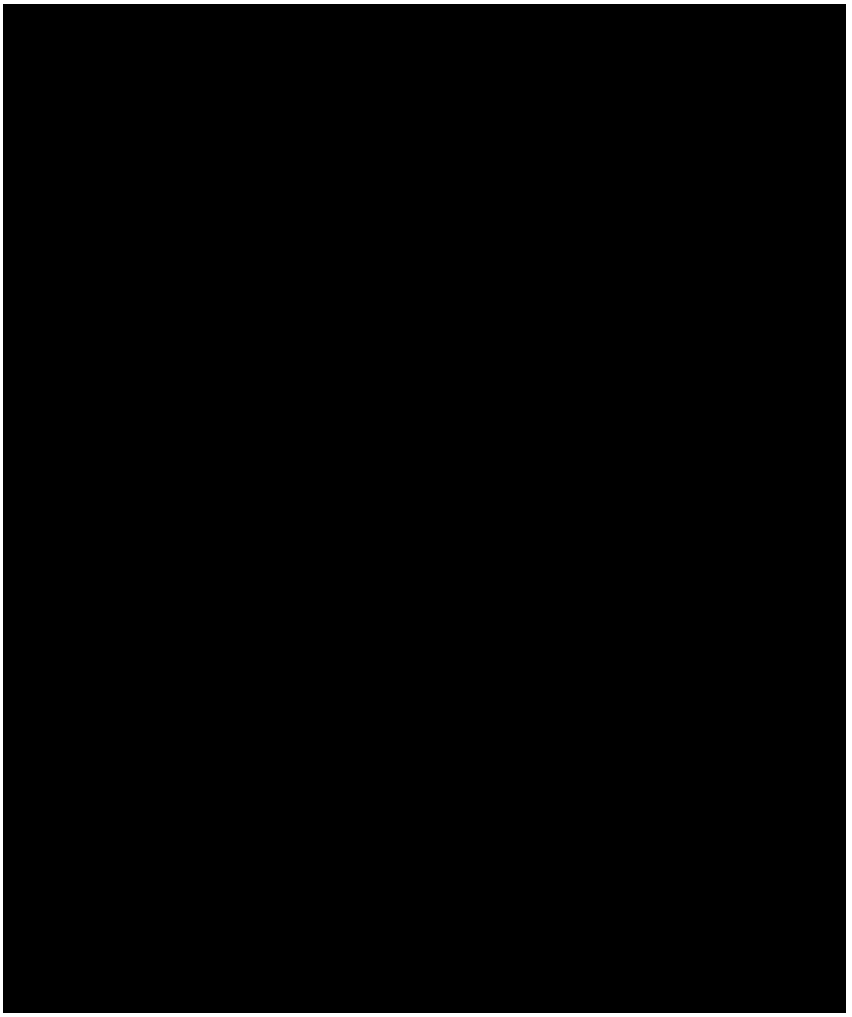
Response to Disturbance of Forest Species

Upper North East and Lower North East Regions

A project undertaken as part of the NSW Comprehensive Regional Assessments

August 1999



NSW CRA / RFA Steering CommitteeSydney

RESPONSE TO DISTURBANCE OF FOREST SPECIES IN CRA REGIONS IN NSW – UPPER NORTH EAST AND LOWER NORTH EAST REGIONS

PREPARED BY

ENVIRONMENT AUSTRALIA

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

Project number NA 17/EH

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The project has been overseen and the methodology has been developed through the Environment and Heritage Technical Committee which includes representatives from the New South Wales and Commonwealth Governments and stakeholder groups.

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1. EXECUTIVE SUMMARY

This report has been prepared for the joint Commonwealth/State Steering Committee, which oversees the comprehensive regional assessments of forests in New South Wales.

The comprehensive regional assessments (CRAs) provide the scientific basis on which the State and Commonwealth governments will sign regional forest agreements (RFAs) for the major forests of New South Wales. These agreements will determine the future of the State's forests, providing a balance between conservation and ecologically sustainable use of forest resources.

Project Objectives

This project was undertaken to identify the conservation needs of flora and fauna species in the Upper North East (UNE) and Lower North East (LNE) regions. It was managed jointly by the NSW National Parks and Wildlife Service, State Forests of NSW with Environment Australia (Commonwealth), as the lead agency.

Methods

Flora and fauna were treated in separate assessments. The work began with NSW National Parks and Wildlife Service compiling lists of forest dependent fauna and flora in the region. Expert ecologists were asked to provide information on the habitat and critical resource requirements, ecological attributes and the disturbances affecting the listed species. Some novel analyses were used to estimate the area of land needed for the conservation of species which were rated as the highest priority.

Experts also provided information to help apply the targets in an ecologically meaningful way. This included recommendations on, distinct populations, dispersal distances and barriers.

The main chapters of this report cover the methods and results of the project. Appendices provide lists of species, lists of experts, and detailed tables of results.

Results

The outcomes of this project will be used, firstly, to guide the design of reserves in the UNE and LNE regions so that the habitats of the most threatened species are protected. Secondly the results are also intended to help the management of forested land over both the regions.

1. INTRODUCTION

The National Forest Policy Statement (NFPS) signed in 1992, included, amongst other things, an undertaking to manage Australia's forests to conserve biological diversity (Commonwealth of Australia 1992). In order to achieve this objective it was agreed that a comprehensive, adequate and representative (CAR) reserve system be created. One of the aims of developing such a reserve system is to maintain viable populations of native forest species throughout their natural range (Commonwealth of Australia 1997). These reserve systems are to be incorporated into a Regional Forest Agreement (RFA) to be signed by the State and Commonwealth governments which will outline the long term management and use of forests in a particular region. The information needed to draw up these agreements will be collected during the Comprehensive Regional Assessments (CRA).

The Response to Disturbance Project was undertaken to identify and synthesise forest species conservation requirements. This information will assist in ensuring the reserve system meets the JANIS criteria pertaining to the conservation of forest species. The most relevant of these being:

- The reserve system should seek to maximise the area of high quality habitat for all known elements of biodiversity…(criterion 5)., and
- Reserves should be large enough to sustain the viability, quality and integrity of populations (criterion 6) (Commonwealth of Australia 1997).

The Response to Disturbance Project provides key information about forest dependent species that is needed to create a reserve system and outlines other information to guide management that will fulfil these JANIS criteria. It has been divided into two sections, one examining the requirements of fauna species and the other, the requirements of flora species.

Throughout the world wildlife managers recognise that it is immensely difficult and expensive to collect sufficient data to confidently describe the conservation requirements of any species. In most cases managers have to rely on the opinions or best guesses of the researchers who know most about the species. With this in mind, Environment Australia has sought to advance the development of methods that would improve the transparency and objectivity of this kind of expert advice. Some of the foremost thinkers on these methods, including Professor Hugh Possingham of University of Adelaide, and Dr Mark Burgman of Melbourne University, have been closely involved. The Response to Disturbance project, and its equivalents in other States, has provided an opportunity to test and refine these new approaches to the conservation of species.

2. METHODS

2.1 INTRODUCTION

The Response to Disturbance project sought to provide information that would: (1) aid the design of reserves for the protection of priority species, and (2) assist in the review of and further development of management prescriptions for species. The methods used were different for flora and fauna and are, therefore, presented seperately. The aim of the assessments was to determine how best to protect species given the their habitat requirements and threatening processes. This project interacted with the projects responsible for modelling the habitat of flora and fauna species, to produce information that can be used to guide the allocation of reserves in the region. It also provided information to the Ecologically Sustainable Forest Management (ESFM) group to review and revise the Conservation Protocols used in NSW State Forests.

2.2 FAUNA

The data needed by the project was collected during two workshops held in June and July 1998. These workshops were attended by species experts nominated by the Environment and Heritage Technical Committee (EHTC) and the state agencies. The experts that attended the workshops are listed in Table 2a.

Table 2a: Experts that attended the fauna workshops for the UNE and LNE Response to Disturbance Project.

Workshop Group	Experts	Organisation
Nocturnal Birds	Dave Milledge	Independent
	Andrew Smith	Independent
	Rod Kavanagh	State Forests
	Sandy Gilmore	National Parks and Wildlife Service
Diurnal Birds	Harry Recher	Independent
	Dave Milledge	Independent
	Jim Shields	State Forests
	Sandy Gilmore	National Parks and Wildlife Service
Arboreal Mammals	Phil Gibbons	Independent
	Andrew Smith	Independent
	Rod Kavanagh	State Forests
	Keith Cherry	National Parks and Wildlife Service
Frogs	Michael Mahoney	Independent
	Andrew Smith	Independent
	Frank Lemckert	State Forests
	Ross Knowles	National Parks and Wildlife Service
Bats	Glenn Hoye	Independent
	Andrew Smith	Independent

	Brad Law Keith Cherry/Harry Parnaby	State Forests National Parks and Wildlife Service

Workshop Group	Experts	Organisation
Terrestrial Mammals	Andrew Smith Jim Shields Sandy Gilmore	Independent State Forests National Parks and Wildlife Service
Reptiles	Ross Saddlier Dave Milledge Frank Lemckert Mark Fitzgerald	Independent Independent State Forests National Parks and Wildlife Service

2.2.1 Species list

The objective of this task was to select the species to be assessed during the project. A comprehensive list of forest dependent species for the UNE and LNE CRA regions was compiled by NSW NPWS staff.

A forest dependent species is defined as a species that is dependent on forested ecosystems for any component of its life cycle.

The list was reduced by the removal of the common and secure species. The list was further refined by experts at the first workshop to give priority to those species that are likely to go extinct, decline further or start to decline in the absence of management action. The final list included species listed on schedules to the *Threatened Species Conservation Act 1995* (NSW) and the *Endangered Species Protection Act 1992* (Commonwealth), as well as species considered by experts to be of concern in the two regions.

2.2.2 Habitat Requirements

During the first workshop, experts described the habitat requirements of the priority species. This involved identifying the critical resources needed by species to survive which may include such things as tree hollows, rocky outcrops or a particular forest structure. If a species was dependent upon a certain disturbance regime, such as undisturbed inner forest or high fire frequency, this was information was also included.

Habitat requirements were identified for different life history stages. These were broken down into habitats and resources needed for breeding, juveniles, dispersal, shelter and feeding. Experts also specified other resources that may be critical for species but did not fall into the above categories such as basking sites for reptiles.

The description of habitat requirements was completed prior to the assessment of disturbances since this information can assist in the identification of the types of disturbances that may affect a species. This information was also provided to an ESFM workshop aimed at reviewing the current Conservation Protocols.

2.2.3 Disturbances

Information describing the disturbances that affect the priority species was also collected during the first workshop. This involved experts listing all the disturbances affecting a species and then ranking them in terms of their impact on the regional population. Those disturbances that had the most detrimental effect were ranked one and so on. In many case experts also provided information that indicated how a disturbance affected a species. An example of this might be the loss of tree hollows through logging, with logging being the disturbance and loss of tree hollows the effect.

The information collected on disturbances will be used in several ways;

1. Aid a review of the current Conservation protocols to ensure they address the processes thought to be threatening the priority species;
2. Guide reserve design by identifying habitat that may be unsuitable for inclusion in a reservefor species or alternatively areas reserves should not be placed near;

3. Refine the description of high quality habitat by indicating possibly unsuitable areas;
4. Assist in the derivation of reservation priority ranks since these require an understanding of the threats affecting species and the potential for management prescriptions to deal with them; and
5. Provide the first step in a diagnosis of why a population is declining.

2.2.4 Reservation priority ranking.

At the end of the first workshop experts were asked to assign each species a reservation priority rank. This rank reflects the relative priority of a species to be included in a formal reserve system. The ranks were between 1 and 5 with species ranked 1 being the greatest priority to be placed in a formal reserve. This information is used in C Plan, the reserve selection tool, to weight each species according to its 'need' to be in a formal reserve.

When assigning the ranks experts considered the following criteria:

1. The vulnerability of the species to off-reserve disturbances;
2. The ability of the Conservation Protocols to ameliorate these disturbances; and
3. The intrinsic risk of the species (ie how rare or uncommon the species is).

The procedure for coming to agreement on the ranks was as follows:

1. Each of the experts involved in a workshop was asked to rank the species considered in that workshop. For example the four experts involved in the bat workshop each provided a rank for each of the priority bat species.
2. Where all four experts provided the same rank for a species this was the rank assigned for that species;
3. Where there were different ranks provided for the same species a discussion was held to allow the experts to provide reasoning for their ranks;
4. In many cases a rank was agreed to following the discussion. When experts could not agree on a rank then the range was reported eg 2-4. Some groups chose to report the average as well;
5. On the last day of the workshop, when all the individual workshops were completed the 2 generalist experts nominated by the EHTC and one expert form each of NPWS and SF NSW reviewed all of the ranks to ensure that each of the groups were treated equally;
6. Once again each of the experts provided a rank for each species. The revised rank could be no more than 1 point diferent to the original rank provided by the species group;
7. Where there was a difference in ranks provided for a species then the species was discussed; and
8. A single rank was then agreed upon for every species.

2.2.5 Species equity targets.

The aim of this assessment was to estimate the area of habitat needed to maintain a species population. The preferred approach to estimating such an area is a formal Population Viability Analysis for each species (Possingham *et al.* 1993, Lindenmayer and Possingham 1994). A great deal of information on the biology of a species is needed to run this type of analysis. Since many of the species living in forests are poorly understood, this approach is not possible.

As an alternative, Professor Hugh Possingham developed a simple formula, using a minimum set of life history parameters that influence the area a species needs. The formula shown below will provide a target area that will give all species assessed an equitable chance of survival.

$$Area = 1000\frac{T}{D\sqrt{L}}$$

Where: T = trophic level; L = average reproductive lifespan of an adult female and D = the typical density (individuals/ha) of the species in the area where the target is to be applied.

Trophic level is an index of population variability. Species at higher trophic levels (predators) experience less variation than herbivores or granivores. A species with lower population variation has a lower risk of extinction and therefore can persist with fewer individuals. T was set at one for a predator of vertebrates, two for insectivores, sap-feeders and other categories, three for a herbivore or frugivore, and eight for a granivore. Experts were encouraged to adjust this value where they felt the variability of the species population was not truly reflected using this method. In doing so experts could select a value between 1 and eight.

