFKUA
Chestnut-rumped Hylacola	*Sericornis pyrrhopygius*		5,8	CBNA	GFA
Speckled Warbler	*Sericornis sagittatus*		4,5,6	CBOA	DGFKA
Weebill	*Smicrornis brevirostris*		4	WMCBNOA	DGFA
Mangrove Warbler	*Gerygone laevigaster*		10,11,14	BA	FA
Origma	*Origma solitaria*		16		A
Brown Gerygone	*Gerygone mouki*	H	1,2,10	WMCBNLOA	DGTFKUA
White-throated Gerygone	*Gerygone olivacea*	H	2,3,4	WCBNLOA	GFTKA
Western Gerygone	*Gerygone fusca*		4,5	NA	DFA
Southern Whiteface	*Aphelocephala leucopsis*		4,6	CNOA	FA
Inland Thornbill	*Acanthiza apicalis*	H	2,3,5,8,23	A	A
Buff-rumped Thornbill	*Acanthiza reguloides*	H	2,3,4	WMCBNLOA	DGFA
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	H	3,4,6	WMCBNLOA	DGFKA
Yellow Thornbill	*Acanthiza nana*	H	3,4	WMCBLOA	DGFKUA
Brown-rumped Thornbill	*Acanthiza pusilla*	H	2,3,4,5	WMCNLOA	DGTFKUA
Striated Thornbill	*Acanthiza lineata*	H	3,4	WMCBNLOA	DGTFKA
Varied Sittella	*Daphoenositta chrysoptera*	H	3,4,13	WMBNLOA	DGFKA
White-throated Treecreeper	*Climacteris leucophaea*	H	1,2,3,4	WMCBNLOA	DGTFKUA
Red-browed Treecreeper	*Climacteris erythrops*	H	2,3	WMCBNLO	DGTFKA
Brown Treecreeper	*Climacteris picumnus*	H	2,3,4	WCBNOA	DGFKA
Red Wattlebird	*Anthochaera carunculata*	H	2,3,4,5,8	WMCBNLOA	DGFKA
Little Wattlebird	*Anthochaera chrysoptera*		3,5,8	CBNLOA	DGFKUA
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		5,13,23	MN	A
Striped Honeyeater	*Plectorhyncha lanceolata*		4,5,9,10	CBNLA	GFKA
Noisy Friarbird	*Philemon corniculatus*	H	3,4,8	WMCBNLOA	DGTFKA
Little Friarbird	*Philemon citreogularis*	H	2,3,4,10	WCNOA	GFA
Regent Honeyeater	***Xanthomyza phrygia***	H	**3,4**	**BNOA**	**GFA**
Blue-faced Honeyeater	*Entomyzon cyanotis*	H	1-4,9,10	WCBNOA	FKA
Painted Honeyeater	***Grantiella picta***	H	**2,3,4,5**	**NO**	**FA**
Noisy Miner	*Manorina melanocephala*	H	3,4,14	WCBNLOA	DGFKAA
Bell Miner	*Manorina melanophrys*	H	2,3	WMCBNOA	DGFK
Lewin's Honeyeater	*Meliphaga lewinii*	H	1,2,3,8	WMCBNLOA	DGTFKUA
Yellow-faced Honeyeater	*Lichenostomus chrysops*	H	3,4,8,10	WMCBNLOA	DGFKA
Mangrove Honeyeater	***Lichenostomus fasciogularis***		10	**A**	**FA**
White-eared Honeyeater	*Lichenostomus leucotis*	H	3,4,8	WCBNOA	DGFKA
Yellow-tufted Honeyeater	*Lichenostomus melanops*	H	3,4,8,10,12,23	CNOA	DGFA
Fuscous Honeyeater	*Lichenostomus fuscus*	H	2,3,4,5,8	CBOA	DGFKA
Singing Honeyeater	*Lichenostomus virescens*		10,11,13,23	A	
White-naped Honeyeater	*Melithreptus lunatus*	H	3,4,8	WMCBNOA	DGFKA
White-plumed Honeyeater	*Lichenostomus penicillatus*	H	3,4,8	NOA	DGFKA
White-throated Honeyeater	*Melithreptus albogularis*	H	1,2,3,12		DGFA
Brown-headed Honeyeater	*Melithreptus brevirostris*	H	3,4,5,8	WCBNLOA	DGFA
Black-chinned Honeyeater	*Melithreptus gularis*	H	2,3,4	N	DFA
Brown Honeyeater	*Lichmera indistincta*	H	3,4,5,8,10,12	WBOA	GFKUA
New Holland Honeyeater	*Phylidonyris novaehollandiae*	H	3,4,8	WBNOA	DGFKA
White-cheeked Honeyeater	*Phylidonyris nigra*		4,8	WMBNLOA	FUA
Tawny-crowned Honeyeater	*Phylidonyris melanops*		8,10	BNLA	FA
Crescent Honeyeater	*Phylidonyris pyrrhoptera*	H	1,2,8,14	O	
Eastern Spinebill	*Acanthorphynchus tenuirostris*	H	1,2,3,4,8,14	WMCBNLOA	DGTFKUA
Black Honeyeater	*Certhionyx niger*		15,23		A
Scarlet Honeyeater	*Myzomela sanguinolenta*	H	1 -5,8,9	WMCBNLOA	DGTFKUA
White-fronted Chat	*Ephthianura albifrons*		6	BNOA	FKA
Mistletoebird	*Dicaeum hirundinaceum*	H	2,3,4	WMCBNLOA	DGFKUA
Spotted Pardalote	*Pardalotus punctatus*	H	3,4,8	WMCBNLOA	DGFKA

COMMON NAME	SCIENTIFIC NAME		Habitats	LSZ	ESZ
BIRDS cont.					
Striated Pardalote	*Pardalotus striatus*	H	2,3,4	WMCNLOA	DGFKA
Silvereye	*Zosterops lateralis*	H	3,4,5,8	WMCBNLOA	DGTFKUA
European Goldfinch	*Carduelis carduelis*		6	WCBNLOA	GFA
European Greenfinch	*Carduelis chloris*		14	O	A
Beautiful Firetail	*Emblema bellum*		8,9		A
Red-browed Firetail	*Emblema temporalis*	H	1,2,3,8	WMCBNLOA	DGTFKUA
Diamond Firetail	*Emblema guttata*		4,23	CBNOA	DFA
Double-barred Finch	*Poephila bichenovii*	H	2,3,5,14,15	CBNLOA	FKA
Plum-headed Finch	*Aidemosyne modesta*	H	3,15	OA	FA
Chestnut-breasted Mannikin	*Lonchura castaneothorax*		9	CBLOA	FA
Nutmeg Mannikin	*Lonchura punctulata*		8,14	BOA	FA
Zebra Finch	*Poephila guttata*		6	CBNOA	A
Common Mynah	*Acridotheres tristis*		14	A	A
Olive-backed Oriole	*Oriolus sagittatus*	H	3,4	WMCBNLOA	DGTFA
Figbird	*Sphecotheres viridis*	H	1,2	WCBOA	DGFKA
Spangled Drongo	*Dicrurus hottentottus*	H	1,2,3,4,10	WCBNLOA	DGTKA
Satin Bowerbird	*Ptilonorhynchus violaceus*	H	1,2,3	WMCBNLOA	DGTFKA
Regent Bowerbird	*Sericulus chrysocephalus*	H	1	WMCBNLOA	DGTFKUA
Paradise Riflebird	*Ptiloris paradiseus*	H	1,2	WCNNOA	DGTFKA
White-winged Chough	*Corcorax melanorhamphos*	H	3,4,5	WCBNOA	DGFKA
Apostle Bird	*Struthidea cinerea*	H	2,3,4,23	O	A
Australian Magpie-lark	*Grallina cyanoleuca*		20	WCBNLOA	DGFKA
Black-faced Woodswallow	*Artamus cinereus*	H	2,3,4,6	NOA	F
White-breasted Woodswallow	*Artamus leucorhynchus*	H	2,3,10	CBNLOA	DGFA
Masked Woodswallow	*Artamus personatus*		4,6	BNA	FA
White-browed Woodswallow	*Artamus superciliosus*		4	WBNOA	GFA
Dusky Woodswallow	*Artamus cyanopterus*		4,6	WMCBNLOA	DGFKA
Little Woodswallow	*Artamus minor*	H	3,4,6		GFA
Grey Butcherbird	*Cracticus torquatus*	H	3,4	WMCBNLOA	DGFKA
Pied Butcherbird	*Cracticus nigrogularis*		4	WCBNOA	DGFKA
Australian Magpie	*Gymnorhina tibicen*		20	WMCBNLOA	DGFKA
Pied Currawong	*Strepera graculina*	H	2,3,4	WMCBLOA	DGTFKA
Grey Currawong	*Strepera versicolor*	H	2,3,4,11,23	CB	FA
Green Catbird	*Ailuroedus crassirostris*	H	1,2	WMBNLOA	DGTFKUA
Australian Raven	*Corvus coronoides*		4,6	WMCBLOA	DGFKA
Forest Raven	*Corvus tasmanicus*	H	2,3,4	WCA	DGFKA
Torresian Crow	*Corvus orru*		4,6	WCBNLOA	DGTFUA
Little Raven	*Corvus mellori*	H	2,3,5,6,8	NOA	A

TABLE 2
SPECIES IN THE SEPL SUPPLY ZONE THAT ARE AT THEIR DISTRIBUTIONAL LIMITS, ARE CONSIDERED ENDEMIC TO THE AREA OR ARE PARTICULARLY RESTRICTED IN DISTRIBUTION

Rest Dist	Restricted distribution	1 = < 10 000 km² 2 = 10 000 - 30 000 km² 3 = 30 000 - 100 000 km²
Endem	Endemic	A = Endemic to SEPL Area B = Nearly Endemic to SEPL Area
Dist limits	Distributional limits	N = North W= West S = South E = East

Species in Bold are Schedule12 species (NP&W Act 1974).

