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Kempsey Shire Council

Report for Vegetation Mapping for Western Portion Kempsey LGA

Background Report

August 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Executive Summary

GHD Pty Ltd (GHD) has been engaged by Kempsey Shire Council (KSC) to prepare a Vegetation Distribution Map, and associated supporting report, for the western portion of the Shire. The western portion is generally considered to be those lands within the shire boundary on the western side of the Pacific Highway.

GHD has utilised 'the latest modelling technology' GIS software to interpret high-resolution satellite imagery to complete the mapping exercise. This enables large areas of vegetation, often in remote locations, to be mapped efficiently and accurately.

The vegetation mapping was carried out using a recent Landsat 5 TM scene and topographic variables as a basis for multi-variate statistical classification techniques. The image was 'seeded' with areas of known vegetation type 'samples', as determined by the ecological field survey, from which spectral and topographic similarity was used to predict the presence of those types elsewhere in the image.

Ecological field surveys collected data relating species and community type (including listed status under relevant government legislation), composition, distribution and habitat 'values' of targeted sites. The assessment included identification of potential koala 'feed tress' and their relationship with Forest Ecosystems (FE's) as well as a rapid assessment for active koala use. Finally, the ecological survey recorded 'incidental' observations of fauna.

The results of the project are summarised in this report and with relevant maps included as Appendices. The vegetation distribution map (shown as Figure 2 Appendix A) has considered the 'Eastern Portion Mapping Project' and is compatible for interpretation.

The vegetation mapping exercise for the western portion of Kempsey Shire will provide council with an effective 'tool' to assist in planning for future growth and conservation of biodiversity values. The mapping exercise was undertaken at scale using satellite imagery and associated GIS software to interpret image data with verification from field surveys. Detailed ecological surveys, as required by *Environmental Planning and Assessment Act 1979,* and council policy, would still be required for rezoning or development applications.

1. Introduction

1.1 Background

GHD Pty Ltd (GHD) has been engaged by Kempsey Shire Council (KSC) to prepare a Vegetation Distribution Map, and associated supporting report, for the western portion of the Shire. The western portion is generally considered to be those lands within the shire boundary on the western side of the Pacific Highway. GHD has utilised 'the latest modelling technology' GIS software to interpret high-resolution satellite imagery to complete the mapping exercise. This enables large areas of vegetation, often in remote locations, to be mapped efficiently and accurately.

KSC propose to use this information for the future preparation of *Koala Plan of Management* for the Shire, as well as a *Biodiversity Management Strategy*. It is also anticipated that the mapping will provide an importance resource for council when making future decisions to accommodate the Shire's predicted population growth.

1.2 Aims and Objectives

The vegetation mapping, and associated report, aims to provide a clear, concise and practical tool for the use of KSC. The objectives of the mapping exercise are to:

- Describe the distribution of native vegetation across the western portion of the Shire;
- Illustrate the spatial distribution of vegetation communities;
- Highlight the potential presence of Endangered Ecological Communities (EEC's);
- Highlight potential habitat corridors for Koalas; and
- Provide a suitable data set for making important planning decisions to accommodate the Shires predicted population growth.

1.3 Relationship With Existing Information

The vegetation mapping exercise has taken into consideration the following reports and information, particularly the Eastern Lands Mapping Exercise:

- Kempsey Shire Council Eastern Lands Vegetation Mapping.
- Native Vegetation and Candidate EEC Mapping Report, July 2006.
- Comprehensive Regional Assessment Air Photo Interpretation Project (CRAFTI), 1998.
- Field Key to Forest Ecosystems by DEC 2004.
- Ocean Shores to Desert Dunes: Native Vegetation of NSW and ACT by David Keith 2004.

It is anticipated that the information contained in the western lands mapping will be compatible with the above dataset.

1.4 Study Area

The study area for the project is the western portion of the LGA encompassing land generally west of the Pacific Highway but outside the area already mapped during the initial vegetation mapping project for the eastern portion of the Shire (see Figure 1). The study area encompasses approximately 2,414 km^2.

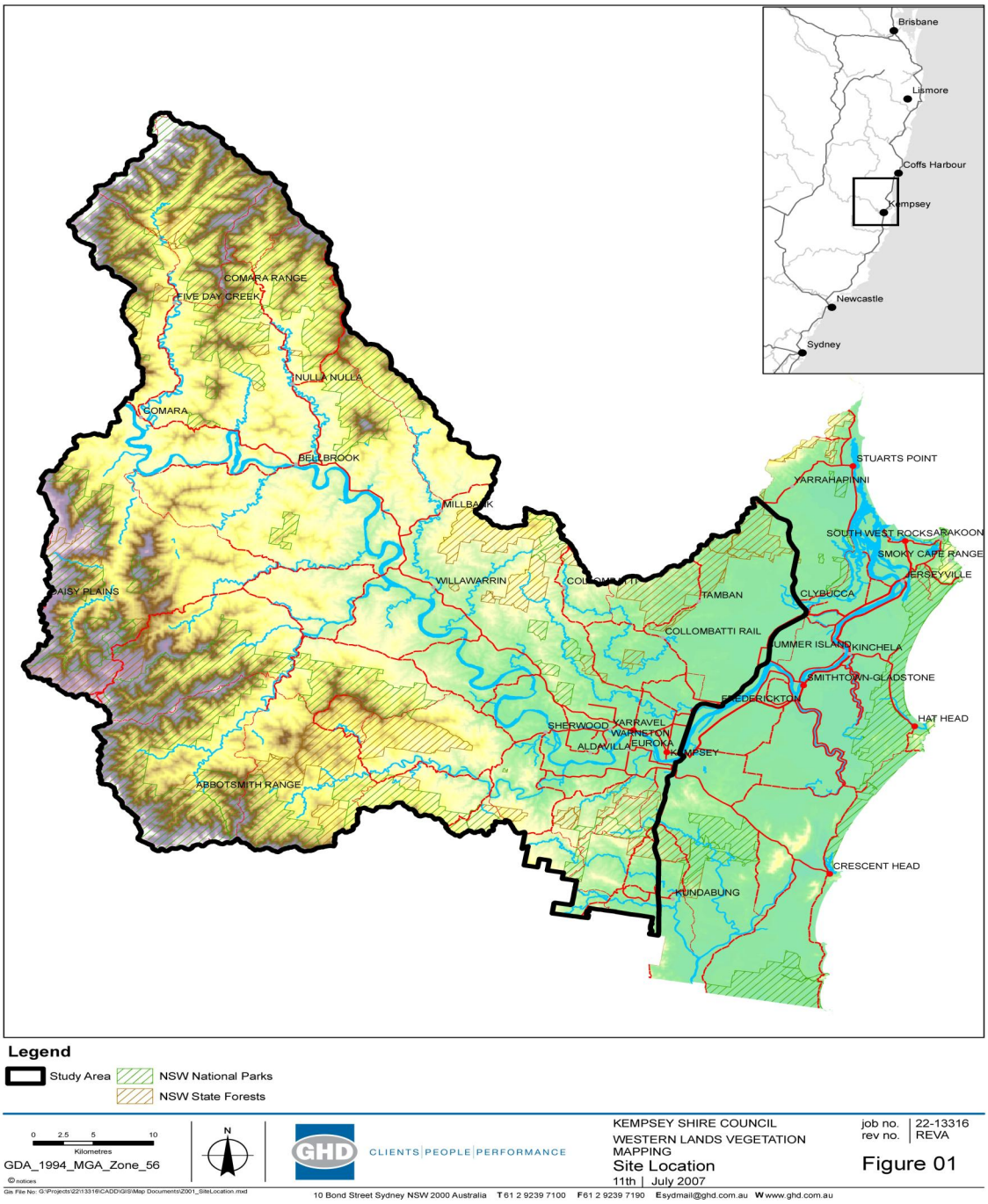

Figure 1 Study Area

2. GIS

2.1 Introduction

GHD has completed all tasks identified in the brief required to complete the vegetation mapping for the western portion of the LGA. A summary of the adopted methodology is outlined below. The mapping exercise has included the results from the initial field surveys, as described in section 3 below.

2.2 GIS Mapping Methodology

The vegetation mapping was carried out using a recent Landsat 5 TM (imagery taken between Dec 2004 and August 2005) scene and topographic variables as a basis for multi-variate statistical classification techniques. The image was 'seeded' with areas of known vegetation type 'samples', as determined by the field survey, from which spectral and topographic similarity was used to predict the presence of those types elsewhere in the image. A few iterations of model and map refinement and validation were then used to produce a final map that was then converted to the preferred GIS format for display.

2.2.1 GIS Data Reviewed

Extensive data review was carried out to gain an initial understanding of the distribution of environmental gradients throughout the site. This assessment focused predominantly on the existing vegetation mapping from the CRAFTI data set as well as topographic variables such as elevation, slope, aspect, soil type, proximity to streams and air photo cues. A complete list of the information reviewed is included in the reference section of this report.

CRAFTI is the acronym for Comprehensive Regional Assessment Forest Type Inventory and is the Aerial Photograph Interpretation Project of the Comprehensive Regional Assessment (CRA). The CRAFTI project primarily focused on mapping vegetation on non-Crown Lands. The vegetation classification adopted for the CRAFTI project was based on existing Forest Type and association classification frameworks, adapted to broad-scale vegetation mapping by aerial photograph interpretation.

2.2.2 Process to Prepare Draft Map

From the above, roughly 60 field sites were nominated for detailed floristic assessment as well as assessment of EEC and Koala habitat significance. Whilst travelling from field site to field site opportunistic sightings of vegetation types were also recorded into a palm-top GPS unit. The strategy of selecting field sites that cover the full variety of environmental gradients for forest types throughout the study area and of incorporating opportunistic sightings of vegetation communities was intended to gain a reasonably comprehensive list of vegetation types for the study area. All records were then used in conjunction to seed the classification model.

The multi-variate classification was performed using Definiens software. The process first uses a 'segmentation' algorithm to group adjacent pixels based on spectral likeness, the output of which are

'image objects' which are basically groups of pixels with similar characteristics. Next, areas of woody vegetation were isolated and other areas were masked out of further analysis. From there the vegetation type records were used to provide examples from which the rest of the image could be classified based on both spectral and topographical likeness. The results of the classification model were reviewed and then post-classification refinements were implemented using decision rules based on topographic variables and class association. Generalisation tools were then applied to reduce speckle before the final map was converted to the preferred vector format (Mapinfo TAB) for display.

An EEC Potential map was produced by sub-setting the vegetation map to show only those FE types that related directly to an EEC (see Section 3.4). Of those FE types that had potential for inclusion in the EEC map many were excluded based on them not being present in the flood plain, as necessary for their definition as an EEC (see appendix B). Only Eastern Red Gums (FE 46), Escarpment Redgum (FE 47), Paperbark (FE 112), and Swamp Oak (FE 143) qualified for EEC status in the map.

A Koala Habitat Potential map was produced by sub-setting the vegetation map to show only those FE types that fulfilled the following criteria: 1, the presence of primary feed trees as dominant or co-dominant in the FE description; 2, the presence of secondary feed trees as dominant or co-dominant in the FE description; and, 3, the presence of primary or secondary feed trees as dominant/co-dominant in the other FE descriptions (see section 3.5).

2.3 Results

From the preliminary assessment it was apparent that certain FE types were too spectrally and topographically similar to be differentiated from one another using the multi-variate statistical classification model. In this case the FE types were grouped together to produce the final map. Care was taken to ensure that FE types that related directly to an EEC were not grouped with those that did not relate to an EEC and vice versa.

The table associated with the vegetation map is attributed to show the other FE types that have been grouped with the one being displayed. The EEC and Koala Habitat significance is also attributed to the table where relevant. The fields are as follows:

Table: 1 Summary of FE Terms

FE_1	the code of the FE type that is preferred for display
FE_1	the description of the FE type that is preferred for display
Other_FE_1	the code of any other FE type that has been grouped with the one preferred for display
Other_FE_2	the code of any other FE type that has been grouped with the one preferred for display
Other_FE_3	the code of any other FE type that has been grouped with the one preferred for display
EEC_Potent	a description of the potential EEC significance of the FE type/s mapped

Koala_Pote	a description of the potential Koala Habitat significance of the FE type/s mapped
K_Rank	a basic rank applied to the significance of the FE type/s mapped • 1 – high significance • 2 – moderate significance • 9 – low significance

Two final validation assessments were carried out using a subset of independent sample areas (i.e. those that were not used to seed the initial classification). The first was a standard confusion matrix that determines absolute errors. The second was a 'fuzzy' confusion matrix that ranks the similarity of classes based on their species composition before weighting errors in favour of those that are more similar over those that are less similar.

	19 Central Mid Elevation Sydney Blue Gum	32 Dry Foothills Blackbutt-Turpentine	33 Dry Foothills Spotted Gum	34 Dry Grassy Blackbutt-Tallowwood	46 Eastern Red Gums	47 Escarpment Redgum	52 Foothill Grey Gum-Ironbark-Spotted Gum	63 Grey Gum-Stringybark	83 Mid Elevation Wet Blackbutt	84 Mid North Coast Wet Brushbox-Tallowwood-Blue Gum	88 Moist Escarpment New England Blackbutt	89 Moist Foothills Spotted Gum	91 Moist Open Escarpment White Mahogany	106 Open Coastal Brushbox	120 River Oak	143 Swamp Oak	158 Wet Spotted Gum-Tallowwood	168 Rainforest	202 Regenerating Rainforest - Lantana
Results of Standard Confusion Matrix																			
Producer's Accuracy	100%	29%	0%	100%	50%	100%	25%	100%	100%	100%	100%	0%	25%	40%	67%	100%	0%	83%	100%
User's Accuracy	67%	100%	0%	100%	25%	29%	100%	20%	50%	50%	100%	0%	100%	100%	100%	71%	0%	100%	60%
Overall Accuracy	56%																		
KHAT	0.54																		
Results of Fuzzy Confusion Matrix																			
Producer's Accuracy	100%	67%	0%	100%	67%	100%	40%	100%	100%	100%	100%	0%	53%	73%	89%	100%	0%	91%	100%
User's Accuracy	89%	100%	0%	100%	44%	57%	100%	44%	73%	67%	100%	0%	100%	100%	100%	100%	0%	100%	100%
Overall Accuracy	81%																		
KHAT	0.80																		

Because the difference between one vegetation community and the next is not clearly defined, i.e. there is often a smooth transition from one to the next, the use of the fuzzy confusion matrix is justified to provide concessions for instances where the disagreement between predicted and observed classes are smaller in some cases than in others. However, as the difference between the accuracy ratings produced from the fuzzy matrix compared to the standard matrix is so great it was considered to be a potentially optimistic approach and therefore we have considered the results of both assessments to be relevant (Huang & Lees, 2007).

KHAT (kappa statistic) of 0.54 is a reasonable result for the standard error matrix considering the number of classes and the variable 'dissimilarity' of both spectral qualities and compositional qualities between classes. KHAT of 0.80 is considered to be very favourable for this type of mapping, however it may be too optimistic. The actual accuracy of the map is likely to lie somewhere in between these two results.

3. Ecology

GHD undertook ground verification of vegetation types as directed by initial GIS interpretation of existing data. Areas to be verified were determined during the preliminary mapping process and aimed to identify areas of distinct vegetation type. Field surveys identified the dominant flora species in each strata, thereby allowing vegetation to be classified into types. Field surveys also aimed to assess each site for condition, habitat value for fauna, threatened species and endangered ecological communities, and potential for Koalas based on *State Environmental Planning Policy 44 – Koala Habitat* (SEPP 44).