Reproductive Lifespan is included because longer-lived animals are better able to persist at lower population sizes than short-lived animals. The density parameter gives a spatial dimension to the result with populations at lower densities requiring more area than a high-density population. Density was estimated for the areas predicted to be habitat by the species-modelling project. Where more than one habitat quality class was modelled, density was estimated separately for each of these classes.

The intent of this formula is to rank species according to their need for space and to provide 'ball park' figures to aim for when creating reserves. In evaluating a reserve system for a species Possingham suggests that areas of suitable habitat should be counted only if they are contiguous and represent at least 10% of the species target area.

The parameters for each species were provided by experts over the course of the two workshops. Where possible empirical data was used in the formula but in many cases, estimates were used since data was not available.

2.2.6 Applying the Species Equity Targets

This step was undertaken at the second workshop held in July 1998. It involved identifying the areas where the Species Equity Target was to be applied for each species. To do this experts had to identify 'distinct' populations in both the UNE and LNE region for each of the species assessed.

Defining a distinct population

Species populations operate at different spatial scales. An owl population may operate at a scale of many thousands of hectares while a small reptile population may operate over only a hundred hectares. This means that the boundaries of the RFA regions will rarely align with the boundaries of a species population. To adequately reserve a species across its natural range all distinct populations of a species need to be identified within each of the regions. It is then appropriate to apply the Species Equity Target to each of these populations. The areas that contained a distinct population of a species were called Species Equity Target Areas (SETAs).

Two types of populations were considered to be 'distinct' for the purposes of target application:

1. *Genetically Isolated Populations* – these represent distinct (but undescribed) species that will eventually become a separate species, or
2. *Metapopulations* – these are discrete population units within which the dynamics of the population is largely restricted. These populations are isolated from adjacent metapopulations by areas of unsuitable habitat. These areas restrict the movement of the species to such a degree so as to prevent effective recolonisation between metapopulations should suitable habitat become vacant.

The identification of genetically distinct populations is quite difficult and requires some genetic information on the species. The description of metapopulations required the identification of areas that are barriers to movement of the species sufficient to prevent recolonisation of vacant habitat.

Identifying dispersal barriers

The identification of recolonisation barriers was done in the July 1998 workshop. It was a difficult task since there is little data available on the process of recolonisation following local extinctions for any species. Dispersal ability was used as a surrogate measure of recolonisation ability, with species more able or inclined to disperse expected to experience fewer barriers. Experts were asked to consider a population 'distinct' if the area that it occupied would not be recolonised within about 100-200 years of a local extinction occurring.

2.3 FLORA

2.3.1 Introduction

The RTD component of the assessments for UNE/LNE brought together information from a number of CRA databases, the CRA Threatened Plants Project and the CRA Species Modelling Project, into two expert driven workshops. The main aims of the workshops were to use the best available data, and the expert knowledge of experienced field botanists, to:

- review the flora species list for the region and identify a shortlist of priority taxa for further assessment;
- review and finalise species habitat models;
- set targets for identified priority taxa;
- set reservation priority ranks for identified priority taxa, and;
- where possible provide management recommendations.

The species list, proposed method for shortlisting, and areal target setting protocol were circulated to all stakeholders and experts prior to the workshops commencing. Final agreement on methods for setting areal targets, population (locality based) targets and the reservation priority ranks were reached by stakeholders, agency representatives and experts at the beginning of the first workshop (1-17 June 1998). During this workshop, experts reviewed the species list, and set preliminary targets and reservation priority ranks for the identified priority taxa. Experts then had time to reflect on, and review these outputs, and during the second RTD workshop (8-10 July 1998), finalised the targets and reservation priority ranks for identified priority taxa. The information collated during these workshops was utilised during the subsequent Conservation Requirements workshop (13-17 July, 1998), whose main tasks were the spatial application of targets, review of conservation protocols and recommendations for species listings.

The flora component of this document provides information on the main outputs from the flora RTD workshops and for ease of reporting, it also includes some of the outputs from the flora Conservation Requirements workshop. For a full and comprehensive documentation of all threatened flora workshop outputs refer to the "Threatened Vascular Flora of NorthEastern NSW**:** Inventory, Assessment and Conservation" (Anon 1998).

2.3.2 Workshop experts

Associate Professor Mark Burgman from Melbourne University, a leading academic on the conservation and management of plant species, was contracted to provide advice and assistance in relation to PVA analysis and the setting of conservation targets of threatened plant species. The main output of this advice was the ongoing development of the target setting protocol outlined in Appendix 1.1, as well as being available for inter-agency meetings, and at the beginning of the first workshop to help facilitate reaching agreement on the methodologies to be used.

During the workshops themselves a panel of experienced field botanists and ecologists made all estimates, judgements and decisions relating to the application of the agreed methodologies. At any one time the panel included a maximum of five experts, including three independent experts, as well as an agency expert from each of NSW NPWS and State Forests of NSW. A total of nine experts were involved at various stages of the workshops depending on their area of expertise (Table 2b). State agencies chose and provided their own experts, while the members of the Environment and Heritage Technical Committee selected the independent experts for each of the main species group.

Table 2b: List of experts involved in Response to Disturbance flora workshops

Expert	Independent or Agency Expert	Main Species Group (Indicative only)
Stephen Bell	Independent Expert	Southern Group
Andrew Benwell	Independent Expert	General and Tablelands Groups
Phil Gilmour	Independent Expert	General and Tablelands Groups
Stephanie Horton	Independent Expert	Rainforest, General and Tablelands Groups
Barbara Stewart	Independent Expert	Rainforest Group
Douglas Binns	SFNSW Expert	Rainforest, General and Tablelands Groups
R. John Hunter	NPWS Expert	Rainforest Group
Peter Richards	NPWS Expert	Rainforest and General Groups
Paul Sheringham	NPWS Expert	Tablelands Group

2.3.3 Species list

A comprehensive regional species list for the combined UNE/LNE regions was compiled by NSW NPWS using a number of different data sources, the detail of which is outlined in the "Threatened Vascular Flora of North-Eastern NSW**:** Inventory, Assessment and Conservation" (Anon 1998). Prior to the RTD project commencing NSW NPWS undertook a review of the list to assess those taxa of priority conservation concern (DeVries 1998), and placed each taxon into one of five priorities for conservation (Table 2c). These preliminary conservation priority ranks were largely assigned in accordance with which statutes or scientific lists each taxon occurred on.

Table 2c: Conservation priority rank

C1	**Critically Threatened**. Identified as a highest priority taxon; Presumed Extinct, Endangered or Vulnerable (as listed on the NSW Threatened Species Conservation Act and the Commonwealth Endangered Species Protection Act, and as identified during the Interim Forestry Assessment); only those species considered of highest conservation or scientific concern; threatened species identified in National or State legislation or related policy documents.
C2	**Threatened**. Identified as a high priority taxon; taxa otherwise considered Potentially Threatened, Threatened, Rare, Uncommon or Poorly Known (ROTAP taxa or as noted in the Flora of NSW) or Declining Regionally (according to Sheringham et al.).
C3	**Regionally Significant**. Identified as a priority taxon of regional conservation significance; taxa otherwise considered Regionally Endemic; Regionally Uncommon; or that have a disjunct distribution (IAP; Sheringham et al.; Flora of NSW).
C4	**Economically, Culturally or Scientifically Important**. Identified as a priority taxon; otherwise considered Economically, Culturally or Scientifically Important (according to various sources);

	includes taxa that reach their distributional limits within the region (eg. Sheringham et al.).
C5	**Not Priority**. Not currently identified as a priority taxon according to any of the above criteria.

During the workshops, experts reviewed the preliminary conservation priority ranks assigned to the priority taxa (C1 to C4), with particular focus on the approximately 1300 taxa assigned ranks of C1, C2 or C3. Given the large number of taxa, and the limited time to undertake the assessments, a subset of these were then considered for more detailed analysis. The identified subset satisfies criteria outlined in JANIS (1996) and included all taxa listed as either C1 or C2 – almost 800 taxa. Taxa included on the list were then assigned conservation targets and reservation priority ranks in accordance with the following agreed methods.

2.3.4 Conservation targets

Conservation targets were set for all priority taxa using two different methods:

1. Areal Targets. For taxa whose habitat had been modelled, and the model had been accepted by experts, areal targets were set using the protocol of Burgman *et al* (1998) – refer to Appendix 1.1. The protocol provides targets for the amount of area required by each species, so that each has an equitable chance of persistence according to their life history characteristics and the types of threatening processes affecting them,
2. Population Targets. For those taxa for which habitat models were not available, or where experts rejected the model, a locality based population target was set. These targets are expressed as a percentage of a taxon's known localities.

Areal Targets

In developing a CAR reserve system, JANIS provides directions for assigning quantitative areal targets for forest ecosystems, old growth and wilderness values. For example, a vulnerable forest ecosystem has a target of 60% of its current areal extent. However, for species there are no specific quantitative guidelines within JANIS for setting targets. Rather, JANIS includes more generalised criteria such as:

"The reserve system should seek to maximise the area of high quality habitat for…rare, vulnerable or endangered species"; and

"Reserves should be large enough to sustain the viability, quality and integrity of populations".

In order to set areal targets for species, methodologies were required that would adequately address these criteria. Burgman *et al* (1998) outline the enormity of the task of trying to set conservation targets for plant species. In the context of the RFA, the challenge faced was to prescribe adequate and equitable conservation strategies for a large number of threatened plant taxa within a very short timeframe. However, as Burgman *et al* (1998) point out, there are also the problems of a lack of detailed demographic work on many of these taxa, and in general a lack of a broad range of Population Viability Analysis methods for plants. The protocol developed by Burgman *et al* (1998) was designed in such a way as to overcome these problems as best as possible or practicable. It incorporates basic principles of PVA that it was envisaged could be applied rapidly to a large number of taxa, based on life-history attributes and disturbance responses that are likely to be available, or guessable, for most taxa. It should be emphasised that the intent of the protocol is as a decision support tool, not a black box. The protocol provides a framework to assist experts in setting conservation targets that give each priority plant species an equal chance of survival over the coming decades.

The only change made to the protocol - as part of the discussion on methods at the beginning of the first RTD workshop - was in regard to what constituted an "adequate" F. The F parameter is defined by Burgman *et al*. as "...the initial (reproductively mature) population size sufficient to withstand the influences of demographic

and environmental uncertainty, assuming an environment free of disturbances characteristic of land use practices since 1750". In the protocol, it is expressed as a 1-% chance of the species declining to 50 mature individuals at least once over the next 50 years. Following discussion by experts, agencies and stakeholders it was agreed to change this to a 0.1% chance of the species declining to 50 individuals at least once over the next 50 years. The effect of this change is an increase in the number of mature individuals required by a factor of between 1.5 and 3.5. The detail for these changes is provided in the "Threatened Vascular Flora of NorthEastern NSW**:** Inventory, Assessment and Conservation" (Anon 1998).

The F parameter explicitly excludes the impact of post-1750 threats that are dealt with in other parts of the protocol. The determination of F takes into account factors such as: seed bank dynamics, disturbance response mechanisms, life history, demographics, outbreeding/selfing characteristics, and genetic homogeneity (Burgman et al 1998). To ensure a consistent approach to setting F values within the workshop, a reference table was created (Table 2d) based on longevity (a critical determinant of F) and resilience (determined by any of the other aforementioned factors). This table was based on the modelled values provided in the protocol (see Appendix 1.1) as well as the adjustments to F outlined previously. The table was used as an initial reference point from which experts could assign a higher or lower value depending on the particular characteristics of the taxon in question. Once all taxa had been assigned an initial F value, all taxa were sorted by F, and given a final review to help ensure equitability. Equitability is enhanced if the relativity between taxa with different attributes is maintained, and this final review was an important final step.

Table 2d: Reference F values

Longevity (years)	Naturally Very Resilient (F / 2)	Naturally Resilient (F / 1.5)	F Reference (x1)	Naturally Vulnerable (F x 1.5)	Naturally Very Vulnerable (F x 2)
1	34430	45906	68860	103289	137719
2	19674	26232	39348	59022	78697
3	14006	18674	28011	42017	56022
4	10929	14572	21858	32787	43716
5	8992	11989	17984	26976	35968
6	7659	10212	15318	22978	30637
7	6688	8917	13376	20064	26752
8	5946	7929	11893	17839	23786
9	5362	7149	10724	16086	21448
10	4890	6519	9779	14669	19558
11	4500	6000	9000	13500	17999
12	4171	5561	8342	12512	16683
13	3892	5190	7784	11677	15569
14	3650	4867	7301	10951	14601
15	3439	4586	6879	10318	13757
16	3254	4339	6508	9762	13016
17	3090	4121	6181	9271	12362
18	2944	3925	5888	8832	11776
19	2812	3749	5623	8435	11247
20	2693	3590	5385	8078	10771
25	2233	2977	4466	6699	8932
30	1920	2560	3840	5761	7681
40	1519	2025	3038	4557	6076
50	1271	1694	2541	3812	5082
60	1101	1468	2201	3302	4403
70	976	1302	1953	2929	3906
80	881	1175	1762	2643	3524
90	805	1073	1610	2414	3219
100	743	991	1487	2230	2973
200	444	592	888	1332	1777
500	231	308	462	692	923
1000	142	190	285	427	570
2000	88	118	177	265	353

Population Targets

Unfortunately with limitations on resources, data and time it was never going to be possible to develop habitat models for all priority taxa. Indeed, it was only a result of the considerable efforts of NSW NPWS officers that so many models (in excess of 100) were produced. For taxa that do not have spatially explicit habitat models, it is obviously meaningless to set an areal target. Consequently, a 'fallback' method was developed to set targets for those taxa for which habitat models were not available or for the limited number of cases where experts rejected the model. For these taxa, locality based population targets were set which are expressed as a percentage of a taxon's reliably known localities. The method incorporated baseline population targets based on the conservation priority rank and reservation priority index of each taxon (Table 2e). Experts could then adjust these baseline targets up or down by considering any critical ecological and life history characteristics of taxa, as well as notions of risk spreading.