COMMON NAME	SCIENTIFIC NAME	Rest Dist	Endem	Dist limits
MAMMALS				
Brown Antechinus	*Antechinus stuartii*			W
Dusky Antechinus	*Antechinus swainsonii*			W
Common Planigale	***Planigale maculata***			**W**
Fat-tailed Dunnart	*Sminthopsis crassicaudata*			E
Northern Brown Bandicoot	*Isoodon macrourus*			W
Long-nosed Bandicoot	*Perameles nasuta*			W
Wombat	*Vombatus ursinus*			W
Mountain Brushtail Possum	*Trichosurus caninus*			W
Eastern Pygmy-possum	*Cercartetus nanus*			W
Yellow-bellied Glider	***Petaurus australis***			**W**
Long-nosed Potoroo	***Potorous tridactylus***	**3**		**W**
Black-striped Wallaby	***Macropus dorsalis***			**S**
Parma Wallaby	***Macropus parma***	**3**	**B**	**N W**
Whiptail Wallaby	*Macropus parryi*			S
Red-legged Pademelon	***Thylogale stigmatica***	**3**		**W S**
Red-necked Pademelon	*Thylogale thetis*			W
Queensland Blossom Bat	***Syconycteris australis***			**S**
Eastern Little Mastiff-bat	***Mormopterus norfolkensis***	**3**		**W S**
Little Mastiff-bat	*Mormopterus planiceps*			E
Golden-tipped Bat	***Kerivoula papuensis***	**2**		
Little Bent-wing Bat	***Miniopterus australis***			**S**
Greater Long-eared Bat	***Nyctophilus timoriensis***			**E**
Hoary Bat	***Chalinolobus nigrogriseus***			**S**
Large Pied Bat	***Chalinolobus dwyeri***			**E**
Troughton's Eptesicus	***Eptesicus troughtoni***			**S**
Little Forest Eptesicus	*Eptesicus vulturnus*			N
Eastern Broad-nosed Bat	*Scotorepens orion*			N
Eastern Chestnut Mouse	***Pseudomys gracilicaudatus***			**S**
New Holland Mouse	*Pseudomys novaehollandiae*			N
Fawn-footed Melomys	*Melomys cervinipes*			S
Grassland Melomys	*Melomys burtoni*			S
Pale Field Rat	*Rattus tunneyi*			S
Hastings River Mouse	***Pseudomys oralis***	**1**	**B**	**S**
Broad-toothed Rat	***Mastacomys fuscus***	**3**		**N**
AMPHIBIANS				
Green-thighed Frog	***Litoria brevipalmata***	**3**	**B**	**S**
Yellow-spotted Tree-frog	***Litoria castanea***	**1**	**A**	**all**

COMMON NAME	SCIENTIFIC NAME	Rest Dist	Endem	Dist limits
AMPHIBIANS cont.				
Red-eyed Tree-frog	*Litoria chloris*			S W
Blue Mountains Tree-frog	*Litoria citropa*			N
Bleating Tree-frog	*Litoria dentata*			W
Eastern Dwarf Tree-frog	Litoria fallax			S
Freycinets' Frog	*Litoria freycineti*	3		W
Dainty Green Tree-frog	*Litoria gracilenta*			S
Jervis Bay Frog	*Litoria jervisiensis*	3		N
Olongburra Frog	***Litoria olongburensis***	**2**		**S**
Pearson's Frog	*Litoria pearsoniana*	3		S
Peppered Frog	***Litoria piperata***	**1**	**A**	**all**
Leaf-green Tree-frog	*Litoria phyllochroa*			N
Glandular Frog	***Litoria subglandulosa***	**2**	**A**	**all**
Tyler's Tree-frog	*Litoria tyleri*	3		W
Revealed Frog	*Litoria revelata*	3		S
Tusked Frog	*Adelotus brevis*			S
Pouched Frog	***Assa darlingtoni***			**S**
Wallum Froglet	***Crinia tinnula***	**3**		**S W**
Haswell's Frog	*Geocrinia haswelli*	3		N
Giant Burrowing Frog	***Heleioporus australiacus***	**2**		**N**
Fletcher's Frog	*Lechriodus fletcheri*			W
Stuttering Frog	***Mixophyes balbus***			**N W**
Greater Barred Frog	*Mixophyes fasciolatus*			W
Fleay's Frog	***Mixophyes fleayi***	**1**		**S**
Southern Barred Frog	***Mixophyes iteratus***	**3**		**W**
Loveridge's Frog	***Philoria loveridgei***	**2**	**B**	**S**
Sphagnum Frog	***Philoria sphagnicolus***	**1**	**A**	**all**
Red-crowned Toadlet	***Pseudophryne australis***	**2**		**N**
Red-backed Toadlet	*Pseudophryne coriacea*			W S
Dusky Toadlet	*Uperoleia fusca*	3		
REPTILES				
Saw-shelled Turtle	*Elseya latisternum*			S
Murray Turtle	*Emydura macquarii*			E
Northern Rivers Tortoise	*Emydura signata*	3		S W
Bynoe's Gecko	*Heteronotia binoei*			E
Lesueur's Velvet Gecko	*Oedura lesueurii*			W
Southern-spotted Velvet Gecko	*Oedura tryoni*			S W
Northern Leaf-tailed Gecko	*Phyllurus comutus*	2		S
Southern Leaf-tailed Gecko	*Phyllurus platurus*	2		N
Border Thick-tailed Gecko	***Underwoodisaurus sphyrurus***	**3**		**S E**
Legless Lizard	*Delma plebeia*			S
Southern Angle-headed Dragon	*Hypsilurus spinipes*	3		S W
Mountain Dragon	*Tympanocryptis diemensis*	3		N
Two-clawed Worm-skink	*Anomalopus leuckartii*			S
Punctate Worm-skink	*Anomalopus swansoni*	3		N
Three-clawed Worm-skink	*Anomalopus verreauxii*	3		S
Scute-snouted Calyptotis	*Calyptotis scutirostrum*	3		S
Red-tailed Calyptotis	*Calyptotis ruficauda*	2	A	all
Tussock Rainbow-skink	*Carlia vivax*			S
Three-toed Snake-tooth Skink	***Coeranoscincus reticulatus***	**2**		**S**
Carnaby's Skink	*Cryptoblepharus carnibyi*			E

COMMON NAME	SCIENTIFIC NAME	Rest Dist	Endem	Dist limits
REPTILES contd.				
Brown-backed Yellow-lined Ctenotus	*Ctenotus eurydice*	3		S W
She-oak Skink	*Cyclodomorphus casuarinae*	2		N
Major Skink	*Egernia frerei*			S
Land Mullet	*Egernia major*	3		S W
Egernia Mcpheei	*Egernia mcpheei*			S W
Eastern Ranges Rock-skink	*Egneria modesta*	3		S
Black Crevice-skink	*Egernia saxatilis*			N
Alpine Meadow-skink	*Eulamprus kosciuskoi*	3		N E
Blue-speckled Forest Skink	*Eulamprus murrayi*	3		S W
Southern Water Skink	*Eulamprus heatwolei*			N
Three-toed Earless Skink	*Hemiergis decresiensis*			N
Pink-tongued Lizard	*Hemisphaeriodon gerrardi*			W
Montane Skink	*Lampropholis caligula*	1	A	all
Dark-flecked Garden Sunskink	*Lampropholis delicata*			W
Beech Skink	*Leiolopisma zia*	2	B	S E W
South-eastern Slider	*Lerista bougainvillii*			N
Tree-base Litter Skink	*Lygisaurus foliorum*			S
Short-limbed Snake-skink	*Ophioscincus truncatus*	2		W S
Southern Forest Cool-skink	*Pseudemoia coventryi*	3		N
Bold-striped Cool-skink	*Pseudemoia duperreyi*			N
Red-throated Skink	*Pseudemoia platynota*			N
Tussock Cool-skink	*Pseudemoia entrecasteauxii*			N E
Yellow-bellied Three-toed Skink	*Saiphos equalis*	3		W
Orange-tailed Shadeskink	*Saproscincus challengeri*	3		W S
Weasel Skink	*Saproscincus mustelina*			W
Eastern Childrens Python	*Liasis maculosus*			S
Keelback Snake	*Tropidonophis mairii*			S
Copperhead	*Austrelaps superbus*	3		N
White-naped Snake	***Cacophis harriettae***			**S**
Dwarf Crowned Snake	*Cacophis krefftii*	3		W
Golden Crowned Snake	*Cacophis squamulosus*			W
White-lipped Snake	*Drysdalia coronoides*			N
Mustard-bellied Snake	*Drysdalia rhodogaster*	2		N
Pale-headed Snake	***Hoplocephalus bitorquatus***			**S**
Broad-headed Snake	***Hoplocephalus bungaroides***	**2**		**N**
Stephen's Banded Snake	***Hoplocephalus stephensii***	**3**		**S W**
Rough-scaled Snake	*Tropidechis carinatus*	3		S W
BIRDS				
Wandering Whistling Duck	*Dendrocygna arcuate*			S
Brahminy Kite	*Haliastur indus*			S
Red Goshawk	***Erythrotriorchis radiatus***			**S**
Australian Brush-turkey	*Alectura lathami*			S
Red-backed Buttonquail	*Turnix maculosa*			S
Lotus Bird	***Irediparra gallinacea***			**S**
Superb Fruit-dove	***Ptilinopus superbus***			**W**
Rose-crowned Fruit-dove	***Ptilinopus regina***			**S**
Wompoo Fruit-dove	***Ptilinopus magnificus***			**W**
Topknot Pigeon	*Lopholaimus antarcticus*	3		W
White-headed Pigeon	*Columba leucomela*			W