The basic unit of vegetation classification and mapping used in stratifying the vegetation in the western portion of the Kempsey LGA was 'vegetation type', which is defined as a community that has a floristically uniform structure and composition, often described by its dominant species (Meagher 1991). A 'community' is described as an assemblage of plant species which are structurally and floristically similar and form a repeating 'unit' across the landscape (Meagher 1991).

An examination of the CRAFTI mapping, which had a total of 297 map units, indicated that a number of units were equivalent floristically. A simplified classification was therefore undertaken in which floristically related units were merged to produce a smaller number of vegetation map units. This list was further refined based on an assessment of floristic similarities and vegetation-terrain relationships observed during fieldwork. The refined units were then assigned a Forest Ecosystem code, a Forest Ecosystem being defined by DEC (2004) as:*'An indigenous ecosystem with an overstorey of trees that are greater than 20% canopy cover. These ecosystems should normally be discriminated at a resolution requiring a map-standard scale of 1:100,000. Preferably these units should be defined in terms of floristic composition in combination with substrate and position within the landscape'.*

A standardised data sheet was used during field surveys, an example of which is provided in Appendix E.

3.1 Ground verification of vegetation types

A rapid assessment approach was undertaken to ground-truth vegetation types and habitat value. Quadrats 150 m x 150 m in size were employed at each site, with the dominant species within each quadrat recorded and assigned a cover abundance ranking. Communities were then assigned an FE Type code and a Keith Type code as applicable, based on descriptions provided in DEC (2004) *Natural Resource Management Field Assessment Guidelines: Field Key to Forest Ecosystems Northeast New South Wales*, and Keith (2004) *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. Data was also collected on aspect, slope, moisture content, and soil type. Any other features of relevance were also noted at this point.

The following tables list the vegetation types used in mapping vegetation for the western portion of the Kempsey LGA. For a description of each FE and Keith community type identified for the project see Appendix C.

3.1.1 Forest Ecosystem Types (FE)

Each vegetation type identified in the field was assigned to a particular Forest Ecosystem (FE) type, based on:

» homogeny of the stratified vegetation type; and

» identification of each vegetation type to forest ecosystem level using the Field Key to Forest Ecosystems (DEC 2004).

FE types were chosen where species composition and other factors provided a 'best fit' for vegetation types identified on the ground. In an effort to increase the user accuracy and presentation of the vegetation type map, FE categories with similar species composition were amalgamated when no discernable pattern along a known environmental gradient was apparent (See Figure 2).

Table: 2 Forest Ecosystem Types used in current project

FE type code	Title
19	Central Mid-elevation Blue Gum
32	Dry Foothills Blackbutt - Turpentine
33	Dry Foothills Spotted Gum
34	Dry Grassy Blackbutt - Tallowwood
46	Eastern Red Gums
47	Escarpment Red Gum
52	Foothills Grey Gum – Ironbark – Spotted Gum
63	Grey Gum - Stringybark
83	Mid Elevation Wet Blackbutt
84	Mid North Coast Wet Brushbox – Tallowwood – Blue Gum (Potential 152)
88	Moist Escarpment New England Blackbutt
89	Moist Foothills Spotted Gum
91	Moist Open Escarpment White Mahogany
106	Open Coastal Brushbox
120	River Oak
143	Swamp Oak (Potential 120)
146	Tallowwood
168	Rainforest (Potential 104, 146 & 157)
202 (note sub-community of 168)	Regenerating Rainforest with Lantana

3.1.2 Keith Types

This list of Keith Types was created based on communities that had been mapped as occurring within the Kempsey LGA (Keith 2004). This list was then refined based on the results of field surveys, and follow up mapping.

Table: 3 Keith types used in current project

Keith type code.	Title
1	Subtropical Rainforest
2	North Coast Wet Sclerophyll Forest
3	Northern Escarpment Wet Sclerophyll Forest
4	Northern Hinterland Wet Sclerophyll Forest
5	Coastal Valley Grassy Woodland
6	New England Grassy Woodland
7	Hunter-Macleay Dry Sclerophyll Forest
8	Northern Gorge Dry Sclerophyll Forest
9	North Coast Dry Sclerophyll Forest
10	Northern Escarpment Dry Sclerophyll Forest
11	Coastal Freshwater Lagoons
12	Coastal Floodplain Wetland
13	Eastern Riverine Forests

3.2 Site Condition Assessment

An assessment of the condition of each site was also determined and included the value of the site as habitat for fauna and threatened species. Details recorded included:

- Vegetation structure;
- Native species richness;
- Relative abundance of weeds;
- Evidence of Eucalypt dieback;
- Evidence of disturbance including fire, clearing, logging, erosion, weeds, and rubbish dumping;
- Presence of hollow bearing trees,
- Seasonal availability of nectar supplies;
- Presence of ground habitats including leaf litter, fallen timber, dense clumping groundcover and rocks, rubble or other debris;

- Potential habitat for threatened species (note, some threatened species were identified during current surveys);
- Evidence of introduced fauna;
- Fire history and/or frequency;
- Riparian zones
- Habitat connectivity, and
- Remnant size (where determinable).

3.3 Endangered Ecological Communities

A list of potential EEC's identified as occurring within the Kempsey LGA was determined based on DECC's Threatened Species, Populations and Ecological Communities Profiles database correlated with structural and floristic composition. Sites identified as potential EEC's were recorded in the field as applicable. Incidental observations of EEC's were also recorded. FE's and Keith types identified as EEC's were also used during post-field mapping to predict the potential location of EEC's. Potential EEC's within the Kempsey LGA include:

- Eastern Redgums (FE – 46) - FE may include Subtropical Coastal Floodplain Forest;
- Escarpment Redgum (FE – 47) - FE may include River-Flat Eucalypt Forest on Coastal Floodplain;
- Swamp Oak Forest (FE – 143 potential 120) - FE may include both Swamp Oak Forest and Swamp Sclerophyll Forest on Coastal Floodplain as listed under TSC Act.

Descriptions of EEC communities found in the Kempsey Shire are provided in Appendix B, and areas mapped as potential EEC are provided in Figure 3. FE 46 and 47 are only considered EEC's when located in the floodplain, within riparian zones and below approx 250m above sea level (taken from DECC threatened species description). The following assumptions have therefore been included in completing EEC map:

- All relevant FE's within the floodplain (considered to be downstream of Willawarrin for this exercise) that may be an EEC have been included in the map;
- Only relevant FE's upstream of Willawarrin within 200m 'either side of each drainage line' have been included in the map; and
- Only relevant FE's below 250m above sea level have been included in the map.

3.4 SEPP 44 Assessment of Potential Koala Habitat

Under SEPP 44, "Potential Koala Habitat" is determined to be present if appropriate feed trees constitute as least 15% of the total number of trees in the upper and lower strata of the tree component.

The potential for each site to offer habitat for Koalas was based on the list of feed trees provided in SEPP 44, as well as the DECC list of primary and secondary Koala feed trees for the NSW North Coast (DECC, 2004). A site was considered to have the potential to be "Potential Koala Habitat" if it contained appropriate feed trees. Feed tree species from SEPP 44 and DECC are provided in the Table below.

Table: 4 Koala Feed Tree Species

Feed tree species identified by DECC	
Primary Feed Trees	***Secondary Feed Trees***
Tallowwood *Eucalyptus microcorys*	Narrow-leaved Red Gum *E. seeana*
Forest Red Gum *E. tereticornis*	Slaty Red Gum *E. glaucina*
Swamp Mahogany *E. robusta*	Small-fruited Grey Gum *E. propinqua*
Parramatta Red Gum *E. parramattensis*	Red Mahogany *E. resinifera*
Orange Gum *E. bancroftii*	Mountain Mahogany *E. notabilis*
Cabbage Gum *E. amplifolia*	Grey Box *E. moluccana*
	Yellow Box *E. melliodora*
	Craven Grey Box *E. largeana*
	Grey Gum E*. biturbinata*
	Large-fruited Grey Gum *E. canaliculata*
	Steel Box *E. rummeryi*
Feed tree species from SEPP 44	
Forest Red Gum *E. tereticornis*	Scribbly Gum *E. haemastoma*
Tallowwood *E. microcorys*	Scribbly Gum *E. signata*
Grey Gum *E. punctata*	White Box *E. albens*
Manna Gum *E. viminalis*	Bimble Box *E. populnea*
River Red Gum *E. camaldulensis*	Swamp Mahogany *E. robusta*

3.5 Initial Results

3.5.1 Site Condition Assessment

The condition data collected in the field at each of the sampling sites indicates that condition of vegetation varies across the study area. Furthermore, vegetation condition appears to be largely influenced by land management practices, such as agriculture and logging, and subsequent weed invasion and feral animal impact.

Vegetation on farmland tended to lack hollow bearing trees, and was characterised by single-aged stands. Past clearance of vegetation is likely to be the cause of limited age class in canopy species. These sites also tended to lack a mid-storey, presumably as a result of under scrubbing to accommodate grazing. While forestry areas offered more diversity in age structure than agricultural areas, impacts from logging, such as weed invasion, were evident.

Lantana was by far the most significant weed identified throughout the LGA, with the exception of the most elevated and remote areas.

Evidence of feral animals including foxes, feral pigs, wild dogs, and feral cats via sightings and scats was found throughout the LGA. Rabbits are also likely to be prevalent despite limited evidence during ground-truthing surveys. Wild dog baiting had been recently carried out in many of the areas surveyed.

Most of the areas surveyed (150 m x 150 m quadrats) were part of a larger stand of vegetation and / or linked in with other vegetated areas suggesting that there is limited fragmentation of vegetation in the region. River flats and floodplains were often cleared for agricultural purposes, and thus, remnants were more likely to be confined to the edges of watercourses or on slopes or hilltops. Vegetation communities on floodplains are usually significantly reduced in the historical distribution and therefore are more likely to warrant conservation. For example, the EEC Swamp Oak Forest on Coastal Floodplains, Swamp Sclerophyll Forest on Coastal Floodplains and Sub-tropical Coastal Floodplain Forest, all of which were identified during ground truthing surveys, are all confined to floodplains.

Fire was also evident at many of the sites surveyed indicated via fire scars, simplified vegetation structure, and a ground layer dominated by Blady Grass (*Imperata cylindrical*) and / or Bracken Fern (*Pteridium esculentum*). Blady Grass was identified at almost every site, except rainforest and high elevation sites.

3.5.2 Fauna Habitat

All of the sites surveyed offered potential native fauna habitat, particularly for ground-dwelling fauna such as macropods, birds, reptiles and in many cases Koalas (see Section 3.7.4).

Areas that were reserved such as National Parks provided the most significant habitat value for fauna. These areas contained a diversity of flora species and vegetation types, with intact ground, mid and canopy layers. These areas had a variety of ages in canopy species and contained hollow bearing trees. Hollow bearing trees are an essential feature for arboreal fauna such as gliders, bird species including owls and parrots, and are a potentially limiting resource for threatened species such as the Yellow-bellied Glider, Squirrel Glider, Powerful Owl, and the Glossy Black-cockatoo.

Forestry areas were more impacted than reserved areas but still contained diversity in species, age class and strata. Areas impacted for grazing were less likely to contain hollow bearing trees, as they often contained single-aged canopy that was too young to have formed significant hollows. These areas also often lack a mid-storey reducing the quality if habitat for woodland bird species especially.

Kangaroos, wallabies and Euros (a species of Wallaroo) were seen throughout the study area foraging on farmland, with wallabies also identified in dense vegetation and rainforest areas. Birds were also abundant, with smaller birds benefiting from areas that retained an intact shrub layer.

Many of the sites contained two or more features of relevance for reptiles and small ground dwelling fauna, such as leaf litter, fallen timber, dense groundcover, rocks, rubble or debris, making much of the regional areas of the study area good habitat for these species.

Riparian areas were often restricted to narrow strips of vegetation along the watercourse, and most had been grazed up to the water's edge. Riparian areas offer habitat for a range of fauna including water

birds, amphibians, reptiles and a variety of bat species although this was limited due to the degraded nature of riparian vegetation throughout much of the study area. Ephemeral watercourses in gullies were common throughout the ranges of the study area, which provide niche areas for fauna, and a variety of flora as well.

Rainforests are recognised for their diverse fauna, both vertebrate and invertebrate. Rainforest areas provide valuable habitat for a range of species, including ecological specialists such as threatened Fruit-doves that are dependent upon the fruit of rainforest trees and shrubs. The importance of lowland rainforest communities in the north coast bioregion is recognised by the Scientific Committee's final determination to list Lowland Rainforest as an Endangered Ecological Community under the TSC Act. In the north of its range, Lowland Rainforest is found up to 600 m above sea level. It is therefore likely that rainforest areas within the LGA may qualify as Lowland Rainforest. It is also likely that across the study area, many small stands of rainforest, important for connectivity and maintenance of landscape-scale ecological processes, occur outside conservation reserves.

Nectar sources provide a foraging resource for arboreal fauna and numerous bird species including the threatened Regent Honeyeater and Swift Parrot. Woodland areas provided nectar sources in the form of flowering Eucalypts. Most areas had a minimum of three Eucalypt species providing foraging resources throughout much of the year. Areas with Paperbarks (*Melaleuca* species), Banksias, and Tee-trees (*Leptospermum* species) provide additional nectar sources for fauna and are a valuable resource. These flora species are most likely to be found near the coast such as in Swamp Forests and coastal dune areas.

3.5.3 Threatened Species

Threatened Species Habitat

Appendix D provides a list of threatened fauna previously identified in the Kempsey region and the FE's these species are likely to utilise. The purpose of this list is not to provide a definitive list of which threatened fauna are likely to occur within the LGA, but rather to provide an indication of which FE's may be important for conservation of threatened fauna. This baseline information will inform future strategic planning projects, such as preparation of a Biodiversity Conservation Strategy.

Species identified during current surveys

The Glossy Black-cockatoo, which is listed as vulnerable under the NSW *Threatened Species Conservation (TSC) Act*, was observed feeding at one site, and evidence of past foraging, in the form of chewed Allocasuarina cones, at a number of other sites during ground-truthing surveys. This species forages on the cones of Allocasuarina species. *Allocasuarina littoralis* and more commonly, *Allocasuarina torulosa,* were identified throughout much of the western portion of the LGA. Glossy Black-cockatoos are likely to occur and forage widely throughout much of the area.

A flock of five Wompoo Fruit-doves (also listed as vulnerable under the NSW TSC Act) was identified in a small area of Brushbox – Turpentine Forest. This species feeds primarily on the fruit of native rainforest species, and is usually associated with this vegetation type but will utilise wet sclerophyll areas also. Areas of rainforest particularly, are essential for this species to persist in an area, along with other threatened rainforest birds such as the Superb Fruit-dove and Rose-crowned Fruit-dove.

3.5.4 Koalas

Each site was assessed for its potential to provide habitat for Koalas based on the presence of appropriate feed trees. Feed trees were identified from SEPP 44 and DECC's list of potential feed trees for the NSW North Coast.

Figure 4 highlights areas that, based on species composition, have the potential to qualify as "potential Koala habitat" as identified under SEPP 44. The map shows a wide distribution of potential Koala habitat based primarily on the presence of food trees. This is indicative of the original distribution of Koalas throughout the Shire and the presence of feed trees in many FE's. The site surveys also included a rapid assessment of vegetation for the presence of 'active' Koala scratches on suitable feed trees. This assessment showed that Koalas were active in FE 19, FE 63, FE 83, FE 89 and FE 158 and were recorded at approximately 20% of survey sites.