Table 2e: Baseline Reference Targets

Reservation Priority Index	Conservation Priority Rank	
	C1	C2
1	100%	100%
2	100%	80%
3	80%	60%
4	60%	20%
5	20%	10%

2.3.5 Review of Habitat Models

The detailed description of the habitat models developed by NPWS as part of the CRA Species modelling project is outlined in the Species Modelling report. Many of the models had had prior input and review by relevant experts, and during the RTD workshops, the models were subject to a final critical review by the workshop experts. All expert comments were recorded and where possible suggestions were taken into consideration and a number of models were subsequently further refined. The models were considered in terms of identifying areas of potential habitat (which includes both occupied and unoccupied areas). There was not enough time to distinguish different qualities of habitat within the potential habitat, and to do so would add another dimension to the areal target setting protocol for which it is currently not designed. However, occupied parts of the habitat were recognised by experts as having a greater importance for inclusion into the reserve compared to modelled habitat. Consequently, as outlined later in the section on the application of targets, known localities were given a higher weighting within Cplan (the conservation planning tool used during integration) for inclusion into any new CAR reserve compared to modelled habitat.

Each model was assessed by experts as to how well the modelled distribution reflected the taxons actual potential habitat. To this end, experts were asked to estimate the proportion of the model that represented actual potential habitat. In some cases, experts used the proportion to help them estimate densities of mature individuals across their potential habitat, which is one of the key parameters used in the calculation of areal targets. The proportion also gives some indication of how good the model was, and also provided the modelled habitat weighting within Cplan indicating the likely amount of potential habitat within a given amount of model. The latter point is crucial for the correct application of the targets, which relate to actual potential habitat (see Burgman et al 1998). For example, if the actual potential habitat was thought to be 50% or 0.5 of the model and there was 100ha of model in a particular planning unit, then you would expect to have 50ha of habitat within that planning unit. So although there are 100ha of model, including that planning unit in any new reserve would only contribute 50ha towards meeting target.

2.3.6 Reservation priority ranks

Because it was unlikely that all species targets could be met within formal conservation reserves, a method of ranking species priority for reservation was developed and agreed to by stakeholders, agencies and experts. The method was tenure free and based on expert panel judgement of both the intrinsic risk associated with each taxon (e.g. low numbers, small number of populations, etc.), and their relative vulnerability to off-reserve threatening processes (such as clearing or forestry operations). While consensus was obtained among the expert panel for the majority of taxa assessed, wherever consensus could not be reached, the majority view was recorded along with the view of any dissenters. The method involved assigning a value of one (most vulnerable, highest priority for reservation) to five (least vulnerable, lowest priority for reservation) to each

taxon. It should be emphasised that the ranking's are relative, and that taxa assigned a lower priority are still likely to require some level of formal protection.

2.3.7 Application of targets

Once the targets were generated for each priority taxon, rules were required to ensure the targets were applied correctly within the Cplan GIS software. These rules relate to each of the following factors:

- Buffering around known localities within habitat models;
- Cplan weighting for occupied habitat and modelled habitat;
- Environmental and Geographic Spread Index;
- Identification of meta-populations;
- Allocation of target between CRA regions, and;
- Identification of localities and removal of duplicate records

2.3.8 Management recommendations

During the threatened flora workshops experts had a number of opportunities to provide information and recommendations that it is hoped will be used by decision-makers and land managers. These include:

Taxon specific management recommendations

An intrinsic component of the areal target setting protocol is an assessment of the threatening processes and types of disturbances that may be adversely affecting a particular taxon. The disturbance information is used to increase the areal target according to the degree of effect the disturbance is having on the taxon. Because the threats were specifically examined, there was also the opportunity for experts to provide taxon specific management recommendations that could be used to help alleviate these threats.

Identification of key threats to plant biodiversity

At the end of the RTD workshops experts were provided with the opportunity to summarise what they believed to be the key threats to plant biodiversity in northeastern NSW and what management recommendations might be implemented to address these threats.

Review of Conservation Protocols

During the Conservation Requirements workshop, experts spent a day reviewing the flora component of the current conservation protocols for northeast NSW. This review, documented in Appendix 1.2, forms an important output of the workshops in relation to implementing the principles of Ecologically Sustainable Forest Management (ESFM).

3.RESULTS

3.1 FAUNA

3.1.1 Species list

APPENDIX 2 contains a list of the 174 species assessed during the first workshop in June 1998. Due to time constraints, the Species Modelling Project was unable to provide habitat models for all of these species for the second workshop in July 1998. The modelling project prioritised the completion of models for the second workshop using the reservation priority ranks. All species with a rank higher than three had models provided. The 144 species assessed in the second workshop are also listed in APPENDIX 2.

3.1.2 Habitat requirements

APPENDIX 3 contains descriptions of the critical resource requirements of each of the species assessed.

3.1.3 Disturbances

APPENDIX 4 contains a list of all the disturbances thought to affect the species assessed in the project. It also contains ranks for each of these disturbances indicating their relative impact on the species. The rankings should not be compared between species, a disturbance ranked one for one species does not necessarily have an equivalent impact as the same disturbance ranked one for another species.

Figure 3a illustrates which disturbances were nominated for the species assessed. To do this analysis the disturbances nominated by the experts were placed into groups. For instance the group called logging includes disturbances such as altered hydrology due to old growth being converted to regrowth, loss of fallen logs due to logging, loss of hollows due to logging, change in canopy structure etc. The graph indicates what percentage of all the species assessed had that disturbance nominated as causing an adverse impact. Not all disturbances are shown on the graph, only those that affected more than 10% of species were included. The disturbances that affected less than 10% of the species assessed were: unknown causes, dingo baiting, recreational activities, drought, barbed wire fences, apiary, native predators, powerlines, lack of a source population and bridge removal.

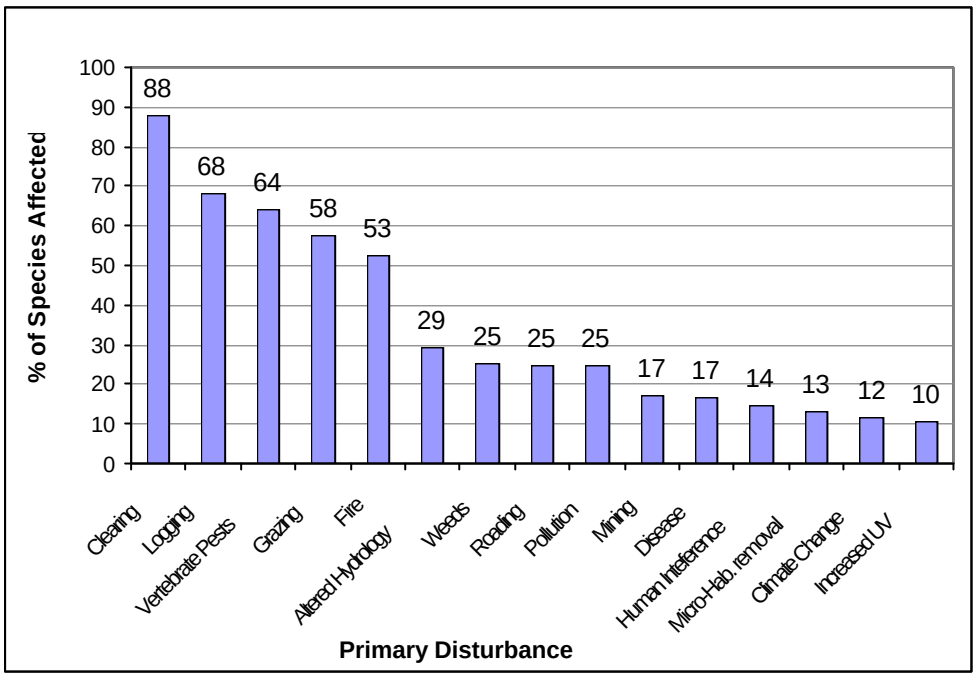


Figure 3a: The percentage of all species assessed that have the listed diturbances nominated as having an adverse impact

Figure 3b indicates the percentage of species that had the listed disturbances ranked number one. This demonstrates which disturbances have the greatest relative impact on the species assessed. This graph does not include those disturbance ranked number one that affected less than 3 percent of the species assessed. These disturbances are; human interference, increased UV, drought, micro-habitat removal, and a lack of source population.

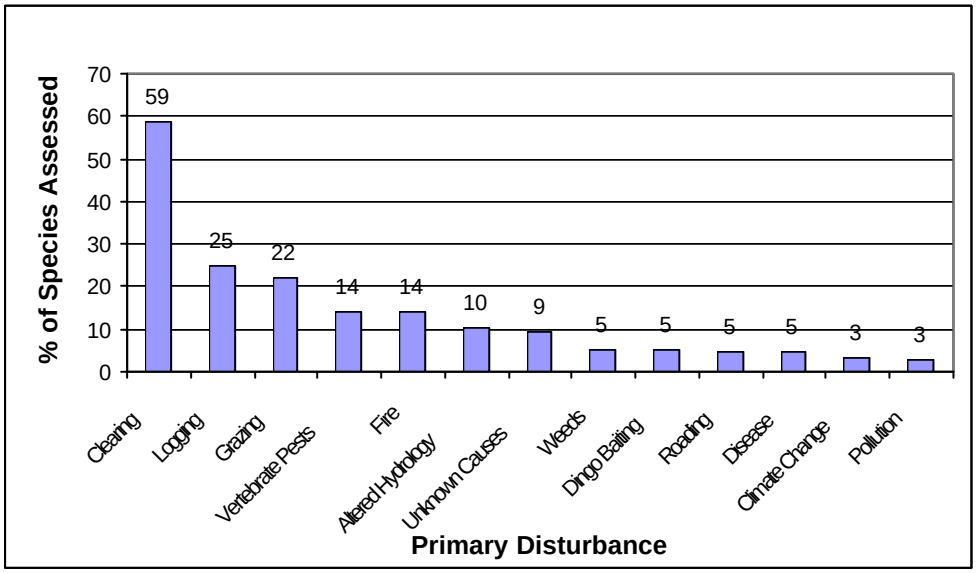


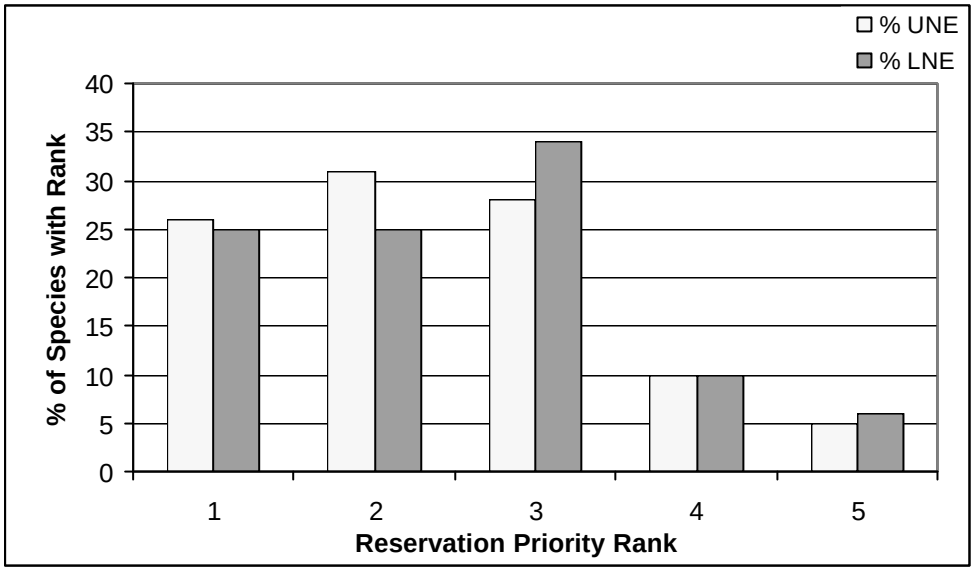
Figure 3b: The percentage of all species assessed that have the listed disturbance ranked number one

3.1.4 Reservation priority ranks

APPENDIX 5 contains the reservation priority ranks assigned to each species in each region.

Figure 3c indicates the percentage of all species assessed that fell into the 5 reservation priority rank groups for UNE and LNE. Where ranks were not a whole number they were rounded down to the nearest whole number eg 1.5 was rounded down to a rank of 1.

Figure 3c: Percentage of species in each reservation priority rank group.



3.1.5 Species equity targets

Appendix 6 contains the estimates of trophic level and reproductive longevity for each of the species assessed. The estimation of trophic level was relatively straight forward for most species. There were some problems estimating reproductive longevity for species that were not very well known. This was the case for some frog, bat and reptile species.

Appendix 7 contains estimates of density for each of the habitat qualities found in each of the areas containing a distinct population for the species assessed. Density estimates were tied to the habitat qualities predicted by the habitat modelling project. Experts found it difficult to estimate densities where the models over predicted the extent of habitat since they needed to take into account habitat that was never likely to be occupied by the species. For these species the densities estimated were lower than really occur.

Appendix 7 also contains the species equity targets as calculated by the formula for each of the species considered at the second workshop. As for the density estimates the targets are linked to the habitat qualities predicted by the habitat models.

Experts became concerned when the targets greatly exceeded the available habitat for a species. There were also other situations where experts felt that adjustments to either the target or how it was applied needed to be further considered. To deal with this all targets were reviewed and some species were placed in one of the groups described below.

1. Species that are on the edge of their range within the region.

The application of the target for these species was problematic since the scale at which the population was operating was greater than the area of habitat available within the region. Experts made one of three recommendations in this case:

- Where the species was well protected across the regional boundary the target was reduced commensurate with the proportion of the population occurring in the region.

- Where experts felt that the species was not well protected across the border or were unsure of its level of protection then the target was left unchanged if there was enough habitat available to apply it to.
- Alternatively if there was not enough habitat to apply the target to then the target was adjusted to the amount of habitat available.

2. Species whose distributions have been reduced to a fraction of their former range.

Range contractions can occur for 2 broad reasons in species. Firstly due to 'natural' processes such as climate change resulting in species displaying relictual populations. The second reason is due to relatively recent disturbances, such as introduced predators or land clearing, which has seen the distribution of species contract to areas where the disturbance is absent or has a low impact. Where the area of habitat was substantially less than the areal target then experts adjusted the target to all of the available habitat.

3. Species that are nomadic or migratory.

Where species utilised different habitats at different times of the year experts recognised that species need to have their target applied in each of these habitats. Where all of these habitats occurred within the region then the target area generated by the formula was applied within each of these habitat types.

4. Species for which public land reservation can only contribute to recovery or conservation in a small way but would benefit from private land reservation or appropriate management on private and public land.

Some species largely occur on private land and are therefore difficult to reserve or manage on public land. This may result in less area being available for selection into the reserve system then the actual target area estimated for a species. Th experts opted for all available habitat for these species and indicated that if appropriate private land became available then the original target should be applied.