COMMON NAME	SCIENTIFIC NAME	Rest Dist	Endem	Dist limits
BIRDS contd.				
Brown Pigeon	*Macropygia amboinensis*			W
Gang-Gang Cockatoo	*Callocephalon fimbriatum*			N
Little Corella	*Cacatua sanguinea*			E
Double-eyed Fig Parrot	***Psitlaculirostris diophthalina***	3		**S**
Swift Parrot	***Lathamus discolor***			**W**
Ground Parrot	***Pezoporus wallicus***	3		
Pale-headed Rosella	*Platycercus adscitus*			S
Turquoise Parrot	***Neophema pulchella***			**E**
Oriental Cuckoo	*Cuculus saturatus*			S
Little Bronze-cuckoo	*Chrysococcyx malayanus*			S
Gould's Bronze-cuckoo	*Chrysococcyx russatus*			S
Powerful Owl	***Ninox strenua***			**W**
Sooty Owl	***Tyto tenebricosa***			**W**
Marbled Frogmouth	***Podargus ocellatus***	3		**S**
White-rumped Swiftlet	*Callocalia spodiopygia*			S
Collared Kingfisher	***Halcyon chloris***			S
Forest Kingfisher	*Halcyon macleayii*			S
Noisy Pitta	*Pitta versicolor*			S
Superb Lyrebird	*Menura novaehollandiae*			W
Rufous Scrub-bird	***Atrichornis rufescens***	2	B	**S W**
Skylark	*Alauda arvensis*			N
Barred Cuckoo-shrike	***Coracina lineata***			**S**
Varied Triller	*Lalage leucomela*			S
Blackbird	*Turdus merula*			N
Rose Robin	*Petroica rosea*			W
Pale-yellow Robin	*Tregellasia capito*	3		S W
Olive Whistler	***Pachycephala olivacea***			**W**
Little Shrike-thrush	*Colluricincla megarhyncha*			S
White-eared Monarch	***Monarcha leucotis***			**S**
Black-faced Monarch	*Monarcha melanopsis*			W
Spectacled Monarch	*Monarcha trivirgatus*			S W
Logrunner	*Orthonyx temminckii*			S W
Red-backed Fairy-wren	*Malurus melanocephalus*			S
Eastern Bristlebird	***Dasyornis brachypterus***	3		
Large-billed Scrubwren	*Sericornis magnirostris*			W
Yellow-throated Scrubwren	*Sericornis citreogularis*			W
Mangrove Warbler	*Gerygone laevigaster*			S
Origma	*Origma solitaria*	3		N
Brown Gerygone	*Gerygone mouki*			W
Red-browed Treecreeper	*Climacteris erythrops*			W
Bell Miner	*Manorina melanophrys*			W
Mangrove Honeyeater	***Lichenostomus fasciogularis***			**S W**
Singing Honeyeater	*Lichenostomus virescens*			E
White-throated Honeyeater	*Melithreptus albogularis*			S
Tawny-crowned Honeyeater	*Phylidonyris melanops*			N
Crescent Honeyeater	*Phylidonyris pyrrhoptera*			N
Black Honeyeater	*Certhionyx niger*			E
European Greenfinch	*Carduelis chloris*			N
Beautiful Firetail	*Emblema bellum*			N
Nutmeg Mannikin	*Lonchura punctulata*			W
Figbird	*Sphecotheres viridis*			S

COMMON NAME	SCIENTIFIC NAME	Rest Dist	Endem	Dist limits
BIRDS contd.				
Satin Bowerbird	*Ptilonorhynchus violaceus*			W
Regent Bowerbird	*Sericulus chrysocephalus*			S W
Paradise Riflebird	*Ptiloris paradiseus*	3		S W
Green Catbird	*Ailuroedus crassirostris*			W
Forest Raven	*Corvus tasmanicus*			N
Tree Sparrow	*Passer montanus*			N

TABLE 3A.
SPECIES LISTED ON SCHEDULE 12 (NP&W ACT 1974) THAT MAY OCCUR IN THE SEPL SUPPLY ZONE.

AMPHIBIANS	
Green & Golden Bell-frog	*Litoria aurea*
Green-thighed Frog	*Litoria brevipalmata*
Yellow-spotted Tree-frog	*Litoria castanea*
Olongburra Frog	*Litoria olongburensis*
Peppered Frog	*Litoria piperata*
Glandular Frog	*Litoria subglandulosa*
Pouched Frog	*Assa darlingtoni*
Wallum Froglet	*Crinia tinnula*
Southern Barred Frog	*Mixophyes iteratus*
Stuttering Frog	*Mixophyes balbus*
Fleay's Frog	*Mixophyes fleayi*
Loveridge's Frog	*Philoria loveridgei*
Sphagnum Frog	*Philoria sphagnicolus*
Giant Burrowing Frog	*Heleioporus australiacus*
Red-crowned Toadlet	*Pseudophryne australis*
REPTILES	
Border Thick-tailed Gecko	*Underwoodisaurus sphyrurus*
Three-toed Snake-tooth Skink	*Coeranoscincus reticulatus*
White-naped Snake	*Cacophis harriettae*
Pale-headed Snake	*Hoplocephalus bitorquatus*
Stephen's Banded Snake	*Hoplocephalus stephensii*
Broad-headed Snake	*Hoplocephalus bungaroides*
MAMMALS	
Tiger Quoll	*Dasyurus maculatus*
Brush-tailed Phascogale	*Phascogale tapoatafa*
Koala	*Phascolarctos cinereus*
Yellow-bellied Glider	*Petaurus australis*
Squirrel Glider	*Petaurus norfolcensis*
Rufous Bettong	*Aepyprymnus rufescens*
Long-nosed Potoroo	*Potorous tridactylus*
Common Planigale	*Planigale maculata*
Black-striped Wallaby	*Macropus dorsalis*
Parma Wallaby	*Macropus parma*
Brush-tailed Rock Wallaby	*Petrogale penicillata*
Red-legged Pademelon	*Thylogale stigmatica*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*
Queensland Blossom Bat	*Syconycteris australis*
Eastern Little Mastiff-bat	*Mormopterus norfolkensis*
Golden-tipped Bat	*Kerivoula papuensis*
Little Bent-wing Bat	*Miniopterus australis*
Common Bent-wing Bat	*Miniopterus schreibersii*
Greater Long-eared Bat	*Nyctophilus timoriensis*
Hoary Bat	*Chalinolobus nigrogriseus*
Large Pied Bat	*Chalinolobus dwyeri*
Troughton's Eptesicus	*Eptesicus troughtoni*
Great Pipistrelle	*Falsistrellus tasmaniensis*
Large-footed Myotis	*Myotis adversus*
Greater Broad-nosed Bat	*Scoteanax rueppellii*
Eastern Chestnut Mouse	*Pseudomys gracilicaudatus*
Hastings River Mouse	*Pseudomys oralis*
Broad-toothed Rat	*Mastacomys fuscus*

BIRDS	
Black Bittern	*Dupetor flavicollis*
Australian Brown Bittern	*Botaurus poiciloptilus*
Black-necked Stork	*Xenorhynchus asiaticus*
Freckled Duck	*Strictonetta naevosa*
Blue-billed Duck	*Oxyura australis*
Osprey	*Pandion haliaetus*
Square-tailed Kite	*Lophoictinia isura*
Black-breasted Kite	*Hamirostra melanosternon*
Red Goshawk	*Erythrotriorchis radiatus*
Painted Snipe	*Rostratula benghalensis*
Brolga	*Grus rubicundus*
Lotus Bird	*Irediparra gallinacea*
Bush Thick-knee	*Burhinus magnirostris*
Superb Fruit-dove	*Ptilinopus superbus*
Rose-crowned Fruit-dove	*Ptilinopus regina*
Wompoo Fruit-dove	*Ptilinopus magnificus*
Red-tailed Black-cockatoo	*Calyptorhynchus magnificus*
Glossy Black-cockatoo	*Calyptorhynchus lathami*
Swift Parrot	*Lathamus discolor*
Ground Parrot	*Pezoporus wallicus*
Double-eyed Fig Parrot	*Psittaculriostris diophthalma*
Turquoise Parrot	*Neophema pulchella*
Sooty Owl	*Tyto tenebricosa*
Powerful Owl	*Ninox strenua*
Masked Owl	*Tyto novaehollandiae*
Marbled Frogmouth	*Podargus ocellatus*
Rufous Scrub-bird	*Atrichornis rufescens*
Yellow-eyed Cuckoo-shrike	*Coracina lineata*
Olive Whistler	*Pachycephala olivacea*
White-eared Monarch	*Monarcha leucotis*
Eastern Bristlebird	*Dasyornis brachypterus*
Regent Honeyeater	*Xanthomyza phrygia*
Painted Honeyeater	*Grantiella picta*
Mangrove Honeyeater	*Lichenostomus fasciogularis*

TABLE 3B
INFORMATION ON SOME OF THE MORE FOREST DEPENDENT SCHEDULE 12 SPECIES THAT OCCUR IN THE SEPL SUPPLY ZONE

NAME	Sch 12	HABITAT DESCRIPTION
AMPHIBIANS		
Hylidae		
Litoria brevipalmata Green-Thighed Frog	2	Inhabits schlerophyll forests and woodlands from northern NSW to southeastern QLD and is widespread in the SEPL region. Little is known about this species. Breeding aggregations occur around grassy semi-permanent ponds in late spring and summer. Distribution: 30 000-100 000 km² Abundance: sparse Status: vulnerable Special requirements: grassy semi-permanent ponds for breeding
Litoria piperata Peppered Frog	2	Inhabits riparian vegetation in a variety of forest habitats. Endemic to the SEPL area, restricted to the New England Tablelands. Distribution: < 10 000 km² Abundance: common Status: secure
Litoria subglandulosa Glandular Frog	2	Inhabits and breeds in warm temperate permanent/semi-permanent. creeks, pools, small streams and rivers in montane forest. Hibernates during winter under rotting logs (up to 16 under one log). Restricted distribution within its range which extends from the northern Tablelands and highlands and into QLD. Distribution: 10 000-30 000 km² Abundance: sparse Status: secure Special requirements: rotting logs
Myobatrachidae		
Assa darlingtoni Pouched Frog	2	Distributed from the McPherson ranges to the Dorrigo area. It is commonly found in or under rotting logs or under rocks and leaf litter in antarctic beech forests and adjacent rainforest. The male has the unique habit of carrying the tadpoles in paired lateral brood pouches, from which they emerge as miniature frogs. Distribution: 10 000-30 000 km² Abundance: sparse Status: secure.
Mixophyes balbus Stuttering Frog	2	The Stuttering Frog ranges from northern NSW, east of the Great Dividing Range, to Victoria. It is a terrestrial inhabitant of rainforest or wet sclerophyll forests. Distribution: 100 000-300 000 km² Abundance: common Status: secure