A further exercise is now required to assess the 'dominance' of feed trees in relevant FE's and assign a potential habitat value of either 'high', 'moderate' or 'low'. This exercise would allow high value habitats to be identified and appropriate 'linking' corridors defined for future planning and conservation outcomes.

4. Conclusion

The vegetation mapping exercise for the western portion of Kempsey Shire will provide council with an effective 'tool' to assist in planning for future growth and conservation of biodiversity values. The mapping exercise was undertaken at scale using satellite imagery and associated GIS software to interpret image data with verification from field surveys. Detailed ecological surveys, as required by *Environmental Planning and Assessment Act 1979,* and council policy, would still be required for rezoning or development applications.

5. References

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Appendix A

Vegetation Maps

Appendix B

EEC Description Summaries

Table: 5 Endangered Ecological Communities

Vegetation Community	Community description and location (DEC 2006)	Occurrence
Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions	Coastal Saltmarsh occurs on the landward side of mangrove stands in intertidal zones along the shores of estuaries and lagoons that are permanently or intermittently open to the sea. This community is characterised by *Baumea juncea*, *Juncus kraussii*, *Sarcocornia quinqueflora*, *Sporobolus virginicus*, *Triglochin striata*, *Isolepis nodosa*, *Samolus repens*, *Selliera radicans*, *Suaeda australis* and *Zoysia macrantha*, with occasional scattered mangroves occurring throughout the saltmarsh. Saltpans and tall reeds may also occur. This community occurs in the intertidal zone along the NSW coast.	Potential to occur within the LGA along the coast
Freshwater Wetlands on Coastal Floodplains	Freshwater Wetlands on Coastal Floodplains occur in coastal areas subject to periodic flooding in which standing fresh water persists for at least part of the year in most years, generally below 20 m elevation on level areas. Structure and composition of the community varies spatially and temporally depending on the water regime, though is usually dominated by herbaceous plants and has few woody species. Communities lacking standing water most of the time are usually dominated by dense grassland or sedgeland vegetation, including Water Couch (*Paspalum distichum*), Swamp rice-grass (*Leersia hexandra*), Mud Grass (*Pseudoraphis spinescens*) and Tussock sedge (*Carex appressa*). Areas subject to regular inundation and drying may include *Baumea articulata*, *Eleocharis equisetina* and *Lepironia articulata*, and emergent or floating herbs such as Frogbit (*Hydrocharis dubia*), Frogsmouth (*Philydrum lanuginosum*), Water primrose (*Ludwigia peploides* subsp. *montevidensis*), Nardoo (*Marsilea mutica*) and milfoils (*Myriophyllum* spp.). As standing water becomes deeper or more permanent, amphibious and emergent plants become less abundant, while floating and submerged aquatic herbs such as *Azolla filiculoides* var. *rubra*, Hornwort (*Ceratophyllum demersum*), Water thyme (*Hydrilla verticillata*), Duckweeds (*Lemna* spp.), Giant Water lily (*Nymphaea gigantea*), Water snowflake (*Nymphoides indica*), Swamp lily (*Ottelia ovalifolia),* and Pondweeds (*Potamogeton* spp.) become more abundant.	Potential to occur within the LGA below 20m elevation.
Littoral Rainforest in the NSW North Coast, Sydney Basin and SE Corner Bioregions	Littoral Rainforest is generally a closed forest, the structure and composition of which is strongly influenced by its proximity to the ocean. Plant species of this community are predominantly rainforest species, with vines potentially comprising a major component of the canopy. The canopy layer is dominated by rainforest species, with scattered emergent individuals of sclerophyll species, such as *Angophora costata*, *Banksia integrifolia*, *Eucalyptus botryoides* and *Eucalyptus tereticornis* also occurring in many stands. There is considerable floristic variation between stands with localised variants occurring in some regions. Littoral Rainforest occurs only on the coast and is found in the NSW North Coast Bioregion, Sydney Basin Bioregion and South East Corner Bioregion. It is a very rare community and occurs in many small stands, and comprises less than one percent of total rainforest present in NSW.	Potential to occur within the LGA along the coast

Vegetation Community	Community description and location (DEC 2006)	Occurrence
Sub-tropical Coastal Floodplain Forest of the NSW North Coast bioregion	Sub-tropical Coastal Floodplain Forest is comprised of a tall open tree layer of eucalypts, which may exceed 40 m in height, a scattered shrub layer, ground covers and vines. While the composition of the tree stratum varies considerably, the most widespread and abundant canopy species include Forest Red Gum (Eucalyptus tereticornis), Grey Ironbark (E. siderophloia), Pink Bloodwood (Corymbia intermedia) and, north of the Macleay floodplain, Swamp Turpentine (Lophostemon suaveolens). Other species may occur at low abundances, or be locally common, and include Grey Box (Eucalyptus moluccana), Grey Gum (E. propinqua), narrow-leaved Red Gum (E. seeana), Broad-leaved apple (Angophora subvelutina), Swamp Mahogany (E. robusta), Red Mahogany (Eucalyptus resinifera subsp. hemilampra), White Mahogany (E. acmenoides), Angophora woodsiana, A. paludosa and rainforest trees such as figs (Ficus spp.) and tuckeroos (Cupaniopsis spp.). A layer of small trees may be present, including Forest Oak (Allocasuarina torulosa), Red Ash (Alphitonia excelsa), Cheese tree (Glochidion ferdinandi), Callistemon spp., Melaleuca spp. and Swamp Oak (Casuarina glauca). Scattered shrubs include Breynia oblongifolia, Acacia concurrens, Commersonia spp., and Hibiscus spp. Occasional vines include Eustrephus latifolius, Parsonsia straminea and Geitonoplesium cymosum. The groundcover is composed of abundant forbs, scramblers and grasses including Imperata cylindrica, Themeda australis, Vernonia cinerea, Dianella caerulea, Pratia purpurascens, Cheilanthes sieberi and Dichondra repens.	Identified during current surveys – predicted occurrence mapped and shown in Figure #.
Lowland Rainforest on Coastal Floodplains	This Rainforest community occurs on fertile soils in lowland river valleys. A high diversity of plant species occur in this community including figs (Ficus macrophylla, F. obliqua and F. watkinsiana), palms (Archontophoenix cunninghamiana and Livistona australis), Silky Oak (Grevillea robusta), Black Bean (Castanospermum australe) and Brush Cherry (Syzygium australe). Animal species that utilise this habitat include Brush-turkey, pademelons, flying foxes, fruit-eating rainforest pigeons, Noisy Pitta, the Land Mullet skink and rainforest snails. This community is found to occur in the Central and Northern Rivers Districts and the Hunter. Threats include clearing and fragmentation for agriculture and development, exotic weed invasion, stock grazing, fire, and degradation of remnants through rubbish dumping and edge effects from roads.	

Vegetation Community	Community description and location (DEC 2006)	Occurrence
Swamp Oak Floodplain forest of the NSW North Coast, Sydney basin and South East Corner Bioregions	Swamp Oak Floodplain is found on coastal floodplains of NSW. It has a dense to sparse tree layer dominated by Swamp Oak (Casuarina glauca). Lilly Pilly (Acmena smithii), Cheese Trees (Glochidion spp.) and Paperbarks (Melaleuca spp.) may be present. Tree diversity decreases with latitude, and Melaleuca ericifolia is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines Parsonsia straminea, Geitonoplesium cymosum and Stephania japonica var. discolor, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. Varying salinity levels alter groundcover species. In less saline conditions prominent ground layer plants include Centella asiatica, Commelina cyanea, Persicaria decipiens and Viola banksii; graminoids such as Carex appressa, Gahnia clarkei, Lomandra longifolia, Oplismenus imbecillis, and the fern Hypolepis muelleri. On more saline fringes of coastal estuaries, the threatened grass species, Alexfloydia repens, as well as Baumea juncea, Juncus kraussii, Phragmites australis, Selliera radicans and other saltmarsh species may occur. Major examples once occurred on the floodplains of the Clarence, Macleay, Hastings, Manning, Hunter, Hawkesbury, Shoalhaven and Moruya Rivers.	Identified during current surveys – predicted occurrence mapped and shown in Figure #.
Swamp Sclerophyll forest on Coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	Swamp Sclerophyll Forest on Coastal Floodplains is characterised by an open to dense tree layer of eucalypts and paperbarks, with trees up to or higher than 25 m. This community includes areas of fern land and tall reed or sedge land, where trees are sparse or absent. Canopy species include Swamp Mahogany (Eucalyptus robusta), Paperbark (Melaleuca quinquenervia) and, south from Sydney, Bangalay (Eucalyptus botryoides) and Woollybutt (Eucalyptus longifolia), with other species such as Sweet Willow Bottlebrush (Callistemon salignus), Swamp She-Oak (Casuarina glauca) Red Mahogany (Eucalyptus resinifera subsp. hemilampra), Cabbage Palm (Livistona australis) and Swamp turpentine (Lophostemon suaveolens) occurring as locally common, or scattered at low abundance. A small tree layer may occur, comprising of Green wattle (Acacia irrorata), Lilly Pilly (Acmena smithii), Blueberry Ash (Elaeocarpus reticulatus), Cheese Tree (Glochidion ferdinandi), Melaleuca linariifolia and M. styphelioides. Characteristic shrubs include Acacia longifolia, Dodonaea triquetra, Ficus coronata, Leptospermum polygalifolium subsp. polygalifolium and Melaleuca spp. Vine species include Parsonsia straminea, Morinda jasminoides and Stephania japonica var. discolor. The groundcover is composed of abundant sedges, ferns, forbs, and grasses including Gahnia clarkei, Pteridium esculentum, Hypolepis muelleri, Calochlaena dubia, Dianella caerulea, Viola hederacea, Lomandra longifolia, Entolasia marginata and Imperata cylindrica. There remains less than 350 ha of this community on the Tweed lowlands, less than 2,500 ha on the Clarence floodplain, less than 700 ha on the Macleay floodplain, up to 7,000 ha in the lower Hunter – central coast district, and less than 1,000 ha in the Sydney – South Coast region.	Identified during current surveys – predicted occurrence mapped and shown in Figure #.

Vegetation Community	Community description and location (DEC 2006)	Occurrence
River-Flat Eucalypt Forest on Coastal Floodplains of NSW Nth Coast and Sydney Bioregions	As the name suggests, this EEC is found on the river flats of the coastal floodplains. It has a tall open tree layer of eucalypts, which may exceed 40 m in height, but can be considerably shorter in regrowth stands or under conditions of lower site quality. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees include *Eucalyptus tereticornis (forest red gum)*, *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). *Eucalyptus baueriana* (blue box), *E. botryoides* (bangalay) and *E. elata* (river peppermint) may be common south from Sydney, *E. ovata* (swamp gum) occurs on the far south coast, *E. saligna* (Sydney blue gum) and *E. grandis* (flooded gum) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. A layer of small trees may be present, including *Melaleuca decora, M. styphelioides* (prickly-leaved teatree), *Backhousia myrtifolia* (grey myrtle), *Melia azaderach* (white cedar), *Casuarina cunninghamiana* (river oak) and *C. glauca* (swamp oak). Scattered shrubs include *Bursaria spinosa* , *Solanum prinophyllum, Rubus parvifolius, Breynia oblongifolia, Ozothamnus diosmifolius, Hymenanthera dentata, Acacia floribunda* and *Phyllanthus gunnii* . The groundcover is composed of abundant forbs, scramblers and grasses including *Microlaena stipoides, Dichondra repens, Glycine clandestina, Oplismenus aemulus, Desmodium gunnii, Pratia purpurascens, Entolasia marginata, Oxalis perennans* and *Veronica plebeia* . The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic shrubs, grasses, vines and forbs.	

Appendix C

Forest Ecosystems and Keith Classification

Table: 6 Forest Ecosystem Vegetation Descriptions

No	FE Type	Vegetation Type Description
19	Central Mid Elevation Sydney Blue Gum	Tall to extremely tall moist forest with an overstorey dominated by Sydney Blue Gum (Eucalyptus saligna) and with Tallowwood (Eucalyptus microcorys) frequently present as a sub-dominant species. The 38 understorey is generally dense and contains shrub species such as Orange Thorn (Citriobatus pauciflorus) and Tree Heath (Trochocarpa laurina), as well as one or more of the warm temperate rainforest species Corkwood (Caldcluvia paniculosa), Coachwood (Ceratopetalum apetalum) or Crabapple (Schizomeria ovata). The ground layer is a mix of forbs, ferns and vines such as Blue Flax Lily (Dianella caerulea), Spiny-headed Mat-rush (Lomandra longifolia) and Climbing Guinea Flower (Hibbertia scandens).
32	Dry Foothills Blackbutt - Turpentine	Tall to very tall forest dominated by Blackbutt (Eucalyptus pilularis) and Turpentine (Syncarpia glomulifera) with Tallowwood (Eucalyptus microcorys) sometimes an associate. There is usually a midstorey of Forest Oak (Allocasuarina torulosa) and a sparse, patchy shrub layer which usually includes Elderberry Panax (Polyscias sambucifolia) and Tree Heath (Trochocarpa laurina). The ground layer is dominated by Blue Flax Lily (Dianella caerulea), Climbing Guinea Flower (Hibbertia scandens), Bracken (Pteridium esculentum), Blady Grass (Imperata cyclindrica) and Spiny-headed Mat-rush (Lomandra longifolia).
34	Dry Grassy Blackbutt - Tallowwood	Tall to very tall forest dominated by Blackbutt (Eucalyptus pilularis) with Tallowwood (Eucalyptus microcorys) occurring as a sub-dominant. There is a midstorey of Forest Oak (Allocasuarina torulosa) and there is often an open shrub layer of species such as Coffee Bush (Breynia oblongifolia), Hopbush (Dodonea triquetra) and White Dogwood (Ozothamnus diosmifolius). The ground layer is dominated by Blady Grass (Imperata cyclindrica), Bracken (Pteridium esculentum), Kangaroo Grass (Themeda australis) and Spiny-headed Mat-rush (Lomandra longifolia). This ecosystem is concentrated on coastal lowlands and foothills of the Nambucca and Macleay Valleys, although it is also scattered more patchily from the Myall Lakes north to the Wooli River.

No	FE Type	Vegetation Type Description
46	Eastern Red Gums	Tall to very tall forest usually with a red gum species as the dominant tree. Canopy species include Cabbage Gum (Eucalyptus amplifolia), Bancroft's Red Gum (E. bancrofti), Narrow-leaved Red Gum (Eucalyptus seeana), Broad-leaved Apple (Angophora subvelutina) and Grey Box (E. moluccana). The midstorey often includes Green Wattle (Acacia irrorata) and Black Oak (Allocasuarina littoralis) and the ground layer is dominated by Kangaroo Grass (Themeda australis), Blady Grass (Imperata cylindrica) and Spiny-headed Mat-rush (Lomandra longifolia).
47	Escarpment Red Gum	Tall to very tall forest which is similar to Ecosystem 44 but occurs at lower altitudes with coastal rather than tablelands associates. The canopy is dominated by Forest Red Gum (Eucalyptus tereticornis) with associated species including Broad-leaved Apple (Angophora subvelutina), Grey Ironbark (E. siderophloia) and Pink Bloodwood (Corymbia intermedia). There is no shrub layer apart from a few scattered shrubs of Coffee Bush (Breynia oblongifolia) and occasional other species and the ground layer is dominated by Blady Grass (Imperata cylindrica), Kangaroo Grass (Themeda australis) and various forbs.
49	Escarpment Tallowwood - Bloodwood	Tall to very tall forest dominated by Tallowwood (Eucalyptus microcorys) which may be associated with a number of other tree species of which the most common associates are Pink Bloodwood (Corymbia intermedia), Turpentine (Syncarpia glomulifera) and Broad-leaved White Mahogany (E. 50 carnea). There is a midstorey of Forest Oak (Allocasuarina torulosa)and a relatively open shrub layer which includes Narrow-leaved Orange Bark (Maytenus silvestris), Coffee Bush (Breynia oblongifolia) and Narrow-leaved Geebung (Persoonia linearis). The ground layer is dominated by species such as Blady Grass (Imperata cylindrica), Spiny-headed Mat-rush (Lomandra longifolia), Bracken (Pteridium esculentum), Blue Flax Lily (Dianella caerulea), Tick-trefoils (Desmodium spp.) and a number of ground ferns such as the Rasp Fern (Doodia aspera). This ecosystem is distributed along the Great Escarpment from the Manning Valley north to the Bellinger River.