5. Species that occur in geographically restricted areas eg along cliff lines or water courses.

The habitat distribution models of species that occurred in geographically restricted habitats were difficult to produce due to the scale at which the modelling was done. This meant that the target areas estimated by the formula had to account for unoccupied habitat making the targets often larger than the scale at which these populations tended to operate. Experts could provide no recommendations on how to deal with this problem.

6. Species with no known populations in their former range within the region.

Litoria booroolongensis was the only species that fell into this group. The experts felt it was inappropriate to be designing a reserve system for a species for which there were no contemporary records and so this species was dropped from the assessment process.

APPENDIX 8 outlines the species that were placed into one of the above groups, the groups they were assigned to and how (if at all) their target was adjusted.

In addition to the target area set using the Species Equity Formula the bat expert group set targets to protect roosts, camps and feeding resources for a small number of bat species. This was done to ensure the most crucial elements of their habitat were protected. The methods used to determine these target areas are described below.

Cave Roosting Bats

Miniopterus schreibersii and Miniopterus australis

Three targets were set for these species. The reservation priority ranks assigned to these features vary as shown below. The targets are for:

1. Maternal caves (Rank = 1)
2. Non-maternal caves (Rank = 1)
3. Foraging habitat (Rank = 3.5-4)

Maternal Caves

The experts felt that an alternative to the Species Equity Formula was needed since these species have a minimum threshold number of individuals required to maintain their thermoregulation and microclimate in the caves**.** They nominated a system of concentric circles around each maternal cave.

For *Miniopterus shreibersii* these were as follows:

1. 0-15km – 100% forest cover (max 70 686 ha);
2. 15-30km – 100% HQ1, 80% HQ2, 50% HQ3 (max 212 057ha); and
3. 30-60km – 75%HQ1, 60% HQ2, 50% HQ3 (max 848 230ha).

For *Miniopterus australis* these were as follows:

4. 0-15km – 100% forest cover (max ? ha); and
5. 15-30km – 80% HQ1, 50% HQ2, 10% HQ3 (max ? ha).

The experts stressed the importance of Willi Willi caves in LNE and wanted these set as the top priority for reservation. The target areas for Willi Willi caves are set out in Table3d.

Table 3d: Targets for the maternal roost at Willi Willi caves

(all expressed in hectares)

Species	**Distance**	**Region**	**Habitat Quality 1**	**HQ2**	**HQ3**	**Total**
Miniopterus australis	0-15km	LNE	59567			59567
	15-30km	LNE	26135	13541	1315	40991
Miniopterus schreibersii	0-15km	LNE	59567			59567
	15-30km	LNE	35649	27376	12779	77804
	30-60km	UNE	726	8		734
	30-60km	LNE	87632	48442	48643	184716

Non-maternal Caves

- Non-maternal caves were given a lower level of protection. For both species, total protection was recommended up to 1 km from caves (314 ha per cave). Beyond this experts recommended that 10 000ha of modelled habitat be reserved up to 15 km away from non-maternal caves. This area should protect 250 females per non-maternal cave.

Foraging habitat

The experts agreed to use the Species Equity Target to cover foraging habitat. This means the targets are:

Miniopterus schreibersi – UNE – 50 596ha, LNE –101 193ha

Miniopterus australis – UNE – 50 696ha, LNE – 50 596ha

Fruit Bats

Pteropus poliocephalus

Peggy Eby was consulted on the approach taken for this species. Two targets were identified to meet the needs of this species. As with the cave roosting bats these features have received a different reservation priority rank:

1. Camps (Rank = 1.5)
2. Foraging habitat (Rank = 2.5)

Camps

As with the cave roosting bats a concentric circles approach was taken with greater protection allocated closer to the camps. The targets are:

1. 0-200m is to be completely protected for all camps (13ha)
2. 200m – 40km protect 20 000 ha of HQ1 or equivalent around maternal camps only

Foraging habitat

Peggy Eby recommended that there be approximately 2 areas set aside in each region to protect functional populations (one of these areas cross the regional boundary between UNE and LNE). A functional population contains 10 000 females and each female needs 10ha. The targets for the two regions are:

1. Upper UNE 100 000ha
2. Lower UNE 60 000ha
3. Upper LNE 40 000ha
4. Mid LNE 100 000ha
5. Lower LNE 100 000ha

These targets are to be met by allocating proportionally within a 40 km radius of camps identified by Peggy Eby in the first instance.

Pteropus alecto

As with *P. poliocephalus* experts recommended that two targets are needed for this species. Once again different reservation priority ranks apply to each feature. The features and ranks are:

1. Camps (Rank = 1.5)
2. Foraging habitat (Rank = 3); and

Camps

The level of protection sought for this species is less than for *P. poliocephalus* . The target is:

- 0-200m from camps to be fully protected (13ha)

Foraging habitat

The experts decided to apply the Species Equity Formula to calculate a target area for the foraging habitat. This is to be applied within 20km of identified camps and is 92 376ha for each camp identified.

3.1.6 Applying the species equity targets.

The identification of distinct populations to which the Species Equity Targets were to be applied was a difficult process for most species. There is virtually no data on the recolonisation of habitat following local extinctions. To overcome this experts considered the inclination and ability of species to disperse for which there is some data.

Data on dispersal is not available for many bat species and so the bat group took a different approach to the other groups. They focussed the application of targets on concentrations of high quality habitat, which sometimes resulted in low quality habitat being identified as a barrier. This was a controversial approach especially when it was known that the species occurred in areas of low quality habitat.

Due to the uncertainty surrounding how private land would be treated during the RFA process experts occasionally nominated areas of private land as a recolonisation barrier. This was done when there was an expectation that this land would be cleared for either urban or agricultural development. The experts stated that where these areas were dealt with during the RFA and there was certainty the areas would not be cleared then the barrier could be ignored and one target instead of two applied.

Appendix 9 contains reasons for why barriers were nominated between the distinct populations identified for each species. There were no reasons given when the barriers ran along the regional boundary. The most common barriers were river valleys such as the Clarence and Hunter River valleys.

3.2 FLORA

3.2.1 Species lists

After expert review - including additions of recently described and proposed new taxa - the current regional species list totalled almost 4500 vascular plant taxa. The list includes 214 families and 1146 genera, demonstrating the enormous variety and richness of the flora of northeast of NSW. The review of the conservation ranks (C1-C3 in particular), led to the identification of a number of species that may warrant listing on either the ROTAP list or on the ESP or TSC Schedules. A small number were also identified that may warrant downgrading. Specific recommendations relating to the NSW TSC schedules were subsequently undertaken by experts as part of the Conservation Requirements workshop. These recommendations are presented in Appendix 10.1, taxa are either proposed for TSC listing, delisting,

upgrading to Endangered, downgrading to Vulnerable, or for TSC listing subject to further research. An additional 145 taxa were considered requiring immediate listing on the TSC schedules, while 80 taxa were considered requiring listing subject to further research, and 8 taxa were recommended for delisting.

Following the thorough review of the taxa of conservation concern, all taxa that had been assigned a rank of either C1 or C2 were identified as priority taxa in respect to the target setting process of the CRA. The identified list of priority taxa was the most comprehensive list of flora species included for this level of analysis in any CRA. The list (Appendix 10.1) initially included 364 taxa identified as Presumed Extinct, Endangered or Vulnerable (as listed on the NSW Threatened Species Conservation Act or the Commonwealth Endangered Species Protection Act, and as identified during the Interim Forestry Assessment or the RTD workshop assessments), and 434 taxa identified as Potentially Threatened, Threatened, Rare, Uncommon or Poorly Known (ROTAP taxa or as noted in the Flora of NSW) or Declining Regionally. However, the subsequent expert review of the TSC schedules indicated the possibility of upgrading a number of additional taxa from the C2 to the C1 rank.

3.2.2 Conservation targets

Areal Targets

A comprehensive range of information was collected on each of the taxa put through the areal target setting protocol, and these have been collated into the decision summaries provided in the "Threatened Vascular Flora of North-Eastern NSW**:** Inventory, Assessment and Conservation" (Anon 1998). An example of a decision summary is shown below:

Taxon Taxon / Metapopulation Unit	Acacia courtii
Assessment Number	4
Regional Conservation Priority	**C1 – Critically Threatened**
Panel Experts	Andrew Benwell, Stephanie Horton, Peter Richards, Barbara Stewart, Douglas Binns
Technical Support	Robert DeVries, Christopher Turbill, Jason Passioura
Ecology (habit, reproduction, longevity, dispersal, resilience, habitat)	Obligate seeder; longevity estimated at about 30 years; soil-stored seed; seed bank long-lived; dispersal ability low to moderate; moderately resilient.
Total population (estimate)	Mature adult population size estimated at 6500.
Disturbance Region/s	1
Model Type and Qualification	
Model Area (ha.)	580 ha.
Potential habitat area (ha.)	580 ha. estimated with reference to the habitat model (100%)
Expert Review of Model	Utilised to derive a potential habitat area.
Density (ha. per plant)	**0.075**
F (P=1%)	**2000**
F (P=0.1%)	**3826**
Key Threatening Processes	Extrinsic threats likely to occur within conservation reserves (assuming benign neglect): fire or inappropriate fire regime (Nd=5; Nu=30; p=0.15); Additional extrinsic threats likely to occur outside formal conservation reserves (assuming benign

	neglect): a minor threat from forestry operations.
Priority Management Issues	Basic autecological research. Population monitoring. Research into fire ecology. Apply appropriate fire regime, particularly near urban areas. Integrate planning, research and management.
PVA and Target-Setting	Fire threat assessed.
A_0	287
A_1	658
A_2	658
A_3	658
H/A_3	
Final habitat target area (ha.)	**658**
Final population target (%)	**N/A**
Reservation Priority	**2 (majority); 3 (State Forests).**

A summary table for all 109 taxa assessed by the protocol which contains the key inputs and outputs for each taxa is provided in Appendix 10.2. Taking into account the RFA region boundaries, 86 taxa in UNE and 43 taxa in LNE had areal targets calculated using the protocol. These targets varied from 76 ha for *Eucalyptus camphora* subsp. *relicta* up to 147,154 ha for *Elaeocarpus williamsianus*, while the median target across all taxa was 4457 ha.

Population Targets

A total of 683 taxa were given locality based population targets for northeast NSW (Appendix 10.1). These included 334 taxa with a 100% target, 186 taxa with a 80% target, 174 taxa with a 60% target, 34 taxa with a 20% target and 3 taxa with a 10% target. In practise, experts rarely diverted from the baseline figures (Table 2e), partly because there simply wasn't enough time for extended deliberation given the large number of taxa. After taking into account RFA boundaries there were 478 taxa with population targets for UNE and 372 taxa with population targets for LNE. However, once the filtering of unreliable and duplicate records had occurred only 253 taxa in UNE and yy taxa in LNE were found to have at least one reliably and accurately known locality that could be integrated into Cplan.

3.2.3 Habitat models

In general, the models were well accepted by the experts, although a limited number were ultimately rejected, and there was insufficient time to refine them any further. As outlined in the methods, experts were asked to estimate the proportion of the model that represented actual potential habitat (see Appendix 10.2 for Cplan weights). Typically, the proportion assigned varied with the extent to which the underlying GIS layers adequately describe the niche within the modelled area. In most cases, the proportion assigned was lower than one; ie the model was broader than what the experts felt represented the actual habitat of the taxon. There were two main reasons for this: firstly, in some cases the resolution of the model (models were either at 100 or 200 meter resolutions) was not fine enough (eg for some species occurring in narrow strips along creeklines), and secondly where experts felt the model overestimated the niche in which the taxon was likely to occur. The latter reason applied to most models, at least to some extent. However, overall the flora experts regarded the models as reasonable approximations of true potential habitat, given the current state of knowledge, the resolution and reliability of the underlying GIS layers, and other modelling or geo-ecological considerations.

3.2.4 Reservation priority ranks

Reservation priority ranks were assigned to each of the priority taxa according to their intrinsic risks and the off-reserve threatening processes affecting them. Each taxon was reviewed by experts at least twice

to ensure that the relative ranking's had been applied consistently. The final ranking's are given in Appendix 10.1. The number of taxa classified into each of the five classes is given in figure 3e.

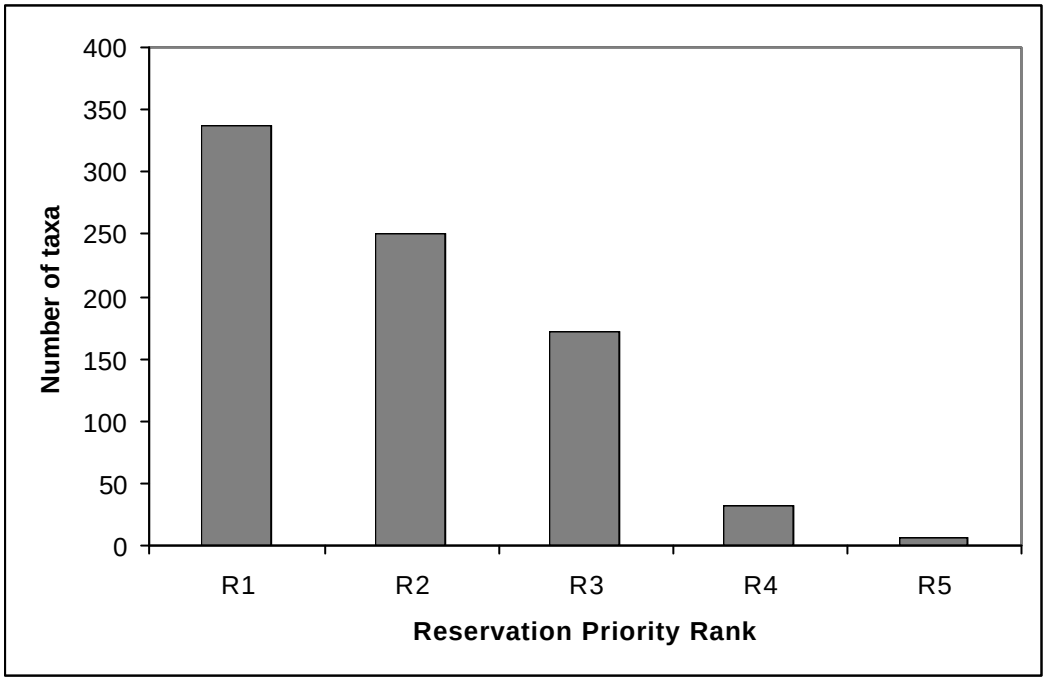


Figure 3e: Reservation Priority Ranks

3.2.5 Application of targets

A number of general rules were developed in order for the targets to be sensibly applied to the C-plan reserve selection tool, these include:

Weighting for occupied habitat

Members of the expert panel were concerned at the possibility of areal targets being met in only modelled habitat. It was felt that when seeking the target Cplan should include higher weighting on known (currently occupied) localities to indicate the greater importance for known localities to be included in any new CAR reserve. It was considered the most appropriate way to achieve this was to incorporate a 750 metre proximity around known, occupied localities such that the enclosed area is considered part of the total habitat model but is weighted at the highest possible relative weight (=1).