NAME	Sch 12	HABITAT DESCRIPTION
Mixophyes fleayi Fleay's Frog	2	Distributed along the Great Dividing Range and coast from the Conondale Range in southeast QLD to Clarence River, NSW. Inhabits rainforest and wet sclerophyll forests. Southern limit of the species distribution occurs within the SEPL. Distribution: < 10 000 km^2 Abundance: sparse Status: secure
Mixophyes iteratus Southern Barred Frog	2	The Southern Barred Frog is a terrestrial inhabitant of coastal rain-antarctic beech or wet sclerophyll forest (riverine forest). It is widespread in the SEPL Area and ranges from the Bunya Mountains and coastal ranges of southeast QLD and northern NSW south to the Narooma area. Distribution: 30 000-100 000 km^2 Abundance: sparse Status: secure
Heleioporous australiacus Giant Burrowing Frog	2	This large burrowing frog inhabits open forest on the coast and ranges from the central coast of NSW to eastern Victoria. Appears to breed in burrows in the banks of small creeks during summer and autumn. Distribution: 10 000-30 000 km^2 Abundance: very sparse Status: probably secure
Leptodactylidae		
Philoria loveridgei Loveridge's Frog	2	Inhabits rainforest and wet sclerophyll forests from the Macpherson Ranges, on the Qld-NSW border to the Gibraltar Range, NSW. It is usually found either in mossy cavities besides streams or burrowed in loose moist soil or moss. Distribution: 10 000-30 000 km^2 Abundance: very sparse Status: probably secure
Philoria sphagnicolus Sphagnum Frog	2	Inhabits warm temperate montane sphagnum bogs and is known only from ranges near Ebor and Dorrigo to the Elands area, NSW. Often found in permanently saturated environments such as in crevices behind or beside waterfalls. Distribution: < 10 000 km^2 Abundance: very sparse Status: probably secure

NAME	Sch 12	HABITAT DESCRIPTION
REPTILES		
Elapidae		
Hoplocephalus bungaroides Broad-headed Snake	1	The Broad-headed Snake is largely confined to the Hawkesbury sandstone formation along the coast and coastal ranges within an area 250 km from Sydney. It is a nocturnal snake found under large rock slabs, rocky ridges and crevices. The southern region of the SEPL area encompasses the northern bound of its range. Live bearing. Distribution: Aust.: 10 000-30 000 km^2 NSW: as in profile Regional: distributed along Colo River Abundance: sparse-common Status: Aust.: vulnerable, possibly endangered Regional: very limited Foraging/Food: small mammals, lizards and frogs. Special requirements: tree-hollows near rocky habitat in hot weather.
Hoplocephalus stephensii Stephen's Banded Snake		Stephen's Banded Snake occurs on the coast and ranges from the Gosford district, NSW, to southern Qld, with an outlier population near Bundaberg. It inhabits rainforest edges and wet and dry sclerophyll forest. Stephen's Banded Snake is nocturnal, partly arboreal and live bearing. Distribution: Aust.: 30 000-100 000 km^2 NSW: eastern NSW from north-eastern NSW to Gosford Regional: as above Abundance: rare-sparse Status: Aust: rare, vulnerable Regional: widespread Foraging/Food: small mammals, including bats, birds, geckos, skinks Special requirements: trees with scar crevices or exfoliating granite for shelter and basking.

NAME	Sch 12	HABITAT DESCRIPTION
Hoplocephalus bitorquatus Pale-headed Snake		The Pale-headed Snake has a patchy distribution in eastern Australia from about 80 kms north of Sydney to Cape York Peninsular. It is found along the coast, ranges and western slopes in a wide range of habitats, from rainforest, wet and dry sclerophyll forest and open woodland (especially *Calitris*). The Pale-headed Snake is partially arboreal and live-bearing. Distribution: Aust.: 300 000-1 million km² NSW: west of Great Dividing Range to coast, extending to north of Sydney Regional: Clarence River to Gosford Abundance: rare-sparse Status: Aust.: vulnerable Regional: widespread Foraging/Food: geckos, skinks, tree-frogs and mammals including bats. Special requirements: trees with scar crevices or exfoliating granite for shelter and basking.
Cacophis harriettae White-naped Snake	2	The White-naped Snake inhabits rainforest, wet sclerophyll forest or moist shrubland thickets in coastal and near coastal areas from northeastern NSW to north of the tropic of Capricorn. It is nocturnal and oviparous. Distribution: Aust.: 100 000-300 000 km² NSW: north-eastern NSW Regional: southern distribution extends to Glenreagh Abundance: common Status: Aust.: secure Regional: moderate Foraging/Food: Feeds on blind snakes, small lizards and their eggs. Special requirements: Fallen rotting timber, deep rotting piles of leaves and vegetation or rocks for shelter.

NAME	Sch 12	HABITAT DESCRIPTION
Scincidae		
Coeranoscincus reticulatus Three-toed Snake-tooth Skink	2	This species has a restricted distribution in the rainforests and wet sclerophyll forests of northeastern NSW and southeastern QLD The southern boundary of its range is in the northern section of the SEPL study area. Apparently an inhabitant of rainforest and adjacent wet sclerophyll forest; usually found in rotting logs or in soil under fallen timber. This skink is frequently found in areas of the forest where tree-falls have occurred, allowing some sunlight to reach the forest floor. Distribution: Aust: 10 000-30 000 km² NSW: north-eastern NSW Regional: southern distribution extends to Clarence River Abundance: common Status: Aust.: vulnerable, probably secure Regional: very limited Foraging/Food: earthworms and burrowing insect larvae. Special requirements: fallen timber and rotting logs.
MAMMALS		
Dasyuridae		
Phascogale tapoatafa Brushed-tailed Phascogale	2	Largely arboreal, this mammal lives in a variety of habitats, although it is restricted by the need for reliable annual rainfall within the range of 500-2000mm. Its prefered habitat is open dry sclerophyll forest with little ground cover, on ridges up to 600m altitude. It sleeps in a nest lined with leaves or shredded bark in a tree hollow, emerging at dusk to feed. Limited patchy distribution in Australia. The species occurs throughout the SEPL area. Distribution: 300 000-1 million km² Abundance: sparse Status: probably secure Foraging/Food: small arboreal mammals, nestling birds, larger orthopods. Special requirements: relatively large tree-hollows for group nesting.
Planigale maculata Common Planigale	2	The Common Planigale is the largest of the planigales weighing up to 22 grams. Occurs in Eastern Australia from south of Sydney to Cape York and the Northern Territory's 'Top End'. The Common Planigale inhabits a range of habitats from tropical to warm temperate rainforest and sclerophyll forest to wooded grassland and marsh. It is nocturnal, sheltering in a nest under timber or rocks during the day. Distribution: 300 000-1 million km² Abundance: common Status: secure Foraging/Food: A nocturnal predator on a wide range of insects and small vertebrates. Special requirements: nests under rocks or fallen timber.

NAME	Sch 12	HABITAT DESCRIPTION
Dasyurus maculatus Tiger Quoll	2	The Tiger Quoll is a semi-arboreal dasyurid and inhabits wet and dry sclerophyll forest and rainforest. Its distribution is restricted to northeastern and southeastern coastal Qld, NSW, Victoria, the ACT and Tasmania, generally in areas that exceed 600mm rainfall per annum. It is a primarily nocturnal, opportunistic predator which nests in rock caves and hollow logs, with basking sites located nearby. Distribution: 300 000-1 million km² Abundance: sparse Status: probably secure Foraging/Food: small terrestrial and arboreal mammals, small macropods, birds, arthropods, reptiles and insects. Special requirements: rock caves, hollow logs and trees for nesting.
Macropodidae		
Macropus dorsalis Black-striped Wallaby	1	Found in central subcoastal Queensland and northeastern of New South Wales. The Black-striped Wallaby's preferred habitat is forested country with a dense shrub layer, which includes: rainforest margins; brigalow scrub, particularly in a phase of regrowth; open forest with a thick *Acacia* or other understorey; and lantana thickets. Most daylight hours are spent resting under cover. Seldom ventures far from cover. It is common within this range. Distribution: 300 000-1 million km² Abundance: common Status: secure Foraging/Food: grazes on native grasses from dusk until dawn. Special req: dense ground cover for shelter with adjacent grassy areas for grazing.
Petrogale penicillata Brush-tailed Rock-wallaby	2	Inhabits cliffs and rock slopes in subtropical to cool-temperate wet or dry sclerophyll forest, in subcoastal and inland areas of southeastern Australia. Its range extends through NSW and into Victoria, being common in the region of the Upper Richmond and Clarence Rivers. Areas colonized are always adjacent or close to grassy areas for grazing. Windblown caves, rock clefts or tumbled boulders are used for shelter. Distribution: 100 000-300 000 km² Abundance: common Status: secure Foraging/Food: nocturnal; grazes on native and introduced grasses. Special requirements: sunny rocky slopes with caves and crevices for shelter.
Macropus parma Parma Wallaby	2	Occurs in wet and dry forests and occasionally in rainforests, although its optimum habitat appears to be wet sclerophyll forest with a thick, shrubby understorey associated with grassy patches. Primarily nocturnal. The Parma Wallaby is endemic to the SEPL area. It has a limited patchy distribution along the Great Dividing Ranges to the coast. Distribution: 300 000-100 000 km² Abundance: sparse Status: probably secure Foraging/Food: grazes on grasses and herbs near cover. Special req: dense ground cover for shelter with adjacent grassy areas nearby.

NAME	Sch 12	HABITAT DESCRIPTION
Thylogale stigmatica Red-legged Pademelon	2	Rainforest appears to be the 'prefered' habitat but it also occurs in wet sclerophyll forests and occasionally in dry vine scrubs. Its southern limit occurs approximately at Newcastle and its northern limit is at Townsville. Distribution is discontinuous and restricted to the coastal ranges and is limited by the availability of vegetation providing adequate cover. Distribution: 30 000-100 000 km² Abundance: common Status: secure Foraging/Food: north; rainforest leaves, south; more grasses, berries. Special requirements: Dense understorey to provide shelter.
Emballonuridae		
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	2	Rare but widespread over northern Australia and occurs in patches in Victoria. Tree hollows or abandoned nests of Sugar Gliders are used for roosts. It may be found nesting on the walls of buildings in daylight. It is thought that those found resting in daylight may be migrating to warmer areas. Distribution: > 1 million km² Abundance: rare Status: probably secure Foraging/Food: insects above forest canopy, forages closer to the ground in mallee areas. Special requirements: tree-hollows for roosting Habit: maybe migratory.
Molossidae		
Mormopterus norfolkensis Eastern Little Mastiff-bat	2	Little is known of the prefered habitat of the Eastern Little Mastiff-bat but it appears to live in sclerophyll forest and woodland. Small colonies have been found in tree-hollows or under loose bark. The southern limit of its range reaches approximately Sydney. Distribution is restricted to the coastal ranges. Distribution: 30 000-100 000 km² Abundance: very sparse Status: probably secure Foraging/Food: insects above the canopy or at the forest edge. Special requirements: tree-hollows or loose bark.
Muridae		
Pseudomys gracilicaudatus Eastern Chestnut Mouse	2	Recorded in open woodland with a grassy understorey but it is more often found in heathland and is most common in dense wet heath and swampy areas. Optimal habitat is provided by regenerating vegetation after fire. Nests may be made out of grass or may be part of a burrow complex. Restricted to northeastern Australia. Its southern limit reaches approximately Newcastle. Distribution: 300 000-1 million km² Abundance: very sparse Status: probably secure Foraging/Food: grasses and grass seed. Special requirements: dense understorey.