No	FE Type	Vegetation Type Description
52	Foothill Grey Gum - Ironbark - Spotted Gum	Tall to very tall dry forest which contains a mixed canopy which is usually dominated by Small-fruited Grey Gum (Eucalyptus propinqua), Grey Ironbark (Eucalyptus siderophloia), Spotted Gum (Corymbia variegata) or a mixture of these in association with a variety of other species like Turpentine (Syncarpia glomulifera) or Pink Bloodwood (C. intermedia). There is a midstorey of Forest Oak (Allocasuarina torulosa) and there may be an understorey comprised of scattered shrubs of Coffee Bush (Breynia oblongifolia), Green Wattle (Acacia irrorata) and Tree Heath (Trochocarpa laurina). The ground layer is dominated by Blady Grass (Imperata cylindrica), Blue Flax Lily (Dianella caerulea) and Wiry Panic (Entolasia stricta) along with various forbs. This ecosystem occurs on sandstone and siliceous soils in the Clarence lowlands with a western extension through the southern Richmond Range inland to Ewingar State Forest and the Mann River.
63	Grey Gum - Stringybark	Tall to very tall dry forest in which a grey gum (Eucalyptus propinqua or E. biturbinata) and one or more stringybarks (E. caliginosa, E. laevopinea or E. eugenioides) characterise the overstorey. Other associates include Tallowwood (E. microcorys), Forest Red Gum (E. tereticornis), Sydney Blue Gum (E. saligna), New England Blackbutt (E. campanulata) and Pink Bloodwood (Corymbia intermedia). A poorly developed understorey of smaller trees or shrubs such as Forest Oak (Allocasuarina torulosa) may be present. Ground layer species include Kangaroo Grass (Themeda australis), Blady Grass (Imperata cylindrica), Snow Grass (Poa sieberiana), Spiny-headed Mat-rush (Lomandra longifolia), Blue Flax Lily (Dianella caerulea), and various forbs. This is a widespread ecosystem of ranges and gorges.
83	Mid Elevation Wet Blackbutt	Tall to extremely tall forest dominated by Blackbutt (Eucalyptus pilularis) with a variety of species which frequently occur as sub-dominants including Tallowwood (E. microcorys), New England Blackbutt (E. campanulata), Brush Box (Lophostemon confertus) and Turpentine (Syncarpia glomulifera). There is a relatively dense midstorey of Forest Oak (Allocasuarina torulosa) and Blackwood (Acacia melanoxylon) with a sparse to moderately dense understorey comprised of Rough Tree Fern (Cyathea australis), Corkwood (Caldcluvia paniculosa) and Scentless Rosewood (Synoum glandulosum) and other warm-temperate rainforest elements. The ground layer is dominated by ferns and forbs with grasses occurring very infrequently. Common species include Blue Flax Lily (Dianella caerulea), Spiny-headed Mat-rush (Lomandra longifolia) and Gristle Fern (Blechnum cartilagineum). This ecosystem is distributed on near coastal ranges of the mid-north coast.

No	FE Type	Vegetation Type Description
84	Mid North Coast Wet Brushbox - Tallowwood - Blue Gum	Tall to extremely tall moist forest dominated by or co-dominated by Tallowwood (Eucalyptus microcorys), Brush Box (Lophostemon confertus) and/or Sydney Blue Gum (E. saligna). A very welldeveloped warm temperate rainforest midstorey and understorey is present. Common species include Rose Maple (Cryptocarya rigida), Corkwood (Caldcluvia paniculosa) and Rough Tree Fern (Cyathea australis). Vines such as Sarsaparilla (Smilax australis), Five-leaf Water Vine (Cissus hypoglauca) and Water Vine (Cissus antarctica) are common, and the ground layer is dominated by Gristle Fern (Blechnum cartilagineum). This ecosystem is distributed extensively at mid elevation on the ranges of the Great Escarpment from Clouds Creek south to Dingo Tops.
88	Moist Escarpment New England Blackbutt	Tall to very tall moist forest in which the canopy is dominated by New England Blackbutt (Eucalyptus campanulata), and in which Tallowwood (E. microcorys) and, less frequently, Sydney Blue Gum (E. saligna) occur as sub-dominants. There is a moderately dense and diverse understorey of moist shrubs such as Tree Heath (Trochocarpa laurina), Hairy Psychotria (Psycotria loniceroides) and Scentless Rosewood (Synoum glandulosum) and a ground layer dominated by Bracken (Pteridium esculentum), Spiny-headed Mat-rush (Lomandra longifolia), Climbing Guinea Flower (Hibbertia scandens) and Common Ground Fern (Calochlaena dubia). This ecosystem is scattered along the eastern fall of the Great Escarpment from the Cataract River south to the Manning River.
89	Moist Foothills Spotted Gum	Tall to very tall moist forest dominated by Spotted Gum (Corymbia variegata or C. maculata) in association with a variety of species with the most frequent including Tallowwood (Eucalyptus microcorys), Brush Box (Lophostemon confertus) and Narrow-leaved White Mahogany (E. acmenoides). There is a midstorey of Forest Oak (Allocasuarina torulosa) and a sparse understorey of species such as Tree Heath (Trochocarpa laurina), Coffee Bush (Breynia oblongifolia), and Hairy Psychotria (Psychotria loniceroides). The ground layer is dominated by Blue Flax Lily (Dianella caerulea), Blady Grass (Imperata cylindrica) and Rasp Fern (Doodia aspera) as well as various forbs and vine species.

No	FE Type	Vegetation Type Description
91	Moist Open Escarpment White Mahogany	Tall to very tall forest containing a mixed canopy of Narrow-leaved White Mahogany (Eucalyptus acmenoides), Tallowwood (E. microcorys), Sydney Blue Gum (E. saligna) and/or New England Blackbutt (E. campanulata). There is a midstorey of Forest Oak (Allocasuarina torulosa) with occasional scattered shrubs in the understorey and a ground layer dominated by Spiny-headed Mat-rush (Lomandra longifolia), Snow Grass (Poa sieberiana), Blady Grass (Imperata cylindrica), Blue Flax Lily (Dianella caerulea) and various forbs.
104	Northern Wet Tallowwood - Blue Gum	Tall to extremely tall forest in which Sydney Blue Gum (Eucalyptus saligna) and Tallowwood (E. microcorys) dominate the canopy, with Brush Box (Lophostemon confertus) or Narrow-leaved White Mahogany (E. acmenoides) frequently sub-dominant. There is a dense understorey of rainforest shrubs and small trees such as Guioa (Guioa semiglauca), White Bolly Gum (Neolitsea dealbata) and Scrub Turpentine (Rhodamnia rubescens). Vines such as Water Vine (Cissus Antarctica) and Five-leaf Water Vine (Cissus hypoglauca) are common, and the ground layer is dominated by ferns and forbs like Giant Maidenhair (Adiantum formosum) and Blue Flax Lily (Dianella caerulea).
106	Open Coastal Brushbox	Tall to very tall forest dominated by Brush Box (Lophostemon confertus) with Turpentine (Syncarpia glomulifera) present as a sub-dominant. There is often a midstorey of Forest Oak (Allocasuarina torulosa), and an open to moderately dense understorey of semi-moist shrubs such as Tree Heath (Trochocarpa laurina), Narrow-leaved Palm Lily (Cordyline stricta) and Scentless Rosewood (Synoum glandulosum). The ground layer is dominated by ferns such as Gristle Fern (Blechnum cartilagineum) and Giant Maidenhair (Adiantum formosum) and forbs such as Spiny-headed Mat-rush (Lomandra longifolia) and Blue Flax Lily (Dianella caerulea). This ecosystem is distributed on coastal lowlands and foothills from the Manning Valley north to the Corindi River.

No	FE Type	Vegetation Type Description
112	Paperbark	Low to very tall woodland and forest in which Broad-leaved Paperbark (Melaleuca quinquenervia) commonly dominates the overstorey, or occasionally another paperbark (e.g. M. alternifolia, M. sieberi, M. linariifolia, M. styphelioides). Associates include Swamp Mahogany (Eucalyptus robusta), Swamp Oak (Casuarina glauca) and Swamp Box (Lophostemon suaveolens). Understorey and ground layer composition varies with substrate, depth and extent of waterlogging, and water quality. Sawsedges (Gahnia spp.), twig-rushes (Baumea spp.), Carex spp., Bungwahl Fern (Blechnum indicum), Feather Plant (Baloskion tetraphyllum), tea-tree (e.g. Leptospermum juniperinum), bottlebrush (e.g. Callistemon pachyphyllus) and certain grasses (e.g. Hemarthria uncinata, Ischaemum australe) may dominate, or alternatively rainforest trees, shrubs and vines such as Cabbage Tree Palm (Livistona australis), Cheese Tree (Glochidion ferdinandi) and Common Silkpod (Parsonsia straminea) can be common. This ecosystem is widespread on coastal lowlands.
120	River Oak	Tall to very tall woodland and forest along permanent freshwater streams in which River Oak (Casuarina cunninghamiana) dominates the overstorey. The understorey of this riparian ecosystem varies with locality, although it may support a variety of rainforest trees and shrubs such as Silky Oak (Grevillea robusta) and Weeping Lilly Pilly (Waterhousea floribunda), or alternatively more sclerophyllous species such as Rough-barked Apple (Angophora floribunda), Broad-leaved Apple (A. subvelutina) and Drooping Bottlebrush (Callistemon viminalis). The ground stratum is prone to disturbance by floodwaters, and often supports a mixture of natives and exotics.

No	FE Type	Vegetation Type Description
143	Swamp Oak	Low to very tall woodland and forest with the overstorey clearly dominated by Swamp Oak (Casuarina glauca). Associates include Broad-leaved Paperbark (Melaleuca quinquenervia) and Forest Red Gum (Eucalyptus tereticornis). Composition of the understorey varies with habitat (e.g. estuarine or floodplain), and it may be poorly developed where the overstorey is dense. Examples of smaller trees, shrubs and vines include various paperbarks (e.g. Melaleuca ericifolia, M. styphelioides), Groundsel Bush (Baccharis halimifolia), Lantana (Lantana camara), Swamp Hibiscus (Hibiscus diversifolius), Goodenia ovata, Common Silkpod (Parsonsia straminea) and Five-leaf Morning Glory (Ipomoea cairica). Ground layer species include Bare Twig-rush (Baumea juncea), Maritime Rush (Juncus kraussii), Enydra fluctuans, Brown Fringe-rush (Fimbristylis ferruginea), Tall Saw-sedge (Gahnia clarkei), and various grasses (e.g. Entolasia spp., Oplismenus spp., Phragmites australis, Sporobolus virginicus, Isachne globosa) and forbs (e.g. Pratia purpurascens, Viola hederacea, Centella asiatica, Hydrocotyle acutiloba). This ecosystem is widespread on poorly drained sites in coastal areas.
146	Tallowwood	Tall to very tall forest which is dominated by Tallowwood (Eucalyptus microcorys) in association with a variety of other tree species including Brush Box (Lophostemon confertus), Broad-leaved White Mahogany (E. carnea) and Grey Ironbark (E. siderophlioa). A midstorey of Forest Oak (Allocasuarina torulosa) is usually present and the understorey is mainly open with Lantana (Lantana camara), Prickly Alyxia (Alyxia ruscifolia) and Coffee Bush (Breynia oblongifolia) common. Occasionally an understorey of dry rainforest species occurs. The ground layer is a mix of grasses, forbs and ferns such as Blady Grass (Imperata cylindrica), Kangaroo Grass (Themeda australis), Spiny-headed Mat-rush (Lomandra longifolia), Maidenhair (Adiantum aethiopicum) and Rasp Fern (Doodia aspera).

No	FE Type	Vegetation Type Description
152	Wet Bloodwood - Tallowood	Tall to extremely tall forest dominated by Pink Bloodwood (Corymbia intermedia) frequently in association with Tallowwood (Eucalyptus microcorys) and also often including Brush Box (Lophostemon confertus), Narrow-leaved White Mahogany (E. acmenoides), Grey Ironbark (E. siderophloia) and Small-fruited Grey Gum (E. propinqua). There is usually a dense understorey dominated by species such as Celery Wood (Polyscias elegans), Lantana (Lantana camara), Guioa (Guioa semiglauca), Native Ginger (Alpinia caerulea) and Ribbon Wood (Euroschinus falcatus). Vines are common, and the ground layer is most frequently dominated by Rasp Fern (Doodia aspera), Blady Grass (Imperata cylindrica), Blue Flax Lily (Dianella caerulea) and Spiny-headed Mat-rush (Lomandra longifolia).
155	Wet Foothills Blackbutt - Turpentine	Tall to extremely tall forest dominated by Blackbutt (Eucalyptus pilularis) with Tallowwood (E. microcorys), Brush Box (Lophostemon confertus) and/or Turpentine (Syncarpia glomulifera) often present as co-dominants. There is a midstorey of Forest Oak (Allocasuarina torulosa) and a dense understorey dominated by shrubs such as Blueberry Ash (Elaeocarpus reticulatus), Rose Myrtle (Archirhodomyrtus beckleri) and Scentless Rosewood (Synoum glandulosum). Vine species such as Five-leaf Water Vine (Cissus hypoglauca) and Sarsaparilla (Smilax australis) are often present. The ground layer is dominated by ferns and forbs such as Common Ground Fern (Calochlaena dubia), Gristle Fern (Blechnum cartilagineum), Bracken (Pteridium esculentum), Spiny-headed Mat-rush (Lomandra longifolia) and Blue Flax Lily (Dianella caerulea). This ecosystem is distributed on foothills and ranges from the Manning Valley north to the Corindi River.
157	Wet Shrubby Brushbox - Tallowwood	Tall to extremely tall forest dominated by Brush Box (Lophostemon confertus) with Tallowwood (Eucalyptus microcorys) and/or Sydney Blue Gum (E. saligna) sometimes present. There is a dense warm temperate rainforest or shrubby understorey of species such as Corkwood (Caldcluvia paniculosa), Crabapple (Schizomeria ovata), Rose Maple (Cryptocarya rigida), Scentless Rosewood (Synoum glandulosum) and Bolwarra (Eupomatia laurina). Vines like Sarsaparilla (Smilax australis), Water Vine (Cissusa antarctica) and Five-leaf Water Vine (Cissus hypoglauca) and Anchor Vine (Palmeria scandens) are common. The ground layer is mainly ferns and forbs such as Gristle Fern (Blechnum cartilagineum), Trim Shield Fern (Lastreopsis decomposita) and Blue Flax Lily (Dianella caerulea).