Environmental and Geographic Spread Index

Experts agreed to apply a standard geographic spread index using latitude with a maximum 50-km interval within the C-plan reserve selection software. Given project and time constraints, application of a single index to all taxa was seen as the most effective means to ensure that reservation is spread across the range of environmental and geographic variation of each taxon.

Subregionalisation

Areal targets were rarely set on the basis of subregions and where recognised were considered by experts to most probably represent genetically isolated if not genetically distinct meta-populations. Those species recognised by experts as having distinct meta-populations include:

- *Acacia orites*
- *Alloxylon pinnatum*
- *Amorphospermum whitei*

- *Corokia whiteana*
- *Eucalyptus glaucina*
- *Grevillea granulifera*
- *Grevillea guthrieana*
- *Hibbertia hexandra*
- *Hicksbeachia pinnatifolia*
- *Pultenaea campbellii*
- *Rutidosis heterogama*
- *Sarcochilus fitzgeraldii*
- *Tasmannia glaucifolia*

Allocation of Targets between the Upper and Lower CRA Units

All targets were allocated on the basis of CRA regions (UNE and LNE). For simplicity and to maintain equitability, unless distinct meta-populations had been identified, the total areal target for each taxon was allocated between regions on the basis of relative modelled habitat area within each region.

Removal of duplicate records

Experts agreed that a 500 m radius should be applied as a heuristic rule to exclude the majority of duplicate records whilst limiting the chances of simultaneously excluding unique locality data.

3.2.6 Management recommendations

Each of the taxa assessed by the Burgman protocol had the threats specifically examined, and during the workshops, experts provided management recommendations that may help to ameliorate these threats. These taxon specific recommendations are provided in the decision summaries in the "Threatened Vascular Flora of NorthEastern NSW**:** Inventory, Assessment and Conservation" (Anon 1998). In addition to those taxon specific threats provided in the decision summaries, experts were asked more generally what they considered to be the key threats to plant biodiversity in northeastern New South Wales, these include:

- Land clearing.
- Development, especially coastal and rural developments.
- Habitat degradation and fragmentation.
- Drainage or degradation (including nitrification) of swampy areas (in particular).
- Weeds.
- Altered or inappropriate fire regimes.
- Grazing, specifically by feral animals, most importantly by cows, goats, pigs and horses.
- Forestry operations.
- Inappropriate herbicide use.
- Collecting, including botanical collecting and especially horticultural collections (eg. orchids and ferns).
- Possibly roading.

Of these land clearing, inappropriate fire regime, weeds (and forest hygiene in general) and grazing were unanimously agreed as the main threats, which is also reinforced by looking at the number of times these threats appeared in the areal target setting process. In light of the identification of the key threats experts were asked what general management recommendations might be implemented to address them, these include:

- Implement effective clearing controls.
- Provide positive vegetation management incentives for private landholders, such as rate relief for the retention and sustainable custodianship of vegetation cover.
- Officially declare riparian vegetation communities 'Threatened Ecosystems'.

- Implementation of an integrated and well-resourced animal and plant pest species management program across all public lands.
- Exclude cattle (and feral grazing generally) from State Forest and National Parks areas or at least limit the area adversely affected by this threatening process.
- Undertake basic autecological research.
- Further Botanical and Vegetation surveys (especially targeted surveys).
- Undertake research into fire ecology and fire managment.
- Long-term environmental monitoring including the monitoring of threatened plant populations.
- Assess the threat status of ecosystems in NorthEastern NSW.
- Maximise the practical use of threatened plant funding to reduce the impact of threatening processes.

During the Conservation Requirements workshop experts reviewed and provided a number of recommendations in regard to the flora component of the current conservation protocols for northeast NSW. It was anticipated that this would feed into the general review of Ecologically Sustainable Forest Management (ESFM). In the review, fully documented in Appendix 1.2, experts highlighted the inadequacies of the current Conservation Protocols, the main points include:

- The need for a thorough revision of the species list attached to the protocols;
- Additions to the definition of Specified Forestry Activities;
- Redefinition of the functional guilds, and;
- Overhaul of the prescriptions.

4. DISCUSSION

4.1 FAUNA

4.1.1 Species list

The fauna species, assessed as part of the Response to Disturbance project, included all those terrestrial vertebrates that were forest dependent and were scheduled under either the *ESP Act* 1992 or the *TSC Act* 1995, as well as other species that agency staff and experts felt were of concern. Ideally the list should also have included invertebrate species and fish, however time and resource limitations meant this was not possible.

4.1.2 Habitat requirements

The habitat requirements of species were identified for 2 reasons:

(1) to help focus the workshop participants on the disturbances likely to affect species; and

(2) to provide the ESFM committee information that will help develop management prescriptions for species.

It was felt that this task took too long relative to the usefulness of the data and it may be more efficient to streamline this process for future assessments. Given the degree of overlap between the species dealt with in this assessment and the Eden assessment with the species likely to occur in the Southern region this might be done by having experts review and, if necessary, update previously provided information.

4.1.3 Disturbances

While there was a very good understanding of the habitat requirements of many species in the UNE./LNE region there was less knowledge on the disturbances affecting them. The information provided identified and ranked disturbances. This indicated that land clearing was the most serious threat to the species assessed. Not only was it the most commonly nominated disturbance it was also the disturbance ranked highest for most species. This is problematic for the RFA process since most land clearing occurs on private land and so governments have limited powers to manage it. In NSW managers of forests on private land are not required to follow any codes of practice (Commonwealth of Australia 1998) however they are bound by the *Native Vegetation Conservation Act* 1997 which seeks to prevent inappropriate clearing of native vegetation. The second most commonly nominated disturbance was logging. Unlike land clearing, logging does not have a permanent impact in all cases. This means that some species may persist in a logged landscape, albeit at lower densities. The impacts of logging may be managed effectively for some species. However, species that have habitat requirements found only in old growth forests, such as hollows or deep leaf litter are the most susceptible to commercial forestry (Scott 1991) and would therefore be the most difficult to manage. Grazing and vertebrate pests were nominated as disturbances almost as often as logging was. Once again grazing is a difficult disturbance to manage since private land holders and members of the public with grazing leases are involved. The impacts of most vertebrate pests are possible to manage effectively, however, most techniques are costly (Olsen 1998).

Experts felt that the information provided on disturbances and their relative impact on species should be provided to all government departments and other groups that are responsible for the management of land in the UNE and LNE regions.

4.1.4 Reservation priority ranks

The estimation of the reservation priority ranks was a difficult task due to the subjective nature of the task. At times there were large discrepancies between the ranks allocated by different experts. However, most of these differences were resolved following discussions. The ranks were meant to reflect the relative priority of each species to be included in a formal reserve based on the disturbances affecting them. Those species that were at greatest risk to disturbances that occur off reserve only should have been ranked higher than those that are at risk to disturbances that occur across the landscape. This was not always the case with some species that were at risk to processes such as predation (which occurs on all land tenures) being ranked higher than species who were affected by processes such as land clearing and logging (which only occur off reserves). This situation could be mostly explained by the experts factoring in the intrinsic risk of species into their deliberations. Species that have suffered large range contractions or a decrease in abundance would have generally been ranked higher than those whose ranges and abundance are more stable.

It was suggested during the workshop that the ranks should only reflect the vulnerability of species to forestry activities rather than all off-reserve disturbances. This would mean that species that were affected by processes occurring largely on private land would be ranked lower than those affected by disturbances occurring in commercial forests. This may mean that species that occur largely on private land and are threatened by processes such as land clearing may miss being included in a formal reserve. Alternatively it means that species that are not greatly affected by commercial forestry are always ranked lower than those that are. The merits of this approach needs to be further discussed between agencies and stakeholders before any changes are made to the method.

4.1.5 Species Equity Formula

The size of target areas provided by the Species Equity Formula was influenced by estimates of the three parameters, Reproductive Longevity, Trophic Level and Density. Experts were fairly confident in their estimates of Trophic Level but had problems estimating Reproductive Longevity and Density for some species. Reproductive Longevity was difficult to estimate for species that were not well known. This was the case for many frog and bat species and some reptile species.

Density was the most difficult parameter to estimate and had the greatest influence on the size of the target area. Experts particularly had problems when the species was not well known and/or the habitat distribution model over-estimated the area that could potentially be occupied by the species. While there is little that can be done to improve estimates of the density for species that are poorly understood it may be possible to deal with the problem of broad habitat distribution models. It might be useful for project mangers involved in both the RTD and Fauna Modelling projects to discuss possibilities for achieving this before proceeding with the next assessment.

In addition, there was also a concern expressed that the density estimates used in the assessment reflected current disturbance regimes and so do not reflect the densities expected were a species to occur in a reserve. Since the target area is meant to be a reservation target, it may be more appropriate to have experts estimate the densities of each species expected in reserves.

At times, the size of the target area provided by the formula exceeded the habitat available. In response to this, experts reviewed all of the species assessed and determined that the target setting method was inappropriate for a number of species. The targets for these species were reviewed and adjusted where it was thought to be appropriate. This was done towards the end of the workshop, which meant that it was mainly left to the generalist experts to complete this task. In future assessments it would be useful for experts to do this at the end of each species group workshop so that all experts can participate in this task.

4.1.6 Application of the Target Areas.

The application of target areas was a relatively contentious task. This was due to its subjective nature. For many species there was little or no data on the recolonisation or dispersal ability of species to help experts identify barriers to movement. There is little that can be done in the short term to deal with this problem except to ensure there is consistency between how the different species are treated. There was some concern expressed at the methods used in the bat expert group that had them focus on areas of high quality habitat as being distinct populations rather than identifying barriers to recolonisation. Each species group must be treated in the same way to ensure there is equity in the outcomes for all species.

4.1.7 Conclusion

The methods used by the RTD project sought to capture as much information, as possible, on the priority fauna species. Due to a paucity of data on many of these species the project largely relied on the experts who work on the species involved. These experts provided data from a range of sources including published and unpublished studies, work in progress as well as personal observations and opinions. This meant that the information provided by one expert was not always in agreement with that provided by another. Some of the assessments were relatively subjective adding to the difficulties facing experts to provide consistent information. It is truly a credit to the experts involved that at the end of the workshops there was agreement on the vast majority of information used in the assessments.

4.2 FLORA

4.2.1 General Discussion

As a consequence of the data acquisition, research and expert assessment conducted during the Comprehensive Regional Assessment (CRA) for northern NSW, the scientific understanding of the regional flora and the conservation status of the threatened plant species in particular has undergone substantial revision. For example, the CRA targeted rare plant surveys identified new taxa in the genera *Leucopogon*, *Olearia*, *Plectranthus* and *Eucalyptus* and rediscovered two species formerly regarded as Extinct, namely, *Rapanea* sp. A and *Elaeocharis tetraquetra*, and during the workshops experts classified one taxon, *Parsonsia largiflorens,* as Extinct. Also, the application of the Burgman protocol provided detailed information on the conservation requirements for a large number of threatened species in Northern NSW. This information included, for the first time in NSW, the setting of areal targets for flora species. These targets were derived in such a way to ensure equitability between species with different life history characteristics, and provide land use planners with an idea of the amount of potential habitat required so that there is an acceptably low risk of extinction in the medium term (50 years). The protocol also resulted in the identification of the threatening processes affecting each species, and experts provided management recommendations that may help ameliorate them.

The RTD workshops were conducted in a spirit of consensus and were successful to the extent that virtually all of the outputs from the workshops were ultimately agreed to unanimously. On the odd occasion where the panel could not reach unanimous agreement, the dissents from the majority decision were documented. The workshop (Anon 1998) and this final report represents the most comprehensive assessment relating to the threatened flora of Northern NSW. The information collected during the workshops was based on the best available data, current knowledge in the form of published and unpublished literature, and the detailed knowledge of a number of experienced field ecologists/botanists. A great deal of emphasis was placed on ensuring equitability between species in assigning targets as much as practicable, and to use the decision support tools as they were intended. That is, as frameworks to guide experts in developing the conservation requirements of threatened species. The inputs and final outputs were thoroughly reviewed throughout the workshops and ultimately, the critical outcomes (areal and population targets, reservation priority ranks) were expert derived and based on the best available data but where necessary incorporate their best judgement. Hence, there should be every confidence that the outputs reflect the current state of knowledge of the flora of northern NSW.

Despite their contribution to understanding the conservation requirements of threatened flora, the workshops also highlighted how little we know about many species. Basic ecological and life history information is not readily available for a great number of species, and new taxa continue to be discovered. Even basic data on the locations of taxa is poor, highlighted by the fact that of the 478 taxa assigned population targets for UNE, 225 of them had no accurate and reliably known records. Thus the information provided here needs ongoing revision as our understanding and knowledge of plant species improves.

The estimate of the density of mature individuals across their potential habitat was the parameter that had one of the most significant effects on the derivation of the areal targets, but was also one of the most problematic. Very little data is available for densities within occupied patches of individuals, and where they were available they had to be extrapolated across the potential habitat based on expert estimates of the proportion of potential habitat occupied. Where no data was available, densities were estimated from the combined field knowledge/experience of the workshop experts. Furthermore the estimate is supposed to reflect pre-1750 densities, and because of the level of disturbance since the arrival of Europeans it can be very difficult for experts to gauge what effect this has had on the distribution of individuals throughout the landscape over time. Additional targeted surveys, improved habitat modelling and basic demographic research would improve the quality of this data.