NAME	Sch 12	HABITAT DESCRIPTION
Pseudomys oralis Hastings River Mouse	2	The Hastings River Mouse inhabits well-watered forests with a dense understorey. Captive animals dig into the soil and climb readily on sticks and stones. Restricted to south-eastern Australia, ranging from Brisbane, to the Barrington Tops area. The southern limit of the species range occurs within the SEPL area. Distribution: <10 000 km² Abundance: very sparse Status: possibly endangered Foraging/Food: captive animals eat grain Special requirements: dense understorey
Petauridae		
Petaurus australis Yellow-bellied Glider	2	This glider is restricted to tall mature eucalypt forests in temperate to subtropical eastern Australia in regions of high rainfall. Its patchy distribution is perhaps determined by the local availability of a variety of suitable flowering trees with overlapping blossoming periods, providing blossom over the greater part of the year. Groups share a den in a tree-hollow. It is widespread in the SEPL area. Distribution: 300 000-1 million km² Abundance: sparse Status: probably secure Foraging/Food: eucalypt sap, nectar, pollen, insects and insect exudates. Special requirements: large tree-hollows for nesting and shelter.
Petaurus norfolcensis Squirrel Glider	2	The Squirrel Glider inhabits dry sclerophyll forest and woodland and is absent from dense coastal ranges, although in Queensland it occurs in some wet forest areas bordering on rainforest. It nests in leaf lined tree-hollows. The Squirrel Glider may be endangered at the southern part of its range in Victoria. It is restricted to the west of the Great Dividing Range and is considered rare. Distribution: 300 000-1 million km² Abundance: common Status: secure Foraging/Food: acacia gum, eucalypt sap, insects and insect exudates. Special requirements: tree-hollows.
Phascolarctidae		
Phascolarctos cinereus Koala	2	The Koala ranges from the tropics to the cool temperate regions and is widespread in the SEPL region. It requires open eucalypt forests and is common with a limited range. Patchy distribution is due to the loss of suitable habitat. The southern limit of a major patch occurs in the SEPL area, at Newcastle. Distribution: 300 000-1 million km² Abundance: very sparse Status: probably secure Foraging/Food: foliage of eucalypts; and some non-eucalypt species; River and Forest Red gum in the north, and Grey gum, Swamp gum, Manna gum and Blue gum in the southeast. Others may contribute to the diet and there are marked local and seasonal preferences. Special requirements: areas of forest with these species of eucalypts.

NAME	Sch 12	HABITAT DESCRIPTION
Potoroidae		
Aepyprymnus rufescens Rufous Bettong	2	A nest builder, like the Potoroos and other Bettongs, this small macropod lives in well-grassed open forest. The nests are usually built at the base of a grass tussock. Distribution over its range is discontinuous and determined by the availability of suitable shelter. It ranges from about Cairns to Newcastle with a small patch on the NSW-Vic border. Distribution: 300 000-1 million km² Abundance: common Status: probably secure Foraging/Food: grasses, sedges, herbs, digs for tubers. Special requirements: usually builds nest at base of tussock, needs grassy debris for shelter.
Potorous tridactylus Long-nosed Potoroo	2	Generally restricted to areas with annual rainfall, greater than 760mm, it inhabits coastal heath and both dry and wet sclerophyll forests. The Long-nosed Potoroo often digs small holes, similar to that of a bandicoot. Patchy distribution over its range from southeast Qld to Tasmania. Distribution: 30 000-100 000 km² Abundance: sparse Status: probably secure Foraging/Food: digs in forest litter for tubers, fungi and insect larvae. Special requirements: dense groundcover and light, sandy soils.
Pteropodidae		
Syconycteris australis Queensland Blossom Bat	2	An inhabitant of rainforest, sclerophyll forest and woodland communities. Its range extends from Cape York into northeastern NSW. The Queensland Blossom Bat roosts in dense foliage. Distribution: 100 000-300 000 km² Abundance: common Status: probably secure Foraging/Food: feeds exclusively on nectar; observed feeding from the blossoms of paperbarks, bottlebrushes, banksias, bloodwoods and cultivated bananas. Special requirements: the dense foliage of rainforest and wet sclerophyll forest for daytime roosting.
Vespertilionidae		
Eptesicus troughtoni Troughton's Eptesicus	2	Usually found in warm temperate to tropical woodland and sclerophyll forest. Largely restricted to northeast Australia on both sides of the dividing range, although a recent specimen captured in south coastal NSW considerably extends the known distribution to southeastern NSW (Parnaby 1992). Distribution: 300 000-1 million km² Abundance: sparse Status: probably secure Special requirements: caves for roosting.

NAME	Sch 12	HABITAT DESCRIPTION
Chalinolobus dwyeri Large Pied Bat	2	The Large Pied Bat occurs in scattered localities from south of Sydney into central QLD. This species inhabits warm-temperate to subtropical dry sclerophyll forest and woodland, roosting in caves, old mines, tree-hollows and in the mud nests of Fairy Martins. Distribution: 300 000-1 million sq.km² Abundance: common Status: probably secure Foraging/Food: flies slowly beneath the canopy feeding on insects. Special requirements: caves and tree-hollows for roosting.
Chalinolobus nigrogriseus Hoary Bat	2	The southern limit of the Hoary Bat's range is on the northern limit of the SEPL area. Occurs in a wide range of habitats, from wet sclerophyll forest to open woodland, and even over scrub on sand dunes. Roosts have been reported in rock crevices, but in areas devoid of crevices, it is likely to roost in tree-hollows or under bark Much of the prey are taken from the ground or from the surfaces of trees or rocks. Restricted to the north and northeastern parts of Australia. Its distribution is continuous within its range and the southern limit of its range occurs in the north of the SEPL area. Distribution: > 1 million km² Abundance: very sparse Status: secure Foraging/Food: prey taken from the ground or tree and rock surfaces. Special requirements: rock crevices, tree-hollows and peeling bark.
Falsistrellus tasmaniensis Great Pipistrelle	2	Occurs in warm- to cool-temperate wet and dry sclerophyll forest. May be found in caves in the Jenolan area of New South Wales and elsewhere in abandoned buildings. The Great Pipistrelle usually roosts in tree-hollows in the high rainfall forests within its range. Its range spans continuously from southeast Qld to west Victoria, along the coast and coastal ranges. A patch exists in southwest WA and it is widespread in Tasmania. Distribution: 300 000-1 million km² Abundance: sparse Status: probably secure Foraging/Food: larger insects below canopy Special requirements: tree-hollows, abandoned buildings and caves. Habit: some migration from cooler to warmer regions.

NAME	Sch 12	HABITAT DESCRIPTION
Kerivoula papuensis Golden-tipped Bat	2	Inhabits cool temperate to tropical rainforests. The Golden-tipped Bat has been trapped in several areas of coastal forest, the southern most area being in NSW close to the Victorian border, the northern most being at the northern tip of Cape York Peninsular. The extention of its range probably reflects increased activity in bat surveys and improved trapping techniques. It appears to roost in dense vegetation and tree-hollows. Distribution: 10 000-30 000 km² Abundance: very rare Status: vulnerable Foraging/Food: intra-canopy aerial insectivore (unique amongst eastern rainforest bats), hovers below or in canopy gleaning insects from leaves and branches. Special requirements: dense vegetation and tree-hollows.
Miniopterus australis Little Bent-wing Bat	2	Inhabits tropical rainforest to warm-temperate, wet and dry sclerophyll forests. The Little Bent-wing Bat depends on specific nursery sites to rear young. The southern most breeding population, found in the Macleay River watershed, seems to depend upon larger colonies of Common Bent-winged Bats to provide the high temperatures required to rear young. It occupies caves and tunnels during the day. Its range extends from Cape York to approximately Coffs Harbour which is in the SEPL area. Its distribution is continuous within this range. Distribution: 300 000-1 million km² Abundance: abundant Status: secure Foraging/Food: small insects above the forest canopy. Special req: cave dweller, uses specific nursery sites to rear young.
Miniopterus schreibersii Common Bent-wing Bat	2	This species inhabits well-timbered valleys in tropical to cool-temperate wet and dry sclerophyll forest. Its range extends in eastern Australia from Cape York to the southeastern corner of SA, and in northern Australia it is found in the Kimberley and Top End regions. This species roosts communally in caves, mines and occassionally buildings and females congregate in nursery caves to rear young. Bats in the southern part of the range may hibernate in winter. Distribution: 300 000-1 million sq.km² Abundance: abundant Status: secure Foraging/Food: feeds on small insects above the forest canopy. Special req: caves and mines for roosting, nuresery caves to rear young.

NAME	Sch 12	HABITAT DESCRIPTION
Myotis adversus Large-footed Mouse-eared Bat	2	Found in cool temperate to tropical wet sclerophyll forests. Colonies of 10 to 15 individuals (occasionally of several hundred), are found in caves, mines, tunnels, under bridges and buildings and even in dense foliage in the tropical part of its range. Males roost alone when not breeding. This bat is widespread in the SEPL region. Its range follows the coast of Australia from Derby WA, continuously east to Victoria and SA. Distribution: 300 000-1 million km² Abundance: very sparse Status: probably secure Foraging/Food: small fish and insects are captured whilst skimming over placid water. Special requirements: placid water, caves, mines, buildings.
Scoteanax rueppellii Greater Broad-nosed Bat	2	Inhabits cool-temperate to tropical wet sclerophyll forest and rainforest. Usually flies slowly and directly, 3 to 6 metres in height to catch insects and beetles. Recent evidence suggests that they also feed on vertebrates. Favoured hunting areas include tree-lined creeks and the junction of woodland and cleared paddocks. They may also forage in rainforest. The Greater Broad-nosed bat roosts in tree-hollows and may be found in roof spaces of old buildings. Its distribution is continuous within its range which spans from Cairns and south to Cape Howe Victoria following the coast. It is widespread in the SEPL area. Distribution: 100 000-300 000 km² Abundance: probably secure Status: possibly endangered Foraging/Food: slow flying insects and vertebrates in the understorey. Special requirements: tree-hollows.