No	FE Type	Vegetation Type Description
168	Rainforest	Typically Closed Forest (>70% crown cover) dominated by Rainforest species. Characteristic features may include vines, epiphytes, drip tips, mosses, compound leaves and tree buttresses. May include emergent Eucalypt species and/or Brushbox with up to 50% crown cover. Where emergent Eucalypt or other non-rainforest species occur, the Rainforest canopy stratum is more or less continuous with crowns typically touching or overlapping.
999	Regenerating Rainforest with Lantana	As for 168 Rainforest but previously cleared or impacted and beginning to regenerate. Often significant infestation of Lantana camara.

Table: 7 Keith Type Vegetation Descriptions

No	Keith Type	Vegetation Type Description (Keith 2004)
1	Subtropical Rainforest	Subtropical Rainforests are comprised of a multi-layered dense canopy structure up to 40 m comprised of large emergent species such as figs and cedars, and sub-canopy species including palms. Indicative tree species found in this vegetation type include Figs (Ficus spp), Red Cedar (Toona ciliata), Brachychiton acerifolius (Illawarra Flame Tree), Dendrocnide excelsa (Stinging Tree), Lophostemon confertus (Brush Box), Doryphora sassafras (Sassafras), and Archontophoenix cunninghamiana (Bangalow Palm). The shrub and ground layer consists of a mixture of vines, creepers, herbs, shrubs and fern species including Citriobatus pauciflorus (Orange thorn), Neolitsea dealbata (White Bolly Gum), Wilkiea huegeliana (Veiny Wilkiea), Cissus antarctica (Water Vine), Morinda jasminoides, Dendrobium gracilicaule (Rats tail Orchid), Platycerium bifurcatum (Elkhorn), Adiantum formosum (Giant Maidenhair), and Cyathea leichhardtiana (Prickly Treefern). Subtropical Rainforest occur where average rainfall exceeds 1300mm. They are found on rich soils derived from alluvium or igneous rock in coastal lowlands, valleys, riparian corridors, and within sheltered gullies and foothills of coastal ranges occasionally extending up into escapment gullies to 900 m elevation. They require fertile soils, warm temperature and a reliable water supply.

No	Keith Type	Vegetation Type Description (Keith 2004)
2	North Coast Wet Sclerophyll Forest	North Coast Wet Sclerophyll Forests grows generally below 500 m elevation where annual rainfall exceeds 1000 mm on alluvial sheltered creek flats and fertile rocky substrates on coastal foothills and ranges. The dominant straight-trunked eucalypt species reach between 30 - 60 m with an open shrub and small tree layer and fern and herb ground cover extending throughout the community. Vines are a feature of this community, sprawling over shrubs and smaller tree species present. Species composition varies greatly and is dependant on soil fertility, terrain, and elevation. In higher rainfall areas this community often grades in warm temperate or subtropical Rainforest. Some indicative species include Eucalyptus acmenoides (White Mahogany), E. microcorys (Tallowood), E. pilularis (Blackbutt), Lophostemon confertus (Brush Box), Syncarpis glomulifera (Turpentine), E. saligna (Sydney Blue Gum), E. grandis (Flooded Gum), Brenia oblongifolia (Coffee Bush), Synoum glandulosum (Scentless rosewood), Elaeocarpus reticulatus (Blueberry Ash), Cissus antarcticus, Clematis glycinoides (Headache Vine), Hibbertia scandens (Climbing guinea flower), Geranium homeanum, Plectranthus parviflorus, Blechnum cartilagineum (Gristle fern), and Cyathea australis (Rough tree fern).
3	Northern Escarpment Wet Sclerophyll Forest	Northern Escarpment Wet Sclerophyll Forests occurs at altitudes between 600 - 1400 m in areas where annual rainfall averages between 1000 - 2000 mm. They occur on fine-grained sedimentary rocks and granite. The canopy Eucalypt species grow to 60 m with a tall sub canopy of shrubs present. A smaller shrub and ground layer exists comprised of small shrubs, ferns and herbs. Composition of this community varies due to altitude, available moisture and nutrients. Species include Eucalyptus campanulata (New England Blackbutt), E. microcorys (Tallowwood), Eucalyptus saligna (Sydney Blue Gum), Callicoma serratifolia (Black Wattle), Lophostemon confertus (Brush Box), Polyscias sambucifolia subsp A (Elderberry Panax), Trochocarpa laurina (Tree heath), Eustraphus latifolius (Wombat Berry), Smilax glyciphylla (Sweet Sarsparilla), Dianella caerulea var producta (Blue Flax Lilly), Stchicherus lobatus (Spreading Shield Fern), and Cyathea australis (Rough Tree fern).
4	Northern Hinterland Wet Sclerophyll Forest	Northern Hinterland Wet Sclerophyll Forests occurs at altitudes below 600 m in areas with annual rainfall exceeding 1000 mm. It occurs on ranges, foothills, and plateaux's with fertile loams derived from siltstone and mudstone. This community contains a tall open canopy layer to 40 m comprised of a variety of Eucalypt speices with an open mesophyllus and sclerophyllus shrub layer and predominately grassy understorey. Indicative species of this community include Eucalyptus propinqua (Grey Gum), E. siderophloia (grey Ironbark), E. microcorys (Tallowwood), Corymbia intermedia (Pink Bloodwood), Angophora subvelutina (Broad-leaved Apple), Allocasuarina torulosa (Forest oak), Jacksonia scoparia (Dogwood), Meytenus sylvestrus (Narrow-leaved Orange Bark), Ozothamnus diosmifolius (White dogwood), Persoonia linearis (Narrow-leaved Geebung), Hibbertia dentata, Pandorea pandorana (Wonga Wonga Vine), Pteridium esculentum (Bracken) and a variety of grasses and herbs.

No	Keith Type	Vegetation Type Description (Keith 2004)
5	Coastal Valley Grassy Woodland	Coastal Valley Grassy Woodlands contain a wide variety of vegetation communities in dry coastal rain-shadow valley's below 350 m elevation with annual rainfall less than 700 - 1000 mm. They are present on deep, loamy, moderatley fertile soils of shale and granite derivative. Eucalyptus tereticornis is a signature species of this Woodland community type. Coastal valley grassy Woodlands are comprised of an open Tree layer of mixed Eucalypt species with scattered shrubs and dense ground layer of perennial tussock grasses and herbs, orchids, lilies, and scrambling twiners. Indicative specie include Eucalyptus teretiornis (Forest Red Gum), Angophora floribunda (Rough-barked Apple), Corymbia maculata (Spotted Gum), Eucalyptus moluccana (Grey box), Corymbia intermedia (Pink Bloodwood), Eucalyptus siderophloia (Grey Ironbark), Bursaria spinosa (Blackthorn), Acacia implexa (Hickory Wattle), Dillwynia sieberi (Egg and Bacon pea), Alphitonia excelsa (Red Ash), Dichondra repens (Kidney weed), Wahlenbergia gracilis (Australian Bluebell), Cheilanthes sieberi subsp. sieberi (Poison Rock Fern), Aristida vagans (Three-awn Speargrass), Themeda australis (Kangaroo Grass), and Microlaena stipoides var stipoides (Weeping grass).
6	New England Grassy Woodland	New England Grassy Woodlands occur above 600 m elevation on fertile loamy soils comprised from sedimentary and granite rocks in regions where annual rainfall is between 550 - 800 mm. It is a variable suite of communities ranging in composition and height depending on soil types, available nutrients and moisture levels. This set of communities contain numerous stringybark and peppermint eucalypt species and distinctly northern woody shrub species. New England Grassy Woodlands are comprised of an open tree layer with a variety of semi-prostrate shrubs and a semi-continuos grassy ground layer. Species include Angophora floribunda (Rough-barked Apple), Eucalyptus nova-anglica (New England Peppermint), E. melliodora (Yellow Box), E. laevopinea (Silver-top Stringybark), E. bridgesiana (Apple Box), Acacia filicifolia (Fern-leaved Wattle), Cassinia quinquefaria, Rubus parvifolius (Native Raspberry), Hardenbergia violacea (False sarsaparilla), Glycine species, Asperula conferta (Common Woodruff), and a variety of native grasses.
7	Hunter-Macleay Dry Sclerohpyll Forest	Hunter-Macleay Dry Sclerophyll Forests occur on foothills and undulating terrain below 400m elevation on well drained loamy soils derived from shale in rain shadow areas. They occur in the transitional zone between Coastal Valley Grassy Woodland and Northern Hinterland Wet Sclerophyll Forests in major coastal river valleys of the Manning and Hunter valley regions. The structure of these Forests comprises of an open canopy of variety of spotted gums, ironbarks, turpentine, boxes and grey gums growing to a height of 30 m with a sparse shrub layer and semi-continuous grass layer. Indicative species for these Forest types include Corymbia maculata (Spotted Gum), Eucalyptus crebra (Narrow-leaved Ironbark), Angophora costata (Sydney Red Gum), Eucalyptus punctata (Grey Gum), Allocasuarina torulosa (Forest Oak), Lissanthe strigosa (Peach Heath), Notelaea longifolia (Large Mock-olive), Calotis lappulacea (Yellow Burr-daisy), and Native grasses.

No	Keith Type	Vegetation Type Description (Keith 2004)
8	Northern Gorge Dry Sclerophyll Forest	Northern Gorge Dry Sclerophyll Forests occur in coastal ranges and gorges comprised of weathered metamorphic rocks and moderately fertile soils. These forests occur in rain-shadow areas that reach high temperatures during summer. Subsequently the forests that occur here are dry open forests to 20 m tall with a mixture of shrubs and a continuous grass layer present. Species composition within this community is largely consistent across its distribution. Species include Angophora subvelutina (Broad-leaved Apple), Corymbia intermedia (Pink Bloodwood), Eucalyptus propinqua (Grey Gum), Allocasuarina littoralis (Black She-oak), A. torulosa (Forest Oak), Exocarpus cupressiformis (Native Cherry), Xanthorrhoea johnsonii (Grass Tree), Hardenbergia violacea (False Sarsaparilla), Chrysocephalum apiculatum (Common everlasting), Viola bentonicifolia (Mountain Violet), Lomandra longifolia (Spiny Mat-rush), Imperata cylindrica var major (Blady grass), and native grasses.
9	North Coast Dry Sclerophyll Forest	North Coast Dry Sclerophyll Forest are a shrubby sub formation of dry sclerophyll forest, occurring on quartz-rich sandstone with low nutrient levels on coastal hills and plateaux. These forests grow to 25 m and contain a moderate cover of grasses with a prominent layer of sclerophyllous shrubs. An indicative species of this forest type is Eucalyptus baileyana. Other species found include Angophora robur, A. woodsiana, Corymbia intermedia (Pink Bloodwood), Eucalyptus umbra (Bastard White Mahogany), Syncarpia glomulifera (Turpentine), Banksia oblongifolia, B. spinulosa var collina (Hair-pin Banksia), Leptospermum polygalifolium, Pimelaea linifolia (Slender Rice Flower), Xanthorrhoea latifolia, Dianella caerulea (Blue Flax Lilly), Entolasia stricta (Wiry Panic), and Lepidosperma laterale.
10	Northern Escarpment Dry Sclreohpyll Forest	Northern Escarpment Dry Sclerophyll Forest occur from 800 - 1400 mm elevation with annual rainfall exceeding 850 mm on sandy loam soils with leucogranite outcrops, low nutrients, in cool regions. These forest typically grow to a height of 20 m and are dominated by Eucalypts with a prominent sclerophyllous shrub layer and sparse groundlayer dominated by grasses and sedges. Species occuring within this community include Eucalyptus campanulata (New England Blackbutt), E. oreades (Blue Mountain Ash), Eucalyptus cameronii (Diehard Stringybark), E. acaciiformis (Wattle-leaved Peppermint), Acacia buxifolia subsp. buxifolia (Box-leaved Wattle), Telopea aspera and T. speciosissima (Waratah), Lomatia silaifolia (Crinkle Bush), Kunzea bracteolata, Platysace ericoides, Gonocarpus tetragynus, Goodenia hederacea subsp hederacea, Pteridium esculentum (Bracken), Lepidosperma laterale, and Entolasia stricta (Wiry Panic).

No	Keith Type	Vegetation Type Description (Keith 2004)
11	Coastal Freshwater Lagoons	Coastal Freshwater Lagoons occur in coastal floodplain and sand plain depressions at elevations less than 10 m. Coastal Freshwater Lagoons contain a wide variety of sedges, rushes and aquatic herbs where permanent stands of freshwater occur. Lagoons formed in sandplains have low nutrient levels and contain simple plant communities of only a few dominant species of sedges, with more diversity present in floating vegetation. Lagoons on floodplains conatin rich deposits of river sediments and muds from the surrounding catchment. These lagoons contain a variety of plant species forming a mosaic of communties depending on water depth, protection from wind and wave action, and local flood and drought occurences. Species present within this vegetation type can include scattered Casuarina glauca (Swamp Oak) or Melaleuca ericifolia (Swamp paperbark), Alsima plantago-aquatic, Persicaria dicipiens (Slender Knotweed), Ranunculus inundatus (River Buttercup), Azolla filiculoides var. rubra (Red Azolla), Utricularia australis (Yellow Bladderwort), Phylidrum lanuginosum (Frogsmouth), Triglochin procerum (Water Ribbons), Eleocharis species, Baumea species, Carex appressa (Tussock sedge), Juncus usitatus (Common rush), Phragmites australis (Common reed), Scoenoplectus validus, and Typha orientalis (Broad-leaved Cumbungi).
12	Coastal Floodplain Wetland	Coastal Floodplain Wetlands occur along fertile floodplains along the major rivers of eastern NSW, and once supported mosaics of forests, woodlands and reedlands. Remnants still occur today along coastal floodplains and further up valley on small flats amid grassy woodlands on undulating terrain along intermittent alluvial creeklines. These wetlands contain forests of Casuarina and Melaleuca up to 20 m tall with highly shaded understoreys of sedges, grasses, and herbs over dense leaf litter. Scattered shrubs may also occur. Versions of this, including semi-remnant patches of woodlands and reedlands on small creek flats also occur. Species present include Angophora floribunda (Rough-barked Apple), A. subvelutina (Broad-leaved Apple), Eucalyptus amplifolia (Cabbage Gum), E. saligna (Sydney Blue Gum), E. tereticornis (Forest Red Gum), Casuarina glauca (Swamp Oak), Lophostemon suaveolens (Swamp Mahogany), Livistona australis (Cabbage Palm), Melaleuca linariifolia, M. stypheloides (Prickly-leaved Tea-tree), Parsonsia straminea (Common Silkpod), Commelina cyanea (Scurvy Weed), Viola hederacea (Ivy-leaved Violet), Baumea juncea (Bare-twig Rush), Juncus krausii subsp. australiensis (Sea Rush), Microlaean stipoides (Weeping Grass), Zoysia macrantha (Prickly couch) and Imperata cylindrica var. major (Blady grass).
13	Eastern Riverine Forests	Eastern Riverine Forests occur along the coastal lowlands and tablelands of eastern NSW from 800 m elevation to almost sea-level, following fast-flowing streams and rivers. The moist and dynamic substrates of these riparian corridors allow a variety of forested wetland communities to emerge, altered by localised disturbances linked to changes in water flow. Casuarina cunninghamiana dominates this forest type, with varying canopy heights from 10 - 40 m and understorey composition of patchy shrubs, sedges, and herbs. In coastal areas the this community is limited by salinity levels, where Casuarina glauca and more salt-tolerant sedges mark the transition into Coastal Floodplain Wetlands. Species composition for the Eastern Riverine Forests includes Casuarina cunninghamiana (River Oak), Tristaniopsis laurina (Water Gum), Acacia floribunda (White Sally), Glochidion ferdinandii (Cheese Tree), Hymenanthera dentata (Tree Violet), Hydrocotyle tripartia (Pennywort), Persicaria hydropiper (Water Pepper), Carex appressa (Tussock Sedge), Lomandra longifolia (Spiny-heade

No	Keith Type	Vegetation Type Description (Keith 2004)
		Mat-rush), and Microlaena stipoides (Weeping Grass).