The estimates of F were less problematic because the two main considerations of F, adequacy and relativity, were reasonably well addressed. The question of adequacy was addressed at the beginning of the first workshop through the definition of F, the subsequent PVA modelling undertaken by Mark Burgman, and the final review of F's by workshop experts. While the question of relativity was addressed by ensuring that the relative differences between the F's of species with different ecological and life history characteristics was maintained. Experts reviewed the values given to all taxa to ensure the relative differences reflected the different characteristics of each species. Other parameters such as frequency of disturbance, time to reproductive maturity, rate of loss of habitat etc…, were usually (although not always) less critical to the final targets, and in many instances better data were available, or the parameter could be reasonably well estimated by experts.

The reservation priority ranks were probably not assigned in a way that took full use of their potential to inform the process. The ranks were designed to indicate, within Cplan, the priority for formal reservation assuming that not all targets could be met within Dedicated Reserves. The weighting assigned to each rank works by ensuring that, in the process of meeting the conservation targets within Cplan, the highest ranked species would have their targets met first, but that lower ranked species would have a certain (lesser) proportion of their target met at the same time. Hence, in general the greater the level of differentiation (number of different ranks) between taxa, the more likely you will obtain an "optimum" conservation solution. Although the final ranks, having been thoroughly reviewed twice by experts, are likely to reflect the correct order of priority for reservation, they are heavily skewed to the higher priority ranks (Fig 3e). In effect experts have only used 3 different ranks, and consequently the differentiation is not as good as could otherwise have been achieved. This was mostly due to the lack of a clear explanation by the designers of Cplan of how the reservation priority rank would be used within the Cplan software, and the consequent lack of understanding by workshop participants in how to assign them. As already mentioned this does not mean that the ranks are not correct, simply that the cut offs tended to higher than what may have been ideal in terms of driving Cplan to achieve the best conservation outcome.

Experts identified a number of ongoing threats to the biodiversity of flora in northern NSW, including: landclearing, habitat degradation (eg riparian areas) and fragmentation, coastal and rural development, weed invasion, forestry operations, grazing and inappropriate fire regimes. Some of the threats identified are not directly applicable to the management of production forests on public land and need to be addressed through other mechanisms. However, it is hoped that some of the conservation requirements of threatened flora outlined in this report, in combination with the review of the conservation protocols (Appendix 1.2) will make a substantial contribution to the conservation of threatened flora on public land. Given the continuing human induced pressures on the environment, and the fact that plant species continue to disappear from the region (eg *Parsonsia largifloren*), without the implementation of well-informed

conservation strategies across all tenures, many other threatened plant species and communities may suffer the same fate.

4.2.2 Conclusion

The methods and protocols used, and the expert decision making process undertaken here, provide a good model of how to make rapid but informed scientific based assessments of threatened species that can contribute to broader land management decisions. Critical to the conservation effort is the availability of baseline floristic, autecological and synecological data. It is hoped that the outcomes of the flora component of the CRA of Forests in North-Eastern are recognised for their contribution to the informed conservation and forest management in the biologically diverse and rufugial north-eastern NSW region. While there is a certain level of uncertainty within some of the outputs of the workshops, these outputs are based on the best available data, knowledge and expert assessment. The fact that we continue to know little detailed information about many threatened species indicates the need for further research into many areas of plant ecology and systematics.

5. REFERENCES

Commonwealth of Australia (1992) *National Forest Policy Statement: A New Focus for Australia's Forests.* Australian Government Publishing Service.

Commonwealth of Australia (1997) *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia.* A Report by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee.

Commonwealth of Australia (1998) *Australia's State of the Forests Report*. Bureau of Rural Sciences. Canberra, Australia.

Lindenmayer, D.B and Possingham, H.P. 1994. *The Risk of Extinction: Ranking Management Options for Leadbeater's Possum using Population Viability Analysis*, Centre for Resource and Environmental Studies, Australian National University, Canberra.

Olsen, P (1998) Australia's pest animals: new solutions to old problems. Bureau of Resource Sciences, Canberra, Australia. Pp160

Possingham, H.P., Lindenmayer, D.B. and Norton, T.W. 1993. *A framework for improved threatened species management using Population Viability Analysis*, Pacific Conservation Biology. 1:39-45.

Scott, D. (1991) *Old Growth forests: their ecological characteristics and value to forest-dependent vertebrate fauna of southeast Australia.* In Conservation of Australia's Forest Fauna. Ed Daniel Lunney. P 138-48.

APPENDIX 1

APPENDIX 1.1 A DECISION SUPPORT PROTOCOL FOR SETTING PLANT CONSERVATION TARGET AREAS.

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Introduction

Governments throughout the world are committing themselves to comprehensive, representative and adequate reserve systems. While the issues of comprehensiveness and representation are dealt with by minimum set algorithms and gap analysis (Margules *et al*. 1988, Pressey 1994, 1995, Pressey *et al*. 1996, 1997) the issue of adequacy can only be dealt with using population viability analysis (Boyce 1992, Burgman *et al*. 1993, Possingham *et al*. 1993). Adequate reserve systems and management plans for a region should conserve "viable" populations of all species throughout their natural range (eg. JANIS 1997). A species may be considered viable if it faces a 'small' risk of extinction or a negligable contraction in range within the next few decades, assuming prevailing or expected conditions eventuate. While there are many tools for estimating viable population sizes and minimum viable habitat areas for fauna, there are relatively few tools or rules for determining actions that provide adequate conservation for plants. Here we present a protocol for plant conservation that may be applied to many taxa that relies on the kinds of limited information that may be available in many regions.

The need for an efficient decision support tool that uses available information is driven by the very short time frames and the social and political imperatives of land use decisions that are part of the Regional Forest Agreement process. Such imperatives in no way replace the need for adequate research into the long-term viability of plant taxa. Many life history strategies are adapted to recruitment windows or rare disturbance events that span decades if not centuries in their occurrence. In Australia, the state, territory and federal governments have agreed that an extensive and permanent native forest estate would be maintained and managed in an ecologically sustainable manner with parallel development of internationally competitive and ecologically sustainable forest-based industries (CoA 1992). A vital element of the National Forest Policy Statement was that joint Commonwealth - State Comprehensive Regional Assessments (CRAs) of the environmental, heritage, social and economic values of the forests would be undertaken to develop a comprehensive, adequate and representative reserve system. Decisions about the future disposition of significant areas of Australia's forests are made under this program, with consequences for the maintenance of abundance and distribution of thousands of plant taxa.

The nationally agreed criteria state that the "reserve system should seek to maximise the area of high quality habitat for all known elements of biodiversity wherever practicable" including the protection of 15% of the pre-1750 extent of forest communities and the maintenance of viable populations of native forest species throughout their natural ranges (JANIS 1997). The categories that should be represented in the reserve system include taxa that are threatened, rare, declining, migratory, dependent on old growth forest, phylogenetically distinct, bioregional endemics, disjunct, at the edge of their range, indicators, and functionally, economically or culturally important

(JANIS 1997). While the community level reservation may accommodate most of the common and widespread species, rare and threatened species tend to occur in localised or specialised habitats (Keith 1990, Lynch 1994) and therefore, their conservation needs to be specifically addressed. Classifications of conservation status (eg. IUCN 1994) were designed to identify classes of taxa at risk of extinction for incorporation into threatened taxa schedules. In contrast, the planning requirements of the CRA process include determination of reservation targets (area and configuration) and management actions to enable a fair and equitable chance of long term persistence for all taxa given the limited resources and time frame for assessment.

The notion of a viable population is not clearly defined in these arguments yet is essential if the issue of an adequate reserve system is to be addressed. One of the challenges for the planning process is to prescribe adequate conservation strategies for a large number of threatened plant taxa (more than 5,000 throughout Australia; Briggs and Leigh 1996). The problem we face is the huge number of taxa, the lack of detailed demographic work on almost all of these taxa, and a lack of a broad range of Population Viability Analysis methods for plants. Population modelling has been used to develop conservation strategies for a large number of animals but plant studies have been few, although the number of published models does allow some generalisation about model structures, levels of variability and related issues (see Klemow and Raynal 1983, Mack and Pyke, 1983, Burgman and Gerard 1988, Groenendael and Slim 1988, Moloney 1988, Venable and Brown 1988, Roerdink 1989, Menges 1990, Burgman and Lamont 1992, Ouborg 1993, Eriksson 1996, Nantel *et al*. 1996, Oostermeijer *et al*. 1996, Quintana-Ascencio and Menges 1996, Silvertown *et al*. 1996).

In this paper we develop a protocol for determining adequate reservation strategies for plants based on life-history attributes and disturbance responses that are likely to be available, or guessable, for most taxa. It is intended for rapid application to a large number of taxa with a broad range of life history strategies. It is not a substitute for detailed ecological work, modelling, or any other decision support tool. The development of the protocol depends on the following general principles about extinction:

- Background risks may be approximated by simple population models, including levels of environmental and demographic variation and exponential population growth. General guidelines are based on the results of detailed population models developed to date (Mack and Pyke, 1983, Groenendael and Slim 1988, Moloney 1988, Venable and Brown 1988 , Menges 1990, Burgman and Lamont 1992, Ouborg 1993, Eriksson 1996, Nantel *et al*. 1996, Oostermeijer *et al*. 1996, Quintana-Ascencio and Menges 1996).
- To minimise the number of plant extinctions in the medium term, resources for conservation should be sensitive to the risks faced by different taxa. The allocation of protection measures should be guided by an understanding of the interaction of the life history of the taxon and the kinds of threats that may be mitigated by reservation or management.
- Disturbance regimes may be modelled as processes resulting in an expected proportion of available habitat remaining available throughout the period over which risks are evaluated.
- Catastrophes may be implicated in the extinction of many plant taxa and conservation strategies are developed to spread this risk.

The method is designed to be efficient, so that in a short period of time (a few weeks), a panel of experts might be able to set area conservation targets for many of the threatened taxa (100 or more) in a region. As with the application of any method for setting conservation priorities, conclusions from equations such as those developed here should be tempered by expert qualitative knowledge. The methods serve to focus attention on the attributes of taxa that predispose them to be susceptible to particular kinds of disturbances, the parameters of these disturbance regimes and the resilience of the taxon following impact. The approach is not intended to be an alternative for other forms of priority setting. Rather, it is intended to act as a guide for the development of management strategies and a means of focussing attention on parameters likely to interact with human activities and affect the chances of persistence of taxon.

We develop a methodology for defining the number of populations and the area of suitable occupied habitat that needs to be set aside to ensure “adequate” conservation of each plant taxon. While we acknowledge that this method has many flaws - there is an urgent need to have some method of setting conservation targets because in Australia, indeed around the world, decisions are being made now. There is insufficient time to develop detailed spatially explicit metapopulation models for every taxon of concern for almost all real conservation planning problems

in large areas. Such a goal is unlikely to be achieved, even in the long term. There have been only two detailed plant population viability models published for Australian species (Burgman and Lamont 1992; Drechsler *et al*. in press). The primary aim of the method is to support better decision making. Conservation planners should use all available tools and all available data to make the best possible decisions within the constraints of time and data availability.

Caveats

At the outset, it is important to state the assumptions and limitations of the protocol. We assume the following conditions:

- The potential habitat of each taxon can be mapped, or inferred from spatially distributed data.
- Some information on the size and distribution of populations is available.
- General notions of preferred habitat, basic life-history attributes of the taxon and some understanding of disturbance regimes governing the taxon in question are available (in the worst case, life-history attributes might be guessed from the attributes of similar taxa).
- Applications will deal explicitly with uncertainty in the data by evaluating the sensitivity of the result to the reliability of the data. One way of doing this is to specify upper and lower bounds for each parameter, and explore the consequences of any decisions based on equivocal information.
- The users are aware of the spatial and ecological context of a species, and issues such as the adjacency of habitat features, dependencies on other species and related ecological issues will be accommodated in any final judgement concerning the conservation status and reservation needs of a taxon.
- The formulae do not address the issue of ecological sustainability. Rather, they are intended to be used as a tool to guide the equitable distribution of limited conservation resources among taxa. The adequacy of any common benchmark for protection must be established independently of the application of these formulae, and should be treated explicitly.
- The application of these formulae must be carried out in dynamic association with plans for landuse and management activities. The expressions below require judgements to be made concerning expected disturbance regimes, both on and off reserves. Any change in the expected treatment of different tenures would require a re-evaluation of the conservation requirements of the species.
- The application of these formulae to a subset of the taxa (with the consequent exclusion of taxa including those not currently listed, those not currently recognised and described, and those belonging to groups other than vertebrates and vascular plants, including aquatic species, invertebrates and non-vascular plants) does not imply that those not considered are necessarily adequately protected.
- The users are aware that the estimation of parameters for the model reflecting background (pre-1750) conditions must account for the potentially biased and suboptimal conditions in which taxa currently persist. Elements such as the lifespan, reproductive mode, ecological dependencies and life history traits are embedded in the estimation of the initial population size required to achieve an equitable outcome, or are included in deliberations over the setting of conservation priorities, of which the protocol below is a part.
- In applying the formulae, it may be appropriate to develop targets for taxa other than recognised species. When targets for populations or groups of populations within a species are developed, it is termed subregionalisation of targets. For example, refugia or other geographic areas may harbour genetically isolated and distinct populations that are considered to be worth protecting in the same way as one might protect a formally recognised species. Dispersal distances and the level of habitat fragmentation will play a role in determining the degree of subregionalisation of targets for each taxon. We usually do not know for certain the degree of genetic exchange between supposed biological populations and typically species concepts are defined operationally by morphological criteria. In the interests of providing the best protection to the broadest spectrum of genetic variation, we might hope that taxonomy is sufficiently robust that species usually provide the most appropriate focus for conservation. If a decision was made to define targets for populations or sets of populations within a species, then the biological basis for the decision should be rationalised. Isolation by itself would not ordinarily be sufficient evidence of genetic uniqueness.