NAME	Sch 12	HABITAT DESCRIPTION
BIRDS		
Meliphagidae		
Xanthomyza phrygia Regent Honeyeater	1	Movements of the Regent Honeyeater appear to be nomadic, although it will regularly appear in some districts when banksias and eucalypts flower. It is sometimes absent for years, or numbers are reduced where they were once abundant. The Regent Honeyeater lives in eucalypt forests and woodland. Its nest is a compact cup of bark strips bound with cobweb, lined with plant down and built into a fork of a tree, 1 to 20 metres above the ground. It is widespread in the SEPL area and its range spans from Bundaberg along the eastern coast and coastal ranges to Adelaide. Distribution: Aust.: 300 000-1 million km², south-eastern Australia NSW: predominately east of the Great Dividing Range, scattered populations to the west Regional: east of Great Dividing Range Abundance: very sparse Status: Aust.: endangered NSW: uncommon (Morris *et al.*), endangered (Garnett) Regional: uncommon-moderately common, limited (species distribution in SEPL based on Blakers *et al.* recording rate), 11% (of 1° blocks where recorded occur in SEPL) Foraging/Food: upper canopy; flowers, nectar, fruits, insects Habit: nomadic
Grantiella picta Painted Honeyeater	2	The painted Honeyeater inhabits forest and woodland usually in pairs or groups of up to six individuals. Mistletoe is regarded as determining this species' pattern of movement. The nest is a frail shallow dish of grass and rootlets bound with cobwebs and suspended in a bush or tree, 3-20 metres above the ground. Distribution is widespread but uncommon throughout its range which extends from Arnhem Land to Adelaide. Distribution: Aust.: >1 million km², inland eastern Australia NSW: scattered throughout NSW, absent from north-western NSW Regional: east of Great Dividing Range Abundance: sparse Status: Aust.: rare, Zmon, limited, 4% Foraging/Food: arboreal; upper canopy; mistletoe occasionally nectar and insects Special requirements: almost completely dependent upon the berries or drupes of mistletoes of the genus *Amyema*. Habit: locally nomadic and strongly migratory, breeding in southern Australia and moving north in winter.

NAME	Sch 12	HABITAT DESCRIPTION
Acanthizidae		
Dasyornis brachypterus Eastern Bristlebird	2	The species has a discontinuous distribution extending from southeastern QLD to far eastern Victoria. Populations in northeastern NSW inhabit grass communities located within open forest, adjacent to rainforest . Coastal populations utilize heath or grass tussock habitats. When breeding, males announce territories of about 1ha. The nest is a domed structure well hidden in a grass tussock. Distribution: Aust.: 30 000-1 million km² NSW: coastal eastern NSW Regional: northeastern NSW Abundance: rare-sparse Status: Aust.: vulnerable NSW: uncommon Regional: limited Foraging/Food: terrestrial; mainly insects and fruit. Special requirements: dense grassy ground cover and low vegetation.
Accipitridae		
Lophoictinia isura Square-tailed Kite	2	The Square-tailed Kite appears to undertake a regular seasonal movement, south in summer and north in winter, in southeastern Australia, and probably in southwest Australia also. Typically, this Kite is seen alone soaring above or just below the forest canopy. In the north and east, most sightings come from forest and woodland, and sometimes rainforest along rivers. Breeding has been recorded in eucalypt forest, *Angophora* and native pine. Distribution: Aust.: >1 million km², widespread across mainland Australia, except South Australia and the arid inland NSW: scattered populations in all regions except Mid-northcoast and the Illawarra Regional: east of the Great Dividing Range Abundance: sparse Status: Aust.: rare, probably secure NSW: scarce (Morris *et al.*), rare (Garnett) Regional: uncommon, very limited, 1% Foraging/Food: nestling birds, young rabbits, small reptiles, carrion. Habit: migratory.

NAME	Sch 12	HABITAT DESCRIPTION
Erythrotriorchis radiatus Red Goshawk	1	Inhabits tropical to warm temperate well-watered forest and woodland in northern and eastern Australia, from the Kimberly to northeastern NSW. The southern limit of the Red Goshawks range is in the SEPL Supply Zone. It is extremely rare and thinly distributed and very little is known of its biology. Distribution: Aust.: 300 000-1 million km² NSW: scattered populations in northern NSW Regional: as above Abundance: rare Status: Aust.: vulnerable NSW: rare (Morris *et al.*), endangered (Garnett) Regional: moderately common, very limited 4% Foraging/Food: aerial; mainly large birds; cockatoos, pigeons and kookaburras. Habit: little is known of its movements.
CACATUIDAE		
Ptilinopus regina *Rose-crowned Fruit-dove*	2	The Rose-crowned Fruit-dove occurs in Indonesia and in northern and eastern Australia from Bamaga in Qld to Port Stephens in NSW and in the Top End and Kimberly region. It inhabits rainforest and adjacent eucalypt forest with rainforest shrubs and monsoon and riverine forest. Its movements southward are erratic and are poorly understood with birds sometimes reaching Sydney and (rarely) Tasmania. Distribution: Aust.: 100 000-300 000 km^2 NSW: east of the Great Dividing Range Regional: as above Abundance: sparse Status: Aust.: vulnerable NSW: moderately common Regional: uncommon, moderate, 8% Foraging/Food: strictly arboreal; forages in the upper canopy for rainforest fruits. Habit: Locally nomadic. Restricted to lowlands in winter, but found at low, middle and high elevations from spring to autumn; there appears to be partial north-south migration during winter.

NAME	Sch 12	HABITAT DESCRIPTION
Ptilinopus magnificus Wompoo Fruit-dove	2	The Wompoo Fruit-dove occurs almost exclusively in rainforest, and occurs in New Guinea and northeastern Australia from Cape York to the Illawarra district of NSW. It is more common in coastal lowlands than in highlands although there appears to be some seasonal altitudinal migration. Distribution: Aust.: 100 000-300 000 km² NSW: east of Great Dividing Range Regional: as above Abundance: sparse Status: Aust.: vulnerable NSW: uncommon Regional: uncommon, moderate, 15% Foraging/Food: rigidly arboreal; forages in the upper canopy for rainforest fruits. Habit: Locally nomadic. More common in lowland rainforest in winter, found at all elevations from late spring to early autumn; some movement to higher elevations in summer.
Ptilinopus superbus Superb Fruit-dove	2	The Superb Fruit-dove occurs mainly in rainforest, but will feed in adjacent mangroves or eucalypt forest. In New Guinea it is common in the lowlands and lives in secondary growth as well as rainforest. In the Innisfail district it is widespread at all altitudes. At Mission Beach it feeds mainly on the fruit of tall trees 72% of the time and spends the rest of the time feeding on the fruit of lower vegetation. Nestling periods maybe as short as seven days. Its nest is a small platform of sticks well hidden in foliage from a few to more than 30 metres up a tree. The species range spans along the coast from Cape York to Cape Howe Vic. Within this range the Suberb Fruit-doves distribution is extremely fragmented, with a sporadic distribution in NSW. It occurs on the coastal areas in the SEPL area. Distribution: Aust.: 100 000-300 000 km² NSW: isolated populations east of the Great Dividing Range from northern NSW to the Illawarra-South Coast region Regional: isolated populations located in northern NSW Abundance: sparse-common Status: Aust.: vulnerable NSW: scarce Regional: uncommon, very limited, 3% Foraging/Food: strongly arboreal; rainforest fruits especially laurals. Habit: altitudinal movement from high and midlands to lowlands in winter; partial north-south migration to northern Qld for winter.

NAME	Sch 12	HABITAT DESCRIPTION
Calyptorhynchus lathami Glossy Black-cockatoo	2	The Glossy Black-cockatoo lives in eucalypt forest and woodland, and feeds almost exclusively on *Casuarina* fruit. *C. torulosa* and *C. littoralis* are the predominant fruit trees. Inland populations use a more diverse range of *Casuarina*. Dependence on such a specific food type makes the Glossy Black-cockatoo vulnerable. Its nest is a spacious tree cavity, carpeted with wood chips and dust. Its distribution is continuous within its range which extends from the Whitsunday Islands, south to Cape Howe and west of the Great Dividing Range. It is widespread in the SEPL area. Distribution: Aust.: 300-1000 km² NSW: all regions except arid inland Regional: widely distributed in northern NSW Abundance: very sparse Status: Aust.: rare NSW: moderately common (Morris *et al.*), rare (Garnett) Regional: moderately common-common, widespread, 12% Foraging/Food: strictly arboreal; feeds almost exclusively on *Casuarina* fruits, Other food sources reported are *Angophora* fruit, wood-boring grubs from *Casurinas* and perhaps *Acacias* and, near Sydney, sunflower seeds. Special requirements: spacious tree-hollows for nesting Habit: locally nomadic.
Calyptorhynchus magnificus Red-tailed Black-cockatoo	2	Inhabits mainly open eucalypt woodland and riparian forest; also mallee, cultivated lands, savannah and Mulga forests. It is generally found throughout mainland Australia, but is absent from the southeast, most of South Australia, and eastern Western Australia. Distribution: Aust.: >1 million km² NSW: distributed along the Darling River and associated tributaries Regional: formerly found south to the Bellinger River Abundance: common Status: Aust.: secure NSW: uncommon (Morris *et al.*), rare (Garnett) Regional: limited Foraging/Food: arboreal and terrestrial; seeds of eucalypts, Casuarinas and Banksias, insects. Special requirements: high tree-hollow for nesting Habit: some seasonal movement suggested, locally nomadic in search of fruits.