Appendix D

Threatened Species List for Kempsey Shire

Table: 8 Threatened Species of the Macleay Shire

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Aepyprymnus rufescens	Rufous Bettong	V		This species is a small marsupial that grows 70 to 80 cm long from nose to tail, and has reddish-brown fur. They inhabit tall, moist eucalypt forests and open woodlands, with a tussock grass understorey. Rufous Bettong's prefer a dense cover of tall native grasses is the preferred shelter. They sleep during the day in cone-shaped nests constructed of grass in a shallow depression at the base of a tussock or fallen log. At night they feed on grasses, herbs, seeds, flowers, roots, tubers, fungi and occasionally insects. reduced to a patchy distribution from Cooktown, Queensland, to north-eastern NSW. In NSW it has largely vanished from inland areas. Changes to the grassy understorey by inappropriate burning and grazing. Competition from rabbits. Predation by feral cats and foxes, whose numbers appear to increase when dingoes are reduced through baiting. Loss of habitat through clearing, logging and collection of fallen timber.	19, 32, 33, 34, 46, 47,52, 63, 83, 88, 89, 91, 120, 143, 146, 155
Amaurornis olivaceus	Bush-hen	V		The Bush-hen is a small, dark wetland bird with lime-green beak and greenish-yellow legs, though the base of the upper beak becomes orange-red in the breeding season. Its plumage is dark olive-brown above and grey below with rich buff under the tail. The species is shy and usually first comes to notice when the loud, distinctive braying, shrieking call is heard. It apparently flies mainly at night, swims readily and flicks its tail when walking in the manner of most rails and swamp-hens. Occurs in a variety of coastal wetlands from mangroves, lagoons and swamps, to river margins and creeks running through rainforest. It has also been recorded away from water in dense low vegetation, including Blady Grass and the Lantana.	112, 120, 143, 168

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Argyreus hyperbius	Laced Fritillary	E		The Laced Fritillary is a butterfly with a wingspan of 60-66 mm. The upperside of the wings is pale orange-brown with many black spots and a black band on the wing edge enclosing orange-brown streaks. Underneath the fore-wing is pinkish-orange with numerous black spots, and underneath the hindwing is pale brown, laced with black and silver markings and greenish-brown spots. Distributed along coastal areas of north-east NSW and south-east Queensland, and also New Guinea, south-east Asia and India. Australian population now restricted to a few widely separated localities from Port Macquarie north to Gympie. The Laced Fritillary has only been recorded from the Port Macquarie and Billinudgel areas in NSW in recent times. Laced Fritillary is found in open swampy coastal habitat. The food plant occurs in ground level vegetation in swampy areas beneath grasses and Lomandra. (DECC 2007).	112, 120, 143
Atrichornis rufescens	Rufous Scrub-bird	V		This species of small bird occurs inhigh altitude subtropical, warm and cool temperate rainforest, and moist euclypt forest with dense rainforest mid-storey. It inhabits dense lower storey starta, foraging in dense leaf litter and amongst fallen logs. breeding occurs from early spring through summer. Threats include localised extinction from small population size, fire, and the clearing of habitat through forestry activities (DEC 2007).	84, 88, 104, 106, 152, 157
Botaurus poiciloptilus	Australasian Bittern	V		This species favours permanent freshwater wetlands with tall dense reedbeds particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.) with adjacent shallow, open water for foraging. No breeding population known from the Lower Hunter. It hides during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails. Threats include drainage of wetlands and ponds, pesticides and other chemicals near wetland areas, and grazing and associated frequent burning of wetland areas (DEC 2007).	112, 120, 143
Burhinus grallarius	Bush Stone-curlew	E		This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights, it feed on insects and small vertebrates, such as frogs, lizards and snakes. Nests are on the ground in a scrape or small bare patch. Threats include predation by foxes and cats, trampling of eggs by cattle, clearance of woodland habitat through removal of litter and fallen timber, introduction of exotic pasture grasses, grazing and frequent fires, and other disturbance in the vicinity of nest sites (DEC 2007).	32, 33, 34, 46, 47, 52, 63

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Calidris alba	Sanderling	V	M	This species of small wading bird occurs in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons. It feeds in receding waves on insects and other small invertebrates. Its diet also includes a variety of plants, seeds, worms, crustaceans, spiders, jellyfish and fish found at the edges of shallow pools. Roosting occurs on bare sand, behind clumps of beach-cast kelp or in coastal dunes. Breeding occurs in the Northern Hemisphere. Threats include pollution, tourism and agricultural development, hydrological changes, and disturbance to breeding and foraging areas (DEC 2007).	NA Coastal Species
Calidris tenuirostris	Great Knot	V	M	Primarily a coastal species, favouring mudflats, harbours and lagoons DEC 2007).	NA Coastal Species
Callocephalon fimbriatum	Gang-gang Cockatoo	V		This species is nomadic, spending summer in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests and winter at lower altitudes in drier more open eucalypt forest and woodlands, particularly in coastal areas. This species nests in hollow-bearing trees close to water with breeding taking place between October and January. Breeding usually occurs in tall mature sclerophyll forests that have a dense understorey, and occasionally in coastal forests (DEC 2007).	Most areas
Calyptorhynchus lathami	Glossy Black Cockatoo	V	E	This species is highly specialised, feeding almost exclusively on the seeds extracted from the wooden cones of Allocasuarina species including Black She-oak (Allocasuarina littoralis), Forest She-oak (Allocasuarina torulosa) or Drooping She-oak (Allocasuarina verticilliata). It is uncommon although widespread throughout suitable forest and woodland habitats, from central QLD to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW. This species needs suitable hollows in living and dead trees for nesting and breeds between March and August (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 83, 89, 91, 146, 155

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Caretta caretta	Loggerhead Turtle	E	E	This species of sea turtle occur in warm temperate and tropical waters off Australia's coast. This species forages in deep waters, feeding on jelly-fish, fish, and bottom-dwelling marine species. Females lay their eggs in nests built on beaches in tropical areas during the warmer months of the year. Threats include trutles being caught in fishing lines, nets, and other marine debris, collisions with marine human traffic, suffocation due to marine pollution such as plastics, and distruction or disturbance to nesting sites including coastal development and irresponsible tourism, and predation of hatchlings (DEC 2007).	NA Coastal Species
Cerartetus nanus	Eastern Pygmy-possum	V		This species is a small arboreal marsupial distributed along the coast of southern QLD, NSW, and Victoria, southeastern SA, and is present throughout Tasmania (Bowen and Goldingay 2000). It is generally a solitary species with home ranges of the males around 0.68 ha and females around 0.35 ha. Banksia spp. and myrtaceous shrubs and trees are favoured food sources and nesting sites in drier habitats. The eastern Pygmy-possum's diet consists largely of pollen and nectar from Banksia spp., Eucalyptus spp., Callistemon spp. and insects (Turner and Ward 1995). It nest in hollows in trees but its small size allows it to nest in a variety of places including under the bark of Eucalypts, forks of tea-trees, and in abandoned bird nests (Turner and Ward 1995). It is an agile climber and a very mobile species, and may undergo short-term seasonal migration possibly in response to food availability (Bowen and Goldingay 2000). The majority of births occur in spring to early autumn, but if abundant food supplies are available breeding will continue on the mainland throughout the year (Turner and Ward 1995).	Most site especially 112
Chalinolobus nigrogriseus	Hoary Wattled Bat	V		This species of bat can be found in dry open eucalypt forests, favouring forests with a sparse understorey and dominated by Spotted Gum, boxes and ironbarks, as well as heathy coastal forests where Red Bloodwood and Scribbly Gum are common. In NE NSW its range extends from near Murwillumbah south to between Grafton and Coffs Harbour. Threats include clearing of habitat, pesticide use, and the loss of hollow-bearing trees through fire and clearing (DEC 2007).	32, 33, 34, 46, 47, 52, 63

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Chalinolobus picatus	Little Pied Bat	V		This species of bat is found in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings in dry open forest and woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, and Bimbil box communities. They feed on moths nd other flying invertebrate. Threats include pesticide use, habitat disturbance or loss, and predation by feral animals (DEC 2007).	32, 33, 34, 46, 47, 52, 63
Charadrius leschenaultii	Greater sand-plover	V		This species is almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. It roosts during high tide on sandy beaches and rocky shores; begins foraging activity on wet ground at low tide, usually away from the edge of the water (DEC 2007).	NA Coastal Species
Charadrius mongolus	Lesser Sand-plover	V	M	Primarily a coastal species, favouring mudflats, harbours and lagoons (DEC 2007).	NA Coastal Species
Climacteris picumnus victoriae	Brown Treecreeper	V		This species inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey within coastal areas. They nest in hollows in standing dead or live trees and tree stumps. Fallen timber is an important habitat component for this species (DEC 2007).	32, 33, 34, 46, 47, 52, 63
Coeranoscincus reticulatus	Three-toed Snake-tooth Skink	V	V	The Three-toed Snake-tooth Skink is a large burrowing lizard with a head and body length of up to 23 cm and a thick, long tail. It has four very short legs, each with three clawed toes, and has long, curved teeth. The body colour varies from fawn to dark brown, usually with a dark collar on the back of the neck and fine patterning on the belly. Because of its burrowing habits it is seldom seen. The Three-toed Snake-tooth Skink occurs in the coast and ranges from the Macleay valley in NSW to south-eastern Queensland. It is very uncommon south of Grafton. Occurs in rainforest and occasionally moist eucalypt forest, on loamy or sandy soils. The Three-toed Snake-tooth Skink lives in loose soil, leaf litter and rotting logs, and feeds on earthworms and beetle grubs. (DECC 2007).	19, 83, 84, 88, 89, 91, 104, 106, 146, 152, 155, 157, 168
Coracina lineata	Barred Cuckoo Shrike	V		This species is an active bird, usually seen in pairs, though rarely observed in NSW. It utilises a variety of habitats including eucalypt forests and woodlands, swamp woodlands, and timber along watercourses. Barred Cuckoo Shrike's feed on insects and fruit (DEC 2007).	Most sites

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Crinia tinnula	Wallum Froglet	V	-	This species of amphibian inhabits acid paperbark swamps and sedge swamps along the northern and central coast regions of NSW. This species can be heard calling at anytime throughout the year following rain but calls are more frequent during the breeding season that takes place during winter. Males call from tussocks or at the waters edge. Threats include habitat loss and degradation through sand mining, road construction, coastal development, reduction of water quality, and frequent burning and grazing of coastal wetlands (DEC 2007).	112, 120, 143
Dasyuru maculatus	Spotted-tailed Quoll	V	E	This species of carnivorous marsupial is largely nocturnal but opportunistically hunts prey during the day. It inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are found in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines. Threats include habitat loss and fragmentation, poisoning through dog-baiting programs, and competition for food with feral animals (DEC 2007).	Most sites
Dermochelys coriacea	Leathery Turtle	V	V	This species is a very large Sea turtle up to 3 m long. It occurs in inshore and offshore marine waters, and rarely breeds in Australia, with the nearest regular nesting site being the Solomon Islands and Malayan Archipelago. A number of sightings in southern waters suggest this species actively seeks temperate feeding grounds, rather than occurring only as stray vagrants (DEC 2007).	NA Coastal Species
Ephippiorhynchus asiaticus	Black-necked Stork	E		Primarily inhabits permanent freshwater wetlands but can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries. This species breeds during summer, nesting in or near a freshwater swamp (DEC 2007).	112, 120, 143
Esacus neglectus	Beach Stone-curlew	E		This species occurs on open, undisturbed beaches, islands, reefs, and estuarine intertidal sandflats and mudflats; beaches with estuaries or mangroves nearby are preferred; may also frequent river mouths, offshore sandbars and rock platforms. Breeding occurs from September to November, with nests being located on sandbanks, spits or islands in estuaries, among mangroves, or in sand surrounded by short grasses and scattered casuarinas (DEC 2007).	NA Coastal Species

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		This species of bat inhabits moist forest generally with trees larger than 20 m and roosts in eucalypt hollows, underneath bark or in buildings. Diet consists of moths, beetles and other insects, which it collects within or just below the tree canopy. This species hibernates during winter and breeding takes place in late spring (DEC 2007).	19, 83, 84, 88, 89, 91, 104, 106, 146, 152, 155, 157
Grus rubicunda	Brolga	V		The Brolga is quite unmistakable - it is one of Australia's largest flying birds - standing 1.3 metres tall with a wingspan of nearly 2.5 metres. It is pale bright grey with a broad band of bare red skin from the beak round the nape of the neck and a black dewlap under the chin. The long legs are black. The call is a far-carrying brassy trumpeting. The Brolga was formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It still abundant in the northern tropics, but very sparse across the southern part of its range. Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs.The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. (DECC 2007).	112, 120, 143
Haematopus fuliginosus	Sooty Oystercatcher	V		This species is an unmistakable, large wader, reaching 50 cm in length, with a bright orange-red bill, eye-ring and iris, coral pink legs and feet, and entirely black plumage. It favours rocky headlands, rock shelves, exposed reefs with rock pools, beaches and muddy estuaries, foraging on exposed rock or coral at low tide for foods such as limpets and mussels. The Sooty Oystercatcher breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories. The nest is a shallow scrape on the ground, or small mound of pebbles, shells, or seaweed when nesting among rocks. Threats include hydrological changes to estuaries and similar water bodies causing modification or removal of important areas of suitable habitat, disturbance to coastal feeding, nesting, and roosting areas through beach-combing, fishing, dog-walking, horse-riding and 4WD vehicles, predation of eggs and chicks by foxes, dogs, cats, rats and raptors, and habitat destruction as a result if residential, agricultural, and tourism development (DEC 2007).	NA Coastal Species