- The target area for a taxon may be split among regions that experience different disturbance regimes. The protocols here assume that the final choice of the spatial distribution of targets will be sensitive to the landscape context of the taxon's habitat, dispersal distances, the adjacency of habitat attributes, the location of barriers to dispersal, the need to protect genetic variation throughout the range of the species, and the need to spread risk among geographically separate populations.
- A benchmark of 50 years is chosen to set an equitable risk of extinction among species because it is anticipated that the actions that result from these analyses are likely to have greatest impact within the next 50 years. Implicitly, it is assumed that an effective strategy to minimise the number of medium and long-term extinctions is to minimise their likelihood in the short-term. Otherwise, short-term outcomes will determine the state of the system before long-term expectations have a chance to be realised. However, the evaluation of the conservation requirements of different taxa should not be blind to ecological time horizons, particularly those relevant to longer-lived species. It would be appropriate to develop an expectation for conservation requirements, assuming a time horizon of (say) 10 generations as well as the requirements for 50 years, to ensure that the conservation effort does not become focussed on short-lived species. Dta on the requirements for long-lived species could be used to inform judgements during the process of setting conservation targets.
- The protocol described below is intended to be used to support the decision-making process. It is intended to be part of a lerger process that sets conservation targets. We assume that the output of these formulae will provide information used to support a final, expert-based evaluation of the conservation requirements and priorities of different taxa. The primary aims of the protocol described below are to eliminate ambiguities in discussions of disturbance regimes and life histories, to make the basis for the evaluation of changed disturbance regimes transparent, to provide a platform so that differences of opinion might be identified and discussed, and to indicate which data are most important in determining the requirements for conservation of different taxa.
- In this spirit, one of the most important outputs of the process will be the provision of a sensitivity analysis, so that experts responsible for providing final judgements concerning conservation requirements may evaluate the consequences and the importance of their estimates.

Some of the points above are re-iterated in the discussion.

Protocol

The objective of this protocol is to conserve sufficient populations so that a taxon is "adequately" conserved. The term adequate conservation is taken to equate with population viability. Shaffer (1981) suggests that a viable population is one which has a less than 1% chance of extinction in 1000 years - other authors set different target extinction probabilities over different time frames. In general, assessing viability without a detailed Population Viability Analysis is difficult and some authors suggest that all predictions of extinction probability should be treated with caution (Possingham *et al*. 1993, Taylor 1995).

Here, we use a risk of quasiextinction (probability of falling below 50 adults at least once) in 50 years to provide a background risk against which to measure the utility of conservation actions of different kinds for taxa with different life history attributes. We assume that an adequate number of populations and an adequate area are those in which the chance of the total adult population falling below 50 individuals within 50 years is less than 1%. The benchmark of 50 years is not entirely arbitrary. Practical concerns are with risks on a scale over which current management prescriptions may be effective, and risks measured over relatively short time-frames may be at odds with those measured over longer periods (Menges, 1998). We can envisage that the reserve system will have some relevance for the next 50 years but over longer periods, other priorities and conservation strategies are likely to play a part. Conservation priorities are primarily concerned with processes that may eliminate species in the short-term (a few years to a few decades), rather than those processes that are important over longer time scales (hundreds or thousands of years) when equilibrial and asymptotic dynamics are likely to determine outcomes.

The benchmark of 50 adults acts as a common reference point for different taxa and it is a small enough population size that if a species is composed of fewer adults, managers and regulators feel uncomfortable. We have elected to concentrate on adult plants, defined as a reproductively mature individual, to provide a means of dealing equitably

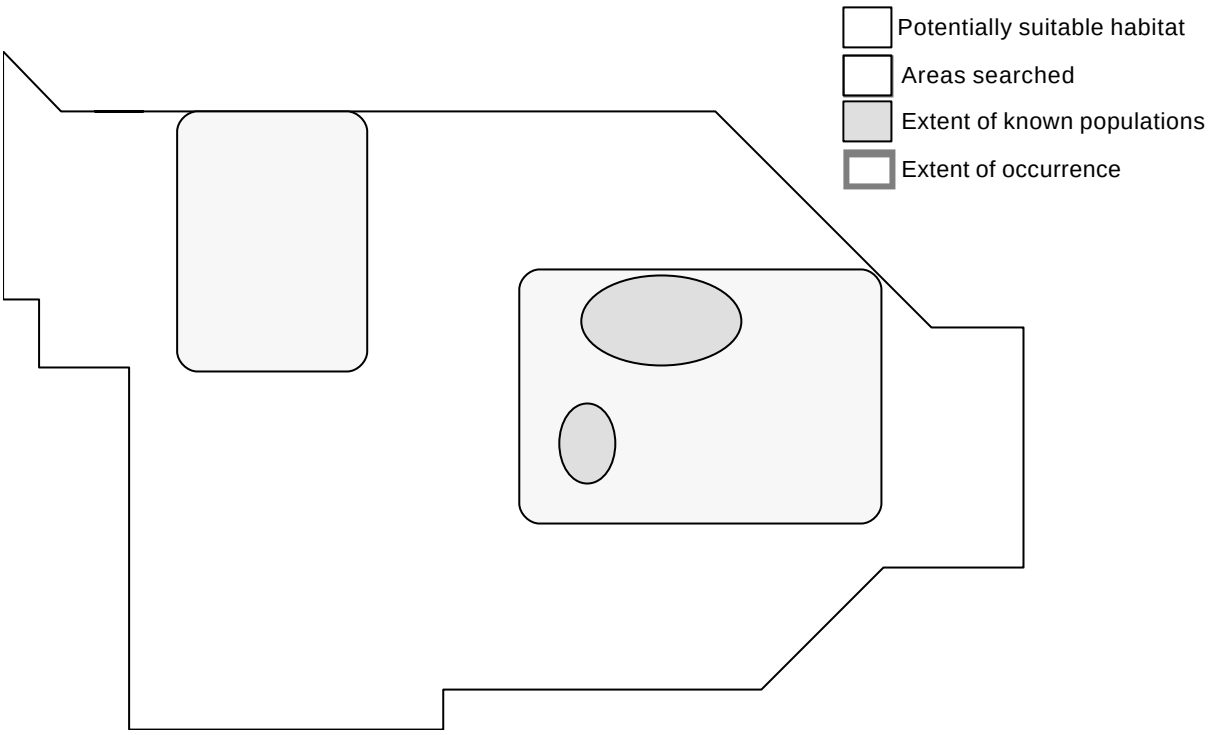
with species with different life forms and life histories, and to remain consistent with IUCN (1994) conventions. For example, many plants have soil stored seeds that provide a buffer against adverse environmental events, while others persist using underground perenniating organs. These factors are accounted for in the estimation of the parameters for the equations used to calculate sufficient population sizes experiencing background (pre-1750) disturbance regimes. Ideally, we would hope that the chances of quasiextinction of species are considerably less than 1% within 50 years. However, our objective is to rank the threats faced by different species and it is relatively laborious to calculate very small probabilities. Overall, the criteria represent a very modest target for the conservation of species, within a realistic management time frame.

The intention of the following procedure is to provide an approximation of the area (either in conservation reserves or under prescription, if it can be demonstrated that prescriptions serve to protect the species) required such that the species (or population) is unlikely to be fewer than 50 individuals at any time in the next 50 years. This is our interpretation of the Regional Forest Agreement goals and something similar is probably reasonable for other regional scale planning decisions.

Step 1 - Identify the area of potential habitat, H.

In this protocol, we assume that biologists can provide a map of the potential habitat for each species, representing the part of the landscape within which a species may grow and reproduce. Potential habitat may be defined by using any of several methods. For example, it may include all areas considered by an expert to be capable of supporting viable populations of the species in question. Alternatively, it may be defined by a set of spatial climate and/or environmental layers and a bioclimatic model, or by a multiple regression model of existing locations together with data layers for each of the explanatory variables (Austin *et al*., 1990).

Other measures of the area inhabited by a species include the area of occupancy and the extent of occurrence (Figure 9a). Neither of these is ideal in the current circumstances. The area of occupancy is the smallest area at any life-history stage essential to the survival of existing populations of a taxon (IUCN, 1994). Essentially, it represents currently occupied habitat. Extent of occurrence was defined by the IUCN (1994) as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence). The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitat and unoccupied suitable habitat. In the vast majority of circumstances, potential habitat will be larger than the area of occupancy and smaller than the extent of occurrence because it includes unoccupied suitable habitat and excludes unoccupied unsuitable habitat. Suitable caution must be exercised in estimating the area of potential habitat to account for competition and predation which might exclude a species from otherwise suitable locations.



Representation of the area of pontentially suitable habitat of a taxon, based on a spatially explicit habitat model

Figure 9a. Representation of the area of potentially suitable habitat of a taxon, based on a spatially explicit habitat model. The total area searched is divided by the number of adult plants found within the area searched to give the density of the taxon (ha/plant). The area of occupancy defined by the IUCN (1994) would include only the hatched areas representing the extent of the known populations. The extent of occurrence defined by the IUCN (1994) would include a minimum convex polygon drawn around the known populations, shown by the heavy line.

The plant density figure is to be arrived at utilising a model of potential habitat. Plant density may be calculated or estimated per disturbance region and also as the area of potential habitat searched divided by number of plants found. It may be very difficult and time-consuming to have the experts arrive at density figures for each disturbance region and to quantify 'areas

searched' without considerable uncertainty. It may be preferable to use the density figure based upon a single habitat model for all calculations but retain some scope for experts to adjust the figures to reflect the long-term average density expected within potential habitat, accounting for the fact that the plants persist under the perturbations of a disturbance regime.

Step 2 Estimate F, the initial population size sufficient to withstand the influences of demographic and environmental uncertainty, assuming an environment free of disturbances characteristic of landuse practices implemented since 1750.

This criterion is met by estimating an initial population size for each taxon that is sufficient to ensure that there is a less than 1% chance of the population declining to 50 individuals at least once over the next 50 years. We assume that biologists can provide this population size for each taxon, but we outline some guidelines for estimating the parameter. The parameter F should explicitly exclude all factors that are considered subsequently in setting the area target for the taxon. It encapsulates the background risk of extinction of the taxon, a benchmark likely to approximate the risks faced by many natural populations free of post-1750 disturbance regimes, and providing a standard against which to compare the relative risks faced by different taxa. It should take into account factors such as seed bank

dynamics, disturbance response mechanisms, life history, demographics, outbreeding/selfing characteristics, and genetic homogeneity. The values for F should be based on the best available population model.

In the absence of a species-specific model, F may be calculated based on a simple birth and death model. We have constructed such a model (Table 9b) and have calculated values of F for several taxa, based on detailed Population Viability Analyses for individual species and on more generic models reflecting broad life-history traits. Table 9b is intended only as a guide, and anyone using the method should provide the best estimate that they are able.

The values for survival and variation and hence for F may be adjusted to reflect the biology and life history of a taxon that are likely to affect the background risks of decline. For example, persistent soil-stored seed will reduce the probability of extinction of a local population, and will reduce the value of F. Species with poor dispersal abilities may require larger F values (Table 9c). Any such modifications could be guided by a simple model that accounts for demographic variation and moderate levels of environmental variation in an unstructured or stage-structured single population model without density dependence. The number F may be smaller than the known number of individuals (frequently F would be smaller than the current population size, especially for abundant species). The number represents reproductively mature plants. If F is fewer than the number that currently exists, then it implies that if there are no detrimental, human caused or human managed stochastic processes or catastrophes to deal with, then we may experience the loss of some individuals and still expect the species to have an acceptably low risk of quasiextinction. In estimating F, it is important that biologists use the best available model for each species.

Table 9b Examples of values of F. In all of the models below, we assumed that the average birth and death rates in the population were such that, under deterministic condition, the population would persist indefinitely without increasing (ie., the growth rate λ=1).

Examples of Values of F

Taxon[1]	Longevity (life expectancy)	Regen. responsAPPENDIX 5.2	CV	F	Regen. modAPPENDIX 5.2
Example 1	1	Continuous	0.5	20,000	Seed
Example 2	2	Disturbance	0.3	10,000	Seed
Example 3	5	Continuous	0.2	3,000	Seed
Example 4	100	Continuous	0.1	500	Seed
Grevillea caleyi[3]	50	Disturbance		2,000	Seed
Banksia goodii[4]	300	Continuous		100	Resprouter
Banksia cuneata[5]	40	Disturbance		2,500	Seed
Alnus incana[6]	20	Continuous		320	Resprouter
Arisaema triphyllum[7]		Continuous		5100	Resprouter
Pentaclethra macroloba[8]	100+	Continuous		1080	Seed

1. The first four examples are based on a generic model that assumed a simple, unstructured population in which survival and reproduction were sampled from a binomial distribution, and the vital rates were sampled independently from a normal distribution (see Burgman *et al*., 1993). The CV represents the level of environmental variation in λ from year to year, without autocorrelation or density dependence (see also Menges, 1998).

2. A variety of life history strategies for plants may provide some guidance towards establishing the size of a population that is likely to persist for 50 years, given a disturbance regime free of post-1750 anthropogenic disturbances.

3. After Regan *et al*. (1998)

4. After Drechsler *et al*. (1998). The model uses pessimistic assumptions concerning survival following fire, based on limited field data. Different assumptions produce an *F* value of around 100.

5. After Burgman and Lamont (1992).

7. After Bierzychudek (1982); the model used the pooled data for two populations , with transition probabilities reduced uniformly by 10% to reduce λ to 1.01, so that the model represents a population persisting at or close to its natural carrying capacity.

8. After Hartshorn (1975); the model is for a large canopy species dominating the tropical wet forests in the Atlantic lowlands of Costa Rica. There is limited seed dormancy and no asexual reproduction. The latter two models are based on implementations in Ferson (1991).

These species represent several of the functional groups identified by Noble and Slatyer (1981) including obligate seeders and resprouters, species with short and long-lived seed banks, and species in which adults are susceptible to disturbance.

Other Factors Affecting F.

Positive Circumstance (Resilience)	**Negative Circumstances** (Vulnerability)
Many large populations	Few small, isolated populations
Widespread distribution	Very restricted distribution
Habitat generalist	Habitat specialist
Not restricted to a temporal niche	Restricted to a temporal niche
Not subject to extreme habitat fluctuations	Subject to extreme habitat fluctuations
No particular genetic vulnerability	Genetic vulnerability
Vigorous post-disturbance regeneration	Weak post-disturbance regeneration
Rapid, vigorous growth	Slow, weak growth
Quickly achieves site dominance	A poor competitor
All life stages resilient	Particular life stages vulnerable
Short time to set first seed / produce propagules	Long time to set first seed / propagules
Long reproductive lifespan	Short reproductive lifespan
Robust breeding system	Dysfunctional breeding system
Readily pollinated	Not readily pollinated
Reliable seed production	Extremely variable seed production
High seed production and viability	Low seed production and viability
Long seed / propagule viability	Short seed / propagule viability
Seed / propagules not exhausted by disturbance	Seed / propagules exhausted by disturbance
Good dispersal	Poor dispersal
Generally survives fire and other damage	Generally killed by fire and other damage
Not adversely affected by pre-1750 disturbance	Adversely affected by pre-1750 disturbance
Adapted to grazing, drought, fire, etc...	Not adapted to grazing, drought, fire. etc...
Able to coppice or resprout	Not able to coppice or resprout
Not vulnerable to pathogens, disease, insects, etc.	Vulnerable to pathogens, disease, insects, etc.
Not dependent on vulnerable mutualisms	Dependent on a vulnerable mutualism

Step 3. Identify populations or groups of populations that currently experience common disturbance regimes (termed disturbance regions). Perform all subsequent calculations on each disturbance region.