NAME	Sch 12	HABITAT DESCRIPTION
Psittacidae		
Lathamus discolor Swift Parrot	2	Known to only breed in Tasmania, the Swift Parrot inhabits eucalypt forest and woodland and is almost always in small flocks. Its distribution is continuous throughout its range which extends from Qld to Victoria, SA and Tasmania, following the Great Dividing Range. Many appear where Eucalypts are flowering in profusion and some of the largest irruptions of the Swift Parrot into NSW coincide with an abundance of lerps. Its nest is a cavity, usually placed high in a eucalypt tree. Distribution: Aust.: 300 000-1 million km² NSW: distributed along the Great Dividing Range and associated ranges Regional: east of Great Dividing Range Abundance: sparse Status: Aust.: vulnerable NSW: moderately common to scarce (Morris *et al.*), vulnerable (Garnett) Regional: uncommon, very limited, 4% Foraging/Food: upper canopy; nectar, pollen, lerps and the fruit and seeds of native and exotic plants. Special requirements: tree-hollows for nesting (breeds only in Tasmania). Habit: migratory.
Neophema pulchella Turquoise Parrot	2	The Turquoise Parrot lives on the edge of eucalypt woodland adjoining clearings, on timbered ridges and creeks in farmland. Usually congregates in groups of up to six birds, although flocks of up to fifty birds may form. The Turquoise Parrot roosts, shelters and builds nests in tree cavities. Distribution: Aust.: 100 000-300 000 km², scattered distribution through south-eastern Australia NSW: distributed along Great Dividing Range and associated ranges, extending to the coast Regional: scattered distribution east of Great Dividing Range Abundance: sparse Status: Aust.: secure NSW: uncommon (Morris *et al.*), rare (Garnett) Regional: uncommon, limited, 10% Foraging/Food: terrestrial; grass seeds and herbs (native and introduced). Special requirements: tree-hollows for nesting. Habit: sedentary or locally nomadic.

NAME	Sch 12	HABITAT DESCRIPTION
Strigidae		
Ninox strenua Powerful Owl	2	The Powerful Owl has a restricted distribution extending from the vicinity of Gladstone, QLD to southern Victoria. It characteristically inhabits gullies with dense eucalypt forest on the coastal slopes of the Great Dividing Range, but also occurs on the western slopes and in some outlying mountain ranges. This owl roosts in leafy trees by day, with several roosts being used in rotation. Distribution: Aust.: 100 000-300 000 km² NSW: extending east of Great Dividing Range and associated ranges to the coast Regional: east of Great Dividing Range . Abundance: very sparse Status: Aust.: rare, possibly endangered NSW: uncommon (Morris *et al.*), rare (Garnett) Regional: moderately common, limited, 11% Foraging/Food: Mainly possums and gliders. Special requirements: large hollows very high in eucalypts for nesting. Habit: pairs occupy permanent territories of about 1000 ha.
Tyto novaehollandiae Masked Owl	2	The Masked Owl inhabits eucalypt forest and woodland in Australia and New Guinea, apparently ocurring nowhere more than 300 km from the coast. It is strictly nocturnal, roosting and nesting in tree-hollows. Pairs mate for life and maintain permanent territories. Distribution: Aust.: > 1 million km NSW: east of Great Dividing Range to coast Regional: east of Great Dividing Range Abundance: sparse to common Status: Aust.: rare, probably secure NSW: uncommon (Morris *et al*), rare (Garnett) Regional: uncommon, moderate, 12% Foraging/Food: terrestrial mammals. Special requirements: tree-hollows, the same tree-hollow is often used for nesting several years in succession. Habit: sedentary.

NAME	Sch 12	HABITAT DESCRIPTION
Psittaculirostris diophthalma Double-eyed Fig Parrot	1	Inhabits rainforest, open forest and mangroves. The species current range is discontinuous, with large gaps between known colonies resulting in three populations, occurring in the Cape York Region, from Cairns to Cardwell, and northeastern NSW. This species is found mainly in coastal lowland areas but does occur in highland forest. Nesting is in a tree cavity usually 10-20 metres from the ground. Distribution: Aust.: 30 000-100 000 km² NSW: isolated populations on Northern Tablelands and Northern Rivers Region Regional: as above Abundance: rare Status: Aust.: endangered NSW: rare (Morris *et al.*), endangered (Garnett) Regional: limited Foraging/Food: forages in tall fruiting or flowering trees, principally species of native fig, selecting the seeds rather than the pulp of the fruit and taking some nectar and insects. Special Requirements: rainforest for roosting. Habit: nomadic
Tytonidae		
Tyto tenebricosa Sooty Owl	2	The Sooty Owl inhabits pockets of rainforest and wet eucalypt forest, roosting and nesting in large high tree-hollows. Members of a pair maintain a bond but do not roost together. Its distribution is discontinuous within its range which extends from Bundaberg to Melbourne. Distribution: Aust.: 100- 000-300 000km² NSW: isolated populations found on the far South Coast and Northern Tablelands Regional: northern NSW, east of Great Dividing Range Abundance: sparse Status: Aust.: rare, probably secure NSW: uncommon (Morris *et al.*), rare (Garnett) Regional: uncommon, very limited, 10% Foraging/Food: terrestrial; terrestrial mammals, possums and gliders. Special requirements: large hollows high in trees for nesting. Habit: sedentary.

NAME	Sch 12	HABITAT DESCRIPTION
Campephagidae		
Coracina lineata Barred Cuckoo-shrike	2	The BarredCuckoo-shrike inhabits rainforest and eucalypt forest, including margins and regrowth. Individuals roost together in the non-breeding season. Despite this, communal breeding has not been reported. The nest is a saucer of twigs and cobwebs placed in a high horizontal tree fork. Its distribution is continuous along the coastal range which extends from Cape York to approximately Kempsey. The southern limit of the Yellow-eyed Cuckoo-shrike is in the SEPL area. Distribution: Aust.: 100 000-300 000 km² NSW: range extends from mid-north coast to north-eastern NSW Regional: as above Abundance: sparse Status: Aust.: secure NSW: scarce (Morris *et al*), rare (Garnett) Regional: uncommon, limited, 10% Foraging/Food: arboreal; fruits (figs) and insects. Habit: strongly nomadic in search of fruit.
Monarchidae		
Monarcha leucotis White-eared Monarch	2	The White-eared Monarch inhabits rainforests and occasionally lives in eucalpyt forests along creeks and around clearings, and sometimes in mangroves. It is frequently seen fluttering its wings to maintain balance on twigs and leaves whilst hunting. The nest, placed in a high tree fork, is a cup of bark strips, grass and other plant material, lined with rootlets and fibre, bound with cobweb and adorned with moss and cocoons. The species is patchily distributed within its range from Cape York to approximately Grafton. The southern limit of this range occurs in the SEPL area. Distribution: Aust.: 100 000-300 000 km² NSW: northern NSW, extending from Clarence River Regional: Clarence River area Abundance: sparse Status: Aust.: secure, possibly vulnerable NSW: scarce (Morris *et al*), rare (Garnett) Regional: moderately common, very limited, 4% Foraging/Food: arboreal; upper canopy; insects. Habit: sedentary, locally nomadic, some seasonal altitudinal migration.

NAME	Sch 12	HABITAT DESCRIPTION
Podargidae		
Podargus ocellatus Marbled Frogmouth	2	Is distributed in two distinct populations in widely separated areas of rainforest in eastern Australia: from the vicinity of Grafton in NSW to near Gympie in Qld, and on Cape York Peninsula. The southern limit of its distribution coincides with the northern boundary of the SEPL Supply Zone. Marbled Frogmouths live in pairs and maintain permanent territories, constructing shallow nests in a tree fork or epiphyte up to 15 metres from the ground. Distribution: Aust.: 30 000-1 million km^2 NSW: isolated population near Grafton Regional: as above Abundance: rare-sparse Status: Aust.: rare, possibly endangered NSW: rare (Morris *et al.*), vulnerable (Garnett) Regional: limited Foraging/Food: terrestrial-arboreal; snatching beetles, spiders and frogs from the ground or tree trunks. Habit: sedentary.
Atrichornithidae		
Atrichornis rufescens Rufous Scrub-bird	2	The Rufous Scrub-bird inhabits rainforest and adjacent eucalypt forest where undergrowth is especially thick. Historically, it was commonly found around clearings within lowland forest. It requires a dense layer of ground cover at least one metre high, a moist microclimate and rainforest nearby. When Europeans arrived this bird was considered a relic species, fragmented populations only surviving in patches of suitable country. Its northern limit reaches Brisbane and its southern limit occurs in the SEPL area. It has a restricted distribution. Distribution: Aust.: 10 000-30 000 km^2 NSW: range extends from mid-north coast to northern Rivers region Regional: mid-north coast Abundance: sparse-common Status: Aust.: rare, possibly endangered NSW: scarce (Morris *et al.*), rare (Garnett) Regional: uncommon-moderately common, limited, 60% Foraging/Food: terrestrial; insects, worms, invertebrates and seeds Special requirements: scattered pockets of highland forest. Habit: sedentary.

NAME	Sch 12	HABITAT DESCRIPTION
Pachycephala *Pachycephala olivacea* Olive Whistler	2	In the northern part of its range, the Olive Whistler lives mainly in rainforest and eucalypt forest above 500 metres. Sightings have occurred in the McPherson Ranges, New England National Park and Barrington Tops. The nest is a cup of twigs, bark and grass, lined with rootlets and placed in a low fork of a tree or shrub or grass tussock. The Olive Whistler's distribution is scattered towards the northern limit of the species range which extends from Brisbane to Mount Gambier, along the coast, east of the Great Dividing Range. Distribution: Aust.: 100 000-300 000 km² NSW: extends east of the Great Dividing Range and associated ranges Regional: east of Great Dividing Range Abundance: sparse-common Status: Aust.: secure NSW: moderately common (Morris *et al.*), rare (Garnett) Regional: uncommon, moderate, 9% Foraging/Food: arboreal; lower canopy/ terrestrial; beetles and weevils. Habit: sedentary.