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Haematopus longirostris	Pied Oystercatcher	V		Primarily a coastal species, favouring mudflats, harbours and lagoons (DEC 2007).	NA Coastal Species
Hoplocephalus bitorquatus	Pale-Headed Snake	V		This species is a medium sized tree dwelling snake up to 90 cm long. It is found mainly in dry eucalypt forest and woodlands though also occasionally in rainforest or moist eucalypt forest. This species favours streamline areas and shelter between loose bark, in tree trunks, tree hollows, or the limbs of dead trees. The Pale-Headed Snake mainly preys on tree frogs although lizards and small mammals also form part of this species diet (DEC 2007).	Most sites especially 120 and 143
Hoplocephalus stephensi	Stephen's Banded Snake	V		This species is a tree dwelling snake up to 12 m long. It prefers rainforest, eucalypt forest and rocky areas. It shelters between loose bark, in tree trunks or hollow tree limbs, amongst vines, and in rock crevices. A nocturnal species, this snake mainly preys on frogs, lizards, birds and small mammals (DECC 2007).	Most sites
Irediparra gallinacea	Comb-crested Jacana	V		The Comb-crested Jacana is small (up to 25 cm long), with huge toes - its feet are virtually as long as its entire body - to walk on floating vegetation. Brown above, it has a white face and throat and belly, separated by a broad dark breast-band, with a big red forehead comb and red bill. It is a busy and unmistakable walker on lily pads and other floating vegetation. Its strident chittery call is also distinctive. It occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney. Vagrants occasionally appear further south, possibly in response to unfavourable conditions further north in NSW. Inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies. with pairs and family groups forage across floating vegetation, walking with a characteristic bob and flick, or flying low with toes dangling behind. They feed primarily on insects and other invertebrates, as well as some seeds and other vegetation. Breeds in spring and summer in NSW, in a nest of floating vegetation. (DECC 2007).	112, 120, 143
Ixobrychus flavicollis	Black Bittern	V		Inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. This species may roost by day in trees or within reeds on the ground. Nests are located in branches overhanging water and breeding takes place from December to March (DEC 2007).	112, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Kerivoula papuensis	Golden-tipped Bat	V		The Golden-tipped Bat has dark brown, curly fur with bright golden tips. The distinctively coloured fur extends along the wings, legs and tail. It has a short, pointed, over-hanging muzzle and pointy, funnel-shaped ears. Found in rainforest and adjacent sclerophyll forest, this species roosts in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests located in rainforest gullies on small first- and second-order streams. Will fly up to two km from roosts to forage in rainforest and sclerophyll forest on upper-slopes and is a specialist feeder on small web-building spiders (DECC 2007).	19, 83, 84, 88, 89, 91, 104, 106, 146, 152, 155, 157, 168
Lathamus discolor	Swift Parrot	E	E	This species is migratory, travelling to the mainland from March to October to forage on winter flowering eucalypts and lerps. While on the mainland, it mostly occurs in the southeast, with records of the species spread approximately between Adelaide and Brisbane. Breeding takes place in Tasmania from September to January. Fragmentation and land clearing for agricultural, urban, and coastal development has resulted in the restriction of the range and distribution of the species (DEC 2007).	Most sites
Lichenostomus fasciogularis	Mangrove Honeyeater	V		Mangrove Honeyeaters are medium-sized honeyeaters, dark grey-brown backed with yellow edges to the wing and tail feathers and yellowish brown throat. A broad black band through the eye is bordered below by a yellow streak. The bird's two to four note call is clear and strong and is repeated in a rollicking sequence. Confined to the coastal fringe and offshore islands of eastern Australia from the Townsville area, Queensland south to the NSW north coast. It is common in Queensland but rare in NSW, where a few colonies exist at scattered localities, including the Tweed, Richmond and Clarence River estuaries and Stuarts Point south of Macksville. Primary habitat of this species is mangrove forest but the species also occurs in other near-coastal forests and woodlands, including casuarina and paperbark swamp forests. It sometimes frequents adjacent shrublands and woodlands dominated by banksias and eucalypts, and is an occasional visitor to gardens in coastal towns (DECC 2007).	NA Coastal Species

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Limicola falcinellus	Broad-billed Sandpiper	V	M	This species is an uncommon, small, stint-like sandpiper reaching 18 cm in length, and favours sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, salt marshes, and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow fresh-water lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches. This species is an active forager, typically feeding by rapidly and repeatedly jabbing its bill into soft wet mud. Feeding also occurs while wading, often in water so deep that they have to submerge their heads and necks in order to probe the underlying mud. Their diet includes insects, crustaceans, molluscs, worms, and seeds (DEC 2007).	NA Coastal Species
Limosa limosa	Black-tailed Godwit	V	M	This species is a large migratory sandpiper reaching 44 cm long, with a wingspan of 63 - 75 cm. Primarily a coastal species, L. limosa is usually found in sheltered bays, lagoons and estuaries with large intertidal mudflats and/or sandflats where it is frequently recorded in mixed flocks with Bar-tailed Godwits. Inland, it can be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have also been recorded in wet fields and sewerage treatment works. This species feeds on a variety of insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles present in soft mud or shallow water. Roosting and loafing occurs on low banks of mud, sand and shell bars. Threats include hydrological changes to inland lakes and estuaries, tourism, and residential and agricultural developments that reduce coastal and inland habitat areas (DEC 2007).	NA Coastal Species
Litoria aurea	Green and Golden Bell Frog	E	V	This species inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in-stream wetlands. It prefers sites containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. They are active by day and breed during the summer months (DEC 2006). Plague Minnow (Gambusia holbrooki) is a key threatening process as they feed on green and Golden Bell Frog eggs and tadpoles. DEC have a recovery plan for this species.	112, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Litoria booroolongensis	Booroolong Frog	E		The Booroolong Frog is a medium sized tree frog, with adults growing to about 5 cm. Their body-colour may be grey, olive or brown with indistinct black markings. The abdomen is white. The skin usually has a slightly warty appearance. The fingers and toes have well developed discs, and the toes are strongly webbed. The call is a soft, purring 'qirk qirk qirk'. The Booroolong Frog is restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from the Northern Tablelands and is now rare throughout most of the remainder of its range. Most recent records are from the south-west slopes of NSW. he Boorloolong Frog lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins, and will shelter under rocks or amongst vegetation near the ground on the stream edge occasionally basking in the sun on exposed rocks near flowing water during summer. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools.(DECC 2007).	112, 120, 143
Litoria brevipalmata	Green-thighed Frog	V		This species occurs in a range of habitats from rainforest and moist eucalypt forest, to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. Breeding occurs after heavy rain in late spring and summer, gathering around grassy semi-permanent ponds and flood prone grassy areas (DEC 2007).	Most sites
Litoria daviesae	Davies Tree Frog	V		Davies Tree Frog grows to 63mm long. It has a broad olive-green stripe from the snout to the top of the arm and a narrow dark-brown stripe from the snout through the eye, broadening and breaking into patches along the sides. There is also a green stripe on the outer thigh. This species was previously recognised as the Glandular Frog (Litoria subglandulosa). Davies Tree Frog occurs along the eastern edge of the New England Tablelands from the Hunter Valley to south of the Hastings River in NSW in the headwaters of coastal rivers. Davies Tree Frog occurs in permanently flowing streams above 400 m elevation. Habitat includes streamside vegetation such as rainforest, moist and dry eucalypt forest or heath and tea tree with tussocks and ferns along streams. (DECC 2007).	Most areas especially 112, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Litora sublandulosa	Glandular Frog	V		The Glandular Frog grows to 50 mm long. It has a broad olive-green stripe from the snout to the top of the arm and a narrow dark-brown stripe from the snout through the eye, broadening and breaking into patches along the sides. There is also a green stripe on the outer thigh. Distribution for this species occurs at the headwaters of coastal rivers in a narrow band along the eastern edge of the New England Tablelands from the Hastings River to south-east Queensland. Glandular Frogs may be found along streams in rainforest, moist and dry eucalypt forest or in subalpine swamps. Breeding occurs in summer, and possibly in spring. (DECC 2007).	Most areas especially 112, 120, 143
Lophoictinia isura	Square-tailed Kite	V		Although this species shows a preference for timbered watercourses, they have been found in a variety of habitats including woodlands and open forests. It appears to occupy large hunting grounds and breeds from July - February with nests generally located along of near watercourses. It is a solitary bird, and a specialised predator, taking small passerines, especially honeyeaters and their eggs and nestlings as well as large insects in the tree canopy. It generally hunts low over open forest, woodlands and mallee communities, heaths, and other low scrubby habitats that are rich in passerines. This species prefers a structurally diverse landscape with a broad range of habitats and appears to utilise a large range greater than 100 km2 (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143
Macropus parma	Parma Wallaby	V		A small wallaby, with a head and body length up to 52 cm. Fur is a uniform greyish-brown on the back and shoulders with a dark stripe along the spine ending mid-back. It has a white stripe on the cheek and upper lip and a white belly. When hopping, remains close to the ground in an almost horizontal position with the forearms tucked tightly against the body, and the tail curved upwards in a shallow U-shape. Once occurred from north-eastern NSW to the Bega area in the southeast. Range is now confined to the coast and ranges of central and northern NSW. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. Typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas. During the day they shelter in dense cover. (DECC 2007).	Most sites especially 19, 83, 84, 88, 91, 104, 106, 146, 152, 155, 157, 168

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Melanodryas cucullate cucullata	Hooded Robin	V		The Hooded Robin is a large Australian robin reaching 17 cm in length. The Hooded Robin is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form is found from Brisbane to Adelaide throughout much of inland NSW, with the exception of the north-west. The species is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. (DECC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143
Miniopterus australia	Little Bentwing-bat	V		This species of bat inhabits moist eucalypt forest, rainforest or dense coastal Banksia scrub. This species primarily roosts in caves, tunnels and sometimes tree hollows. Breeding for this species occurs during winter at maternal roost sites (DEC 2007).	19, 83, 84, 88, 91, 104, 106, 112, 146, 152, 155, 157, 168
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		This species has dark reddish-brown to dark brown fur and is essentially a cave bat, but also utilises man-made habitats such as road culverts, storm-water tunnels and other man-made structures. It is known from a variety of habitats along the east coast including rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grasslands (Churchill 1998, DEC 2006). In forested areas, it flies above the canopy to hunt, while in open grassland areas, flight may be within 6 m of the ground. Moths form the major component of their diet and breeding takes place from October to April (Churchill 1998).	Most sites
Mixophyes balbus	Stuttering Barred Frog	E	V	This species is a large muscular frog that occurs along the east coast of Australia. They are found in rainforest and wet, tall, open forest. When not breeding, adults live in deep leaf litter and thick understorey vegetation on the forest floor. This species feeds on insects and smaller frogs, breeding in streams during summer after heavy rain. Threats include modification and loss of habitat, changes to hydrology and water quality, predation of eggs and tadpoles by introduced fish, and fungal disease (DEC 2007).	19, 83, 84, 88, 91, 104, 106, 146, 152, 155, 157, 168

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Mixophyes literates	Giant Barred Frog	E	E	This species occurs on the coast and ranges from southeastern QLD tot eh Hawkesbury River in NSW, particularly in Coffs Harbour - Dorrigo area. They forage and live amongst deep, damp leaf litter in rainforest, moist eucalypt forest and nearby dry eucalypt forest. They breed in shallow, flowing rocky streams from late spring to summer, and feed primarily on large insects and spiders. Threats include changes to hydrology and water quality, loss of leaf litter and fallen log cover through burning, manual removal, forestry practises, vegetation clearance, predation by introduced fish, weed spraying close to streams, and fungal disease (DEC 2007).	Most sites
Mormopteru norfolkensis	Eastern Freetail-bat	V		This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range and roosts primarily in tree hollows but also in man-made structures or under bark. This species is solitary and probably insectivorous (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143
Myiagra cyanoleuca	Satin Flycatcher		M	This is a migratory species which breeds around the Calliope Ranges in QLD southward to Tasmania during September / October to January / February before migrating north to southern and eastern Papua New Guinea and adjacent islands over winter (Readers Digest 1993). It prefers heavily vegetated gullies in forests, tall woodlands and during migration, coastal forests, woodlands, mangroves, trees in open country, and even gardens (Pizzey & Knight 1998).	Most sites
Myotis adversus	Large-footed Myotis	V		Primarily a coastal species that forages over streams and watercourses feeding on fish and insects which it catches by raking its feet across the water surface. Breeding takes place during November or December, roosting in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage (DEC 2007).	112, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Ninox connivens	Barking Owl	V		This species is a typical hawk-owl, with staring yellow eyes, and no facial disc. It has an unmistakeable, quick, dog-like "wook-wook" territorial call, which it repeats. It inhabits eucalypt woodlands, open forest, swamp woodlands, and, especially in inland areas, timber along watercourses. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or in dense clumps of canopy leaves in large eucalypts. The Barking owl feeds on a variety of prey, with invertebrates predominant for most pf the year, and birds and mammals such as smaller gliders, possums, rodents and rabbits important during breeding. This species lives alone or in a pair with territories ranging from 30 to 200 hectares. Nests are built in hollows of large, old eucalypts including River Red Gum (Eucalyptus camandulensis), White Box (Eucalyptus albens), Red Box (Eucalyptus polyanthemos), and Blakely's Red Gum (Eucalyptus blakelyi). Breeding occurs during late winter and early spring (DEC 2007).	Most sites except 168
Ninox strenua	Powerful Owl	V		This species is a nocturnal, solitary and sedentary species. They occur in a number of vegetation types ranging from woodland and open sclerophyll forest to tall open wet forest and rainforest. However, this species does prefer large tracts of vegetation. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old with breeding taking place from late summer to late autumn. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400 - 1,450 ha. It forages within open and closed woodlands as well as open areas (DEC 2006). This Owl has a variety of vocal calls and is known to 'dawn call' when returning from its night hunting activities to mark the position of its daytime roost (Parks Victoria 2003).	Most sites

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Oxyura australis	Blue-billed Duck	V		This species is a small and compact duck up to 40 cm long. It is a partly migratory bird that travels short-distances between breeding swamps and over-wintering lakes, with some long-distance dispersal to breed during spring and early summer. It prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. Nesting occurs in Cumbungi over deep water between September and February, as well as in trampled vegetation of Lignum, sedges or Spike-rushes, where a bowl-shaped nest is constructed. Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes. The species is completely aquatic, swimming low in the water along the edge of dense cover. They feed on seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies found on the bottom of swamps they inhabit. Threats include frequent burning which reduces the diversity of woody plant species, and the destruction or degradation of breeding habitat through drainage, flood mitigation works and ground water extraction, regulation of river flows and water harvesting schemes that disrupt flooding regimes of inland wetland breeding areas, the clearing and overgrazing of Cumbungi and Lignum, increasing salinity resulting in degradation and loss of tall dense wetland vegetation used for nesting, illegal hunting, pesticides and herbicide pollution of wetlands, and Rubbish dumping (DEC 2006).	112, 120, 143
Pachycephala olivacea	Olive Whistler	V		The Olive Whistler is a small, stocky bird with a large head and strong sharp bill. It grows up to 22 cm long, including the 10 cm tail. It has a dark grey head, olive-brown upperparts, a grey throat and buff-brown underparts. The female is duller in colour than the male. The Olive Whistler has perhaps the most rich and melodious array of calls of any of the whistlers. The Olive Whistler inhabits the wet forests on the ranges of the east coast mostly above 500m. During the winter months they may move to lower altitudes. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria. In the south it is found inland to the Snowy Mountains and the Brindabella Range. It forages in trees and shrubs and on the ground, feeding on berries and insects, making a nest of twigs and grass in low forks of shrubs. (DECC 2007).	19, 83, 84, 88, 91, 104, 106, 146, 152, 155, 157, 168