TABLE 4
SPECIES FROM THE FOREST ENVIRONMENTS WITHIN THE SEPL SUPPLY ZONE WITH PARTICULAR REQUIREMENTS FOR TYPICAL 'OLD GROWTH' FOREST HABITAT FEATURES including tree hollows, fallen timber, hollow logs and peeling bark

§ **Schedule 12 species (NP&W Act 1974).**
\# **Species which require large tree-hollows.**

TREE-HOLLOWS

Mammals

§Eastern Little Mastiff-bat
King River Eptesicus
#Little Forest Eptesicus
Little Broad-nosed Bat
§Greater Long-eared Bat
Gould's Wattled Bat
§Great Pipistrelle
§Yellow-bellied Sheathtail-bat
#Mountain Brushtail
§#Yellow-bellied Glider
§#Squirrel Glider
Eastern Pygmy-possum
White-striped Mastiff-bat
#Large Forest Eptesicus
§Greater Broad-nosed Bat
#Gould's Long-eared Bat
Lesser Long-eared Bat
#Chocolate Wattled Bat
§Hoary Bat
#Brushtail Possum
#Greater Glider
Sugar Glider
Feathertail Glider
§Brush-tailed Phascogale

Reptiles

Robust Velvet Gecko
§Stephen's Banded Snake
Brown Tree Snake
#Diamond Python

Birds

Sulphur-crested Cockatoo
§#Glossy Black-cockatoo
Little Lorikeet
Rainbow Lorikeet
§Turquoise Parrot
Crimson Rosella
Red-rumped Parrot
Barn Owl
§#Sooty Owl
#Boobook Owl
Australian Owlet-nightjar
Dollarbird
Hooded Robin
Brown Treecreeper
#Yellow-tailed Black-cockatoo
Musk Lorikeet
Scaly-breasted Lorikeet
#King Parrot
#Laughing Kookaburra
White-cheeked Rosella
Striated Pardalote
§#Masked Owl
#Barking Owl
§#Powerful Owl
Forest Kingfisher
Tree Martin
Red-browed Treecreeper
White-throated Treecreeper

HOLLOW LOGS/FALLEN TIMBER

Amphibians

Red-backed Toadlet
Tusked Frog
§Salmon-striped Frog
§Yellow-spotted Tree-frog
§Glandular Frog (winter shelter)
Pouched Frog
Brown Toadlet

Reptiles

Wood Gecko
Legless Lizard
Common Scaley-foot
Tree Dtella
Excitable Delma
Eastern Bearded Dragon

Reptiles (Cont'd)

Nobbi
Gould's Goanna
Punctate Worm-skink
Red-tailed Calyptotis (burrows)
Tussock Rainbow Skink
Robust Ctenotus
Land Mullet
Eastern Ranges Rock-skink
Alpine Water Skink
Barred-sided Skink
Beech Skink
Short-limbed Snake-skink (soil)
Tussock Cool-skink
Orange-tailed Shadeskink
Faint-striped Blind Snake
Proximus Blind Snake
Diamond Python
Dwarf Crowned Snake
White-lipped Snake
Red-naped Snake
Eastern Small-eyed Snake
Coral Snake
Mountain Dragon
Two-clawed Worm-skink (soil)
Three-clawed Worm-skink (soil)
Southern Rainbow Skink
§Three-toed Snake-tooth Skink
She-oak Slender Bluetongue
Egernia Mcpheei
White's Skink
Blue-speckled Forest Skink
Three-toed earless Skink
South-eastern Slider
Red-throated Skink
Yellow-bellied Three-toed Skink (burrows)
Eastern Blue-tongue Lizard
Blackish Blind Snake
Brown-snouted Blind Snake
§ White-naped Snake
Golden Crowned Snake
Mustard-bellied Snake
Spotted Black Snake
Bandy Bandy

Mammals

§Tiger Quoll
Dusky Antechinus
Common Dunnart
Mountain Brushtail Possum
Broad-toothed Rat
Brown Antechinus
§Common Planigale
Fat-tailed Dunnart
Common Brushtail Possum
Bush Rat

UNDER PEELING BARK

Reptiles

Tree Delta
Thick-tailed Gecko
Carnaby's Skink
Boulenger's Skink
§Pale-headed Snake
Eastern Childrens Python
Robust Velvet Gecko
Cream-striped Shinning-skink
Tree Skink
Eastern Childrens Python
Boulenger's Skink
§Stephen's Banded Snake

Mammals

Eastern Pygmy possum
Feathertail Glider
White-striped Mastiff-bat
Lesser Long-eared Bat
Chocolate Wattled Bat
§Squirrel Glider
§Eastern Little Mastiff-bat
§Greater Long-eared Bat
Gould's Long-eared Bat
§Hoary Bat (in absence of rock crevices)

Birds

Crested-shrike Tit
Red-browed Treecreeper
Paradise Riflebird
White-throated Treecreeper

TABLE 5
BIRD SPECIES OF THE SEPL SUPPLY ZONE INCLUDED IN THE CONSERVATION AGREEMENTS BETWEEN AUSTRALIA AND JAPAN (JAMBA) AND CHINA (CAMBA) FOR THE PROTECTION OF MIGRATORY BIRDS AND BIRDS IN DANGER OF EXTINCTION

?🖫 Cattle Egret	Habitat	dairy pasture and grazing land, swamp margins.
	Foraging	stalks in grass for insects.
	Nesting	platform of sticks; placed in a tree.
	Impact	increased sedimentation in swamps; possible benefit from increase in grazing lands.
?🖫 Great Egret	Habitat	cool temperate to tropical wetlands, sluggish rivers, estuaries, mudflats and flooded pastures.
	Foraging	wades for aquatic life; frogs, yabbies, small fish etc.
	Nesting	platform of sticks; placed in a tree near water.
	Impact	increased runoff, sedimentation and silting of waterways, reduction in food resource.
?🖫 Oriental Cuckoo	Habitat	rainforest, eucalypt forest, melaleuca swamp and mangroves.
	Foraging	appears to require large trees to act as vantage points from which to pounce on prey (large insects and larvae), both on the foliage and on the ground.
	Nesting	none built, the species being parasitic.
	Impact	loss of large trees for foraging and roosting.
? Rainbow Bee-eater edges,	Habitat	temperate to tropical woodland, savannah, forest farms.
	Foraging	distribution determined mainly by the availability of flying insects, which are taken in flight and dismembered on high exposed perches.
	Nesting	tunnels excavated in earth banks or at similar sites.
	Impact	erosion of banks; effects of vegetation removal on insects.
🖫 White-bellied Sea Eagle	Habitat	extensive bodies of inland water, tropical to cool temperate coasts.
	Foraging	birds, small mammals and fish.
	Nesting	nest only in very high trees.
	Impact	loss of tall trees for nesting, increased sedimentation and silting of waterways.

? JAMBA

🖫 CAMBA

TABLE 6
FOREST DEPENDENT BIRD SPECIES OF THE SEPL SUPPLY ZONE WHICH INDULGE IN EITHER ALTITUDINAL OR LATITUDINAL MOVEMENTS

MIGRATORY BIRDS	HABIT
Latitudinal movements	
Oriental Cuckoo	Breeds in Asia, migrates for southern summer.
Pallid Cuckoo	South of 26°S migratory to northern Australia (sometimes Indonesia or PNG) for winter.
Brush Cuckoo	Southeast Australian birds migrate north to winter in southern PNG.
Fan-tailed Cuckoo	Move north and inland in winter from the southeast and Tasmania.
Black-eared Cuckoo	Movements not entirely understood. Southern populations appear migratory, some wintering in Indonesia and PNG.
Horsfield's Bronze-cuckoo	Migrate to PNG and Indonesia for winter. Some populations don't move, but all birds leave Tasmania.
Golden Bronze Cuckoo	Migrates to PNG, adjacent islands and Indonesia.
Shining Bronze-cuckoo	Migratory, winter in PNG and parts of Indonesia.
Little Bronze-cuckoo	Some movement of species north across Torres Strait.
Gould's Bronze-cuckoo	May be migratory at the southern end of it's range.
Common Koel	Migratory, winters in PNG and Indonesia.
Channel-billed Cuckoo	Strongly migratory, winters in southern Indonesia and PNG.
White-throated Nightjar	Southern populations migrate north, some spending winter in PNG.
Forest Kingfisher	Migrates in winter to PNG.
Sacred Kingfisher	Migrates to PNG in winter.
Collared Kingfisher	May be migratory in southern parts of range.
Dollarbird	Species migrates north in winter to PNG.
Black-faced Cuckoo-shrike	Seasonal movements, migrating north in winter.
Barred Cuckoo-shrike	Some seasonal movements in winter.
Cicadabird	Migrates to western islands of Torres Strait in winter.
Leaden Flycatcher	Southern birds migrate north in the winter to PNG and Queensland.

MIGRATORY BIRDS	HABIT
Latitudinal movements (Cont'd)	
Satin Flycatcher	Migrates to northern areas.
Grey Fantail	Some seasonal migration north.
White-throated Gerygone	Seasonal movements in southern parts of range.
Yellow-faced Honeyeater	Northward migration along NSW coast in autumn is pronounced but no information is available on wintering destinations.
White-naped Honeyeater	Some populations move north in autumn and south in spring but destinations are unknown.
Painted Honeyeater	Migratory populations south of 26°S move north in winter.
Black Honeyeater	Some evidence of regular seasonal movement, more often recorded in the south in spring and summer than in autumn and winter.
Scarlet Honeyeater	Some irregular north-south movement.
Spiny-cheeked Honeyeater	Some seasonal movement in northern areas.
Golden Whistler	Strongly migratory in the southeast, mainly sedentary everywhere else.
Rufous Whistler	Strongly migratory in the southeast, sedentary, nomadic or partly migratory in other areas.
Black-faced Monarch	Strongly migratory, moving north for winter, seldom found below Rockhampton QLD in winter.
Spectacled Monarch	Resident of north, winters in New Guinea, breeds in south in summer.
Silvereye	Part of population migrates, only birds from Tasmania have regular seasonal movemnet.
Olive-backed Oriole	Partly migratory in winter.
Spangled Drongo	Migratory populations move north or south in winter.
Dusky Woodswallow	Migratory in southeast, sedentary in other areas.
Swift Parrot	Breeds only in Tasmania, migrates in autumn and spends winter in the southeastern mainland states.

MIGRATORY BIRDS	HABIT
Altitudinal movements	
Brown Goshawk	Altitudinal change with season, moving to lower elevations in winter.
White's Thrush	Altitudinal change with season.
Rose Robin	Species moves to lower elevations in winter.
Flame Robin	Altitudinal change in winter, movements to lower elevations.
Red Wattlebird	Altitudinal change with season.
Fuscous Honeyeater	Altitudinal change with season.
Crescent Honeyeater	Altitudinal change with season.
Eastern Spinebill	Some evidence of seasonal altitudinal movement.
Rose-crowned Fruit-dove	Birds spend late spring to early autumn at all elevations but move to the lowlands in winter. There is also some northward migration into QLD during winter.
Superb Fruit-dove	As above.
Wompoo Fruit-dove	Moves to lowlands in winter, part of the population moves to the highlands in summer.
Topknot Pigeon	Moves from high elevations in autumn to mid elevations for the winter months, flying by day to feed in the lowlands.
White-headed Pigeon	Birds spend late spring and summer at high elevations, late summer and autumn at mid elevations and move to lowland forest for winter shelter.