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Pandion haliaetus	Osprey	V	M	This species is a large, water-dependent bird of prey, distinctive in flight and when perched. Despite its wing-span of up to 1.7 m, it is noticeably smaller than the White-bellied Sea-eagle. It favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. Breeding takes place from July to September in NSW, with nests being built high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. Threats include the removal of large trees near the coast, diminished water quality that increases turbidity in feeding areas, and the ingestion of fish containing discarded fishing tackle (DEC 2007).	NA Coastal Species
Petalura australis	Giant Dragonfly	E		The Giant Dragonfly is the second largest dragonfly in Australia and one of the largest dragonflies in the world. The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Grafton to Nadgee in They live in permanent swamps and bogs with some free water and open vegetation. Adults are short-lived surviving for one summer after emerging in October spending most of their time settled on low vegetation on or adjacent to the swamp hunting for flying insects. Females lay eggs into moss or other soft vegetation bordering swamps. Larvae dig long branching burrows under the swamp leaving their burrows at night to feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation. Larvae are slow growing and the larval stage may last up to 10 years (DECC 2007).	112, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Petaurus australis	Yellow-Bellied Glider	V	V	This species of large arboreal mammal occurs in a variety of forest types though prefers tall mature eucalypt forest with high rainfall and rich soils, along the east coast to the western slopes of the Great Divide. This species relies on hollow-bearing trees for shelter and nesting. In southern NSW its preferred habitat at low altitudes is moist gullies and creek flats in mature coastal forests. Plant and insect exudates provide the bulk of this gliders diet including nectar, sap, honeydew and manna, whilst protein is obtained from arthropods and some pollen. The Yellow-bellied Gilder incises tree trunks and branches to obtain phloem sap, often leaving a distinctive 'V'-shaped scar. Tree selection and usage is complex and a large number of tree species are used as sap trees throughout the range of this glider. Threats include loss and fragmentation of habitat, and loss of hollow-bearing and feed trees (DEC 2007).	Most sites
Petaurus norfolcensis	Squirrel Glider	V		This species of glider is widely though sparsely distributed throughout eastern Australia. In NSW it inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. This species prefers a diversity of food supplies including acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein, and requires an abundant supply of tree-hollows for nesting and shelter. Threats include loss and fragmentation of habitat, flowering trees and shrubs, and hollow-bearing trees, and barbed wire fences snagging individuals whilst gliding (DEC 2007).	Most sites especially 32, 34, 47, 49, 52, 63, 83, 152, 155
Petrogale pencillata	Brush-tailed Rock-wallaby	E	V	This species is a relatively small and muscular wallaby that is rufous in colour with a characteristic long and bushy, dark rufous-brown tail. It also has a characteristic white cheek-stripe and a black stripe from its forehead to the back of its head. It is known from southeast QLD to the Grampians in western Victoria, roughly following the line of the great Dividing Range, although the distribution of the species has declined and become fragmented (DEC 2007).	Most sites
Phascogale tapoatafa	Brush-tailed Phascogale	V		This species prefers dry sclerophyll forest with a sparse groundcover of herbs, grasses, shrubs or leaf litter. They also inhabit heath, swamps, rainforest and wet sclerophyll forest. They forage mostly in rough barked trees and feed mostly on arthropods but will eat other invertebrates, nectar and occasionally small vertebrates (DEC 2007).	Most sites

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Phascolarctos cinereus	Koala	V		The Koala is protected under SEPP 44, which aims to conserve habitat within its current distribution. The Koala has a fragmented distribution throughout eastern Australia. It is limited to areas of preferred feed trees in eucalypt woodlands and forests. Along the coastal fringe these areas are becoming more fragmented and isolated due to urbanisation. Koalas are generally inactive for 20 hours a day, with activity peaking just after sunset when they begin to forage (Martin and Handasyde 1995). The size of their home range varies depending on the quality of habitat, ranging from less than 2 ha to several hundred hectares in size. Females breed at two years of age and produce one young per year (DEC 2005). NPWS have developed a draft Recovery Plan for this species.	19, 32, 34, 46, 47, 49, 52, 63, 83, 84, 88, 89, 91, 104, 112, 143, 146, 152, 155, 157
Philora sphagnicolus	Sphagnum Frog	V		Sphagnum frogs are small, ground-dwelling frogs, growing only to 35 mm. Their colour varies from cream through various shades of yellow, orange and russet to black above, usually with a number of irregular flecks and patches. A dark-brown or black band bordered above by a thin white or cream line runs from the snout through the eye to the shoulder. There is another similar line along the flank, and a third band runs from the groin to the back. The belly is white, while the throat is flecked with brown. The skin is smooth or has a few low warts. Fingers and toes are free from webbing. The call is a low growl 'creeerk' or 'gur..r..r..r..r' like a golf ball rattling in a cup. This species occurs in north-eastern NSW along the eastern escarpment of the Great Dividing Range from the Gibraltar Ranges to Barrington Tops. It is found in rainforests, including Antarctic Beech forest, moist eucalypt forest and sphagnum moss beds, usually at higher elevations. Sphagnum Frogs burrow in loose, moist soil or moss, under leaf litter often in soaks or seepages, or may use cracks and cavities behind and beside large or small waterfalls where the environment remains saturated with moisture. They eat ants and other insects. (DECC 2007).	84, 104, 106, 152, 157, 168
Planigale maculata	Common Planigale	V		This species utilises a variety of habitats including rainforest, eucalypt forest, heathland, marchland and rocky areas (with sufficient groundcover) and often close to water. They are nocturnal and carnivorous hunters, sheltering in saucer-shaped nests built in crevices hollow logs beneath bark or under rocks. Breeding occurs from October to January (DEC 2007).	Most sites

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Potorous tridactylus	Long Nosed Potoroo	V	V	This species is a small mammal with greyish-brown fur above and light grey below. It feeds on the fruiting bodies of underground-fruiting fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil. This species is generally restricted to areas with high annual rainfall, inhabiting coastal heath and dry and wet sclerophyll forests. Its major habitat requirement is relatively thick ground cover with occasional open areas and may consist of grass trees, sedges, ferns or heath, or low shrubs of tea-trees and Melaleucas where soil is light and sandy. Breeding season is biannual and occurs in late winter / early spring and in late summer, with one young being reared (Johnston 1995). In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with a n annual rainfall exceeding 760 mm.	Most sites especially 112
Pseudomys gracillicaudatus	Eastern Chestnut Mouse	V		This species is mostly found in NSW in heathland and is most common in dense, wet heath and swamps. They appear to inhabit regenerating heathland within 18 months to 4 years after a fire before larger ground dwelling mammals begin to dominate. The Eastern Chestnut Mouse utilises runways and forages for invertebrates, grass stems, fungi and seeds at night within grassy and sedge understorey in an area less than a hectare. Litters are produced from spring to autumn (DEC 2007).	112, 120, 143
Pteropus alecto	Black Flying-fox	V		The Black Flying-fox is almost completely black in colour, relieved only by an incomplete rusty-red collar and a light frosting of silvery grey on the belly. It can be distinguished from the Grey-headed Flying-fox by its greater size, darker colour and bare legs. Distributed throughout coastal and near-coastal areas across northern Australia through eastern Queensland to the Bellinger River in northern NSW. Relatively uncommon in NSW although it appears to be increasing in numbers, extending its range to the south. Large communal day-time camps in remnants of coastal subtropical rainforest or swamp forest, often with Grey-headed Flying-foxes. Bats fly out at dusk to feed on rainforest fruits as well as nectar and pollen from flowering eucalypts, paperbarks and banksias. When native foods are scarce, particularly during drought, they take fruit from orchards. (DECC 2007).	168, 112

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species is known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, melaleucas and banksias. Grey-headed Flying-fox show a regular pattern of seasonal movement with much of the population moving to northern NSW and QLD during May and June where they exploit the winter flowering trees such as Swamp Mahogany, Forest red gum and Paperbark (NSW Scientific Committee 2004). This species will also forage in urban gardens and cultivated fruit crops (DEC 2007).	Most sites
Ptilinopus magnificus	Wompoo Fruit-dove	V		This species is a large and dramatically beautiful rainforest pigeon, almost twice the size of other coloured fruit-doves. It occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests, feeding on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit; some of its feed trees rely on species such as the this to distribute their seeds. The Wompoo fruit-dove is most often seen in mature forests, but also found in remnant and regenerating rainforest. Threats include clearing, fragmentation and weed invasion of the low to mid-elevation rainforest due to coastal development and grazing, logging and road construction in moist eucalypt forest with well-developed rainforest understorey, and burning, which reduces rainforest habitat patches (DEC 2007).	84, 104, 106, 152, 157, 168
Ptilinopus regina	Rose-crowned Fruit-dove	V		This species is a small colourful rainforest pigeon found on the coast and ranges of eastern NSW and QLD. It occurs mainly in sub-tropical and dry rainforest, and occasionally in moist eucalypt and swamp forest where fruit is plentiful. Threats include clearing of Rainforest, logging and road construction, burning of remnant rainforest habitat, and weed invasion (DEC 2007).	84, 104, 106, 152, 157, 168
Ptilinopus superbus	Superb Fruit-dove	V	M	A small pigeon that inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species. The main threats include clearing and degradation of rainforest remnants (DEC 2007).	84, 104, 106, 152, 157, 168

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Rostratula benghalensis	Australian Painted Snipe	E	V, M	This bird is a wetland species with a scattered distribution in Australia. It occurs primarily along the east coast from north QLD to the Eyre Peninsular in SA excluding the majority of Victoria and NSW. This species is normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. This cryptic species nests on the ground amongst tall reed-like vegetation near water. It emerges from the dense growth at dusk to feed on mudflats and the water's edge taking insects, worm and seeds (DEC 2007). This species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	112, 120, 143
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		This species of insectivorous bat forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. This species roosts in tree hollows and buildings and in areas where trees are scarce or absent, and has been known to utilise mammal burrows. Breeding takes place between December and mid-March. Threats include clearing of trees with hollows, grazing which reduces the regeneration of roost trees, pesticide and herbicide use, and predation by feral cats at roost sites (DEC 2007).	Most sites except 168
Scoteanax rueppellii	Greater Broad-nosed Bat	V		This species is a large and robust bat that feed on slow-flying prey such as large moths and beetles. It hunts from above rows of trees lining creeks and the edges of woodland in otherwise cleared paddocks, roosting in hollow tree trunks and branches as well as the roofs of old buildings (Churchill 1998). It inhabits a variety of habitats ranging from moist and dry eucalypt forest and rainforest to tall wet forest, however tends to prefers moist gullies in mature coastal forest or rainforest from the Atherton Tablelands in north QLD, along the coastal regions to southern NSW. The species is only found at low altitudes (below 500 m) (Churchill 1998; DEC 2006). Reproduction takes place in January at maternal roosting sites (DEC 2005). Suspected threats include clearing and fragmentation of forests in coastal and lowland areas, and the effects of logging activities including direct mortality and reduction of suitable hollows.	Most sites
Stagonopleura guttata	Diamond Firetail	V		This species is known to occur in grassy eucalypt woodlands, including Box-Gum Woodlands, and Snow Gum (Eucalyptus pauciflora) Woodlands, riparian areas (rivers and creeks), and sometimes in lightly wooded farmland (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Sterna albifrons	Little Tern	E	M	This species is a small, slender, migratory or partly migratory seabird, around 25 cm long. Migrating from eastern Asia, the Little Tern is found on the north, east and south-east Australian coasts. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria, and is almost exclusively coastal, preferring sheltered environments, however also occurs several kilometres from the sea in harbours, rivers, and inlets. It breeds through spring and summer, nesting in small, scattered colonies on low dunes or sandy beaches just above high tide mark near estuary mouths or adjacent to coastal lakes and islands. The nest is a scrape in the sand, which may be lined with shell grit, seaweed or small pebbles. Their diet consists of small fish, crustaceans, insects, annelids and molluscs sourced from shallow water in channels and estuaries, and in the surf on beaches. Threats include predation of eggs by feral animals and larger bird species, disturbance to coastal feeding, nesting and roosting areas through recreational activities, land clearing for residential, agricultural and tourism developments, mining, and hydrological changes to estuaries and other water bodies that modify or remove important areas of suitable habitat, or affect the availability of food. This species is also potentially susceptible to pesticides and contamination of estuaries by oil-spills and heavy metals. (DEC 2007).	NA Coastal Species
Stictonetta naevosa	Freckled Duck	V		This species prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. They generally rest in dense cover during the day, usually in deep water. They feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable and nests are usually located in dense vegetation at or near water level (DEC 2007).	112, 120, 143
Syconycteris australis	Common Blossom-bat	V		This species of bat often roosts in littoral rainforest and feeds on flowers in adjacent heathland and paperbark swamps. They roost individually and change roost sites daily but return to favourite feeding sites (DEC 2007).	168, 112

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Thylogale stigmatica	Red-legged Pademelon	V		A small, compact wallaby with soft, thick fur, grey brown above, pale grey below and rufous brown on the face, forearms, flanks and hind legs. The tail is short and thick. Patchily distributed along coastal and subcoastal eastern Australia from Cape York to the Hunter Valley in NSW. Also found in New Guinea. The Red-legged Pademelon inhabits forest with a dense understorey and ground cover, including rainforest, moist eucalypt forest and vine scrub. Wet gullies with dense, shrubby ground cover provide shelter from predators, and in NSW, thsi species is rarely found outside forested habitat. They disperse from dense shelter areas to feed from late afternoon to early morning, favouring native grasses and herbs on the edge of the forest. Also known to feed on fruits, young seedling leaves and stems, fungi and ferns (DECC 2007).	19, 83, 84, 88, 91, 104, 106, 146, 152, 155, 157, 168
Tyto capensis	Grass Owl	V		This species is found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on floodplains. They have been recorded occasionally in all mainland states of Australia, but appear to be more commonly recorded in northern and northeastern Australia. Grass Owls rest by day in a "form" - a trampled platform in a large tussock or other heavy growth. If disturbed they burst out of cover, flying rather slowly, before dropping straight down again into cover. This species also nests in trodden-down grass. Threats include loss of suitable habitat and disturbance die to grazing, agriculture and development, the use of pesticides in agriculture to control rodent populations thereby reducing seasonal food sources for the owls, and potentially poisoning owls, and frequent burning, which reduces groundcover (DEC 2007).	112, 120, 143
Tyto novaehollandiae	Masked Owl	V		This species occurs in dry eucalypt woodlands at altitudes from sea level to 1100 m and roosts and breeds in hollows and sometime caves in moist eucalypt forested gullies. It hunts along the edges of forests and roadsides and has a home range covering between 500 ha and 1000 ha. Prey for this species are principally terrestrial mammals but arboreal species may also be taken. Masked Owls are sparsely distributed from southern QLD to SA and WA. It has also been recorded on the Nullarbor plain. The southern subspecies occupies a home range of 5 to 10 square km. Threats include clearing for agriculture. (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Habitat Association	Potential FE/s
Tyto tenebricosa	Sooty Owl	V		Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals. Nests in very large tree-hollows (DEC 2007).	19, 83, 84, 88, 89, 91, 104, 106, 146, 152, 155, 157, 168
Xanthomyza phrgia	Regent Honeyeater	E	E	This species is a semi-nomadic species that inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak where there are significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast (DEC 2007).	32, 33, 34, 46, 47, 52, 63, 120, 143
Xenus cinereus	Terek Sandpiper	V	M	This species is a medium sized migratory wader. It has been recorded on lagoons, creeks and estuaries throughout Australia, however tends to favours mud banks and sandbanks located near mangroves, but can also occur on rocky pools and reefs. Primarily a coastal species, this species is occasionally spotted around brackish pools up to 10 km inland. X. cinereus roosts communally amongst mangroves of dead trees, often with other wader species, breaking into smaller flocks or solitary birds when feeding. Diet consists of a variety of worms, crustaceans, small shellfish, and the adult and larvae forms of various beetles, water-bugs, and flies. Threats include the clearing of suitable habitat for residential, agricultural and tourism developments, hydrological changes, and disturbance of foraging and roosting sites by recreational activities (DEC 2007).	NA Coastal Species

Appendix E

Field Record Data Sheets

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