Disturbance regions represent areas of the landscape that are subject to common sources and intensities of disturbance. It will be necessary to characterise these differences in terms of their frequency and extent, and to estimate the time to recovery of the species following disturbance within each region. In this context, a disturbance is any process resulting from post-1750 human activities that affects the abundance and distribution of plant taxa.

Step 4. Estimate the density, D, of plants within their potential habitat, in units of ha/plant.

Biologists could use the expression

D = (area of potential habitat searched) / (number of adult plants found)

or some other estimate of the average density of reproductively mature plants within potential habitat. This density should reflect the long-term average density expected within potential habitat, accounting for the fact that the plants persist under the perturbations of a disturbance regime, in addition to any impacts considered explicitly here.

Step 5. Calculate the target area for reservation or protection, A_0.

This is the area of potential habitat required to support a taxon given particular life-history characteristics such that it has a less than 1% chance of falling below 50 individuals, once in the next 50 years,

$A_0 = D * F.$

Step 6. Identify relatively small-scale disturbance impacts affecting the species' potential habitat from which the species recovers within the management time-frame of 50 years. Use estimates of the characteristics of these disturbances to calculate the proportion of potential habitat that will be available to the species at any time.

Identify the different kinds of stochastic impacts that may lead to an area being unsuitable. This could be a single event such as a prescribed fire at a particular time of year, or a logging effect. More typically it will be a combination of events such as two or more fires in a short time interval. These are termed adverse regimes 1, 2, 3 etc. The average annual area of these impacts should generally be less than the total potential habitat. We assume that these events are randomly and independently distributed across the landscape with respect to the distribution of the taxon, a plausible model for a broad class of disturbance processes (Gardner *et al*. 1987; Johnson and Gutsell 1994; Pacala *et al*. 1996; McCarthy and Gill 1997). Given that the habitat requires n years before it is again suitable for the taxon (termed the recovery time, representing the time between disturbance and the appearance of reproductively mature adults), we need to calculate the average proportion , S, of potential habitat available to a species each year.

If a disturbance has a characteristic annual probability independently distributed across the landscape, the expected proportion of areas that are n years old is equal to the proportion of the area disturbed n years ago (=p) multiplied by

the probability that these areas were not disturbed subsequently $(1-p)^{n-1}$ (McCarthy and Burgman, 1995) The parameter p may be estimated if any of the following characteristics are known;

- the proportion of the landscape (or the population) that is, on average, more than n years old,
- the proportion of the landscape (or the population) that is, on average, less than n years old,
- the average size of disturbance events (annual total area disturbed within the potential habitat), or
- the return time between events (the average time between disturbances at a point in the landscape).

The parameter n_d is the time between disturbance and the point at which a plant has developed sufficiently to reproduce. It includes the time to reach reproductive maturity for plants that are eliminated by recurrent disturbance, such as obligate seeders. We may also define n_u, the time between disturbance and the point at which the habitat has developed so that it is unsuitable for the species. This will be relevant for species that inhabit early successional stages within a landscape and which rely on periodic disturbances of particular kinds for germination or regeneration. For these species, the absence of a disturbance may result in unfavourable habitat beyond n_u years.

Given the parameter for each type of disturbance impact with the disturbance region in question,

p_x = the proportion of the potential habitat disturbed on average each year by process x,

the proportion of the landscape, p_u, that is undisturbed each year by a total of z disturbance processes and which will support mature individuals of the species in question is

$$p_u = (1- p_1)*(1- p_2)* \ldots *(1- p_z)$$

where p_1, p_2 are the probabilities of disturbance from processes 1, 2, and so on for z independent processes. Relatively small-scale disturbances are modelled as processes that have similar consequences, making the areas 'young' with respect to the ecology of the species in question. Given

n_d = the recovery time for the species following a disturbance, and

n_u = the number of years after the disturbance until the habitat is no longer suitable for the species,

the average proportion, S, of the potential habitat that will be suitable for the species at any time within the management time horizon of 50 years, accounting for disturbances that are either too frequent or too infrequent, is

$$S = p_u^{n_d} - p_u^{n_u}$$

The parameters n^d and n^u encapsulate the window of opportunity for the species. Before n^d, the area is too young for a seed producing individual to have developed, and after n^u, the area is too old to support the species. We have assumed that the recovery time following disturbance is the same, irrespective of the kind of disturbance.

For example, assume a taxon is adversely affected by logging, and this disturbance regime is imposed on the background of a natural fire regime. The recovers naturally after logging because a soil-stored seed bank in stimulated to regenerate by logging. However, suppose there is a 10 year time lag between the logging event and the development of adults that will replenish the seed bank. If the rotation time for the logging impacts is 80 years, then the probability of disturbance for a site, p, is 1/80. The proportion of the potential habitat that will be suitable for the taxon, given this additional source of disturbance, is

$$S = (1 - \frac{1}{80})^{10} = 88\%$$

That is, about 12% of the potential habitat, on average, will support populations that are too young to withstand other disturbances such as unplanned wildfires because they will have not produced seed to replenish the seed bank that was depleted following the most recent disturbance. To conserve the taxon, we should assume that the logging activities effectively reduce available habitat by 12%, and protection strategies should take this stochastic impact into account.

Step 7 - Refine the target area (A_1) required to take into account habitat that is temporarily unsuitable due to disturbances defined in Step 6. The target area, A_1, such that we may expect in any one year that an area equivalent to A_0 will be available for a taxon is

$$A_1 = A_0/S$$

It may be that the disturbance regimes are too complex to allow a reliable estimate of the parameters p and n. In such circumstances, it may be easier directly to estimate S, the proportion of the potential habitat that is suitable for occupation by the species.

Step 8. Identify any trends that irreversibly affect the species' potential habitat.

Such adverse trends are events which cause permanent loss of habitat (at least within the management time frame) and the consequent permanent loss of the species at a site. Examples may include land clearance for agriculture, roading and urban development, or salinisation processes. The parameter L is the rate of loss of potential habitat, H, per year due to irreversible attrition. The proportion of the target area, A_1, remaining at the end of 50 years is $A_1(1 - L)^{50}$ and the area of potential habitat required at present such that A_0 could be expected to be available 50 years hence, given i such processes, is

$$A_2 = \frac{A_1}{c_1(1 - L_1)^{50} + c_2(1 - L_2)^{50} + ... + (1 - \sum c_i)}$$

where c_1, c_2 represent the proportion of the potential habitat threatened by processes 1 and 2. The values of c_i should sum to be less than or equal to 1. This formula assumes that a proportion, c_1, of the habitat is threatened by process 1. Of the remaining area, a proportion c_2 is threatened by process 2, and so on. If processes 1 and 2 are coincident in space (such as land clearance and salinisation) then they should be treated as a single process. This equation can be used to distinguish between reserved and non-reserved components of the target area if there is a differential susceptibility to irreversible impacts according to tenure. For example, land clearance may be a threat to a taxon on one tenure but not on another.

Step 9. Identify processes that permanently reduce the density of populations within their area of occupancy.

Ordinarily, such processes will not necessarily eliminate the taxon from any location but may reduce the viability of a taxon at a site. Examples may include grazing of livestock or increased disease rates which result in reduced local population density. Estimate values for r_i, the proportional reduction in local density due to each of the i impacts. The area of potential habitat required to ensure the level of persistence specified at the outset is

$$A_3 = A_2/(\Pi\ r_i).$$

where Π represents the product of i numbers. For example, if grazing reduces the average density of a population within its extent of occurrence by 10% and a disease reduces population density by 20%, then r for grazing is 0.9 and r for disease impacts is 0.8. The area A_3 will equal $A_2/(0.9*0.8)$.

This is the final step in estimating the area required for a particular taxon within each disturbance region, such that it has a less than 1% chance of falling below 50 individuals once in the next 50 years. The steps between **3** and **9** are calculated for each disturbance region, giving a value for A_3 for each region. Steps **10** and **11** may be used to guide the allocation of this area among different potential locations.

Step 10. Identify catastrophes likely to affect the species' potential habitat

Catastrophes include larger scale, infrequent disturbances affecting the species' habitat, such as floods, intense wildfires or disease outbreaks. The average annual area affected by these impacts should be much greater than the total potential habitat area of each population of the species. For the purposes of applying this equation, a population is defined as any group of individuals that is affected by a common catastrophe.

Determine the annual probability (henceforth referred to as the frequency, f) of each catastrophe. In some cases this will involve a certain amount of intelligent guess-work. In case of events such as extreme fires, the data may be the product of an explicit model. The number of populations a species needs to persist depends on the frequency of these catastrophes. The greater the frequency of catastrophes, the greater the number of populations. If, for example, the decision process includes a constraint such that at least five populations of each species should be conserved (when five or more exist), then

$$N = \max (5, -3 / (\log_{10} (1 - e^{(-10f)})))$$

where f is the annual probability of a catastrophe and N is the minimum number of populations required. The expression above is conditioned such that if there is a catastrophic event every 10 years, $N = 15$, and if there is an event every 1000 years, $N = 5$. Catastrophes do not affect the area required. The equation for catastrophes approaches 0 asymptotically as the probability of a catastrophe approaches 0. In practice, if there is no risk of a catastrophe then there is no advantage in spreading the risk among populations, and the minimum number of populations would be selected. This equation assumes that populations may be selected far enough apart to ensure that catastrophes occur independently, requiring a minimum level of separation that exceeds the maximum area affected by each catastrophe. It also assumes that the dispersal mechanisms of the species are sufficient that populations eliminated by a catastrophe may be recolonised by propagules or dispersing individuals. Thus, any advice on the number of populations required resulting from the application of this equation should be conditioned by knowledge of the biology of the species and by other factors such as selection of populations to protect genotypic variation using factors such as variation in the taxon's morphology and habitat, and encompassing the taxon's range.

Step 11. Add regional targets together to achieve a species target. Select areas such that the total area protected is sufficient to meet the condition that the taxon is less than 1% likely to fall below 50 individuals within the next 50 years.

An area A_3 has been calculated for each disturbance region. This is the area that would be required if the target area for the taxon were to be selected from that region alone. The areas A_3 differ because potential habitat subjected to different disturbances has different conservation value. Different levels of protection are afforded by different types of 'reserves'. Not all will be equally effective at offsetting extinction risks. The different values of A_3 reflect the different disturbance regimes. Land is selected under Step 11 according to the ability of land from each disturbance regime to maintain viable populations. Thus, the value of A_3 from a large National Park may be half that of A_3 calculated for a prescription zone. Targets for conservation may be met in a number of ways and the formula in step 11 ensures that the target is met, irrespective of the way in which land is allocated for a species among different disturbance regions.

The calculations between steps 1 and 9 result in a value of A_3 for each of k disturbance regions which may be denoted A_3^k. Select areas from the k disturbance regions such that

$$\frac{X^1}{A_3^1} + \frac{X^2}{A_3^2} + \frac{X^3}{A_3^3} + \ldots + \frac{X^n}{A_3^n} \geq 1$$

where X^n areas are selected from n disturbance regions and the values for A^n are the required areas, A_3, calculated for each of the n disturbance regions.

Discussion and examples

The process of setting conservation targets is not met with the above equations in isolation. Clearly, subsequent work is required to identify which areas should be protected, and target areas may change as management prescriptions change or as distributional and ecological knowledge improves. For example, if the total target area required for the persistence of the species is less than the area of habitat currently occupied by and managed for the conservation of the species, then there will be no additional areas required. If the area required exceeds the area of potential habitat, then all potential habitat should be targeted for conservation, and additional management strategies may be needed. In addition, the planning process may take into account the conservation status of species derived from independent rule sets, or the taxonomic uniqueness of a species.

In making decisions about plant conservation, not all targets will be met. In some cases, the required habitat will not be available. In other cases, the habitat may not be able to be protected or managed, even when it is available. Resource constraints and political and public priorities contribute to conservation outcomes. The process of identifying land to satisfy individual species targets may also be constrained by the need for efficiency and comprehensiveness in achieving other conservation goals. The equations above are intended to provide a framework within which the relative susceptibility of plant taxa to explicitly defined disturbance regimes may be included in the conservation planning process.

The statistic A_3 calculated for each taxon may be used to provide information in addition to a simple area statement. The ratio

$$I_M = \frac{X^1}{A_3^1} + \frac{X^2}{A_3^2} + \frac{X^3}{A_3^3} + \ldots + \frac{X^n}{A_3^n}$$

gives an indication of how well the target has been met. When it equals 1, the target has been met. When it is greater than 1, the target has been exceeded, and when it is less than 1, the target has not been achieved. The ratio

may also be used to provide guidance and support for the ranking of priorities for negotiations regarding land use and tenure.

Similarly, A_3 may be compared with H. One may calculate the ratio

$$I_H = \frac{H^1}{A_3^1} + \frac{H^2}{A_3^2} + \frac{H^3}{A_3^3} + ... + \frac{H^n}{A_3^n}$$

If available habitat H, is substantially less than the area required, I_M will be small and it implies that even the protection of all existing potential habitat is unlikely to sustain the species. The larger the discrepancy, the greater the threat to the species continued existence. The smaller the number, the greater the imperative to do more than just conserve land (passively). Some examples will illustrate the utility of the protocol.

Boronia keysii

This species is listed in Queensland and nationally as Vulnerable and it is endemic to Queensland. It is a sprawling shrub to about 2m, and it lives for 15 to 30 years. It is an obligate seeder, with a long-lived seed bank that is exhausted by disturbance. A mildly explosive pod provides some short-distance dispersal. There are about 10,000 known adult plants in 15 populations in mixed low Eucalypt and Brushbox woodland. The juvenile period is about 3 years and an absence of fire for more than about 50 years would exhaust the seed bank.

Step 1. Area of potential habitat (H): 150 ha

Step 2. Required population target in the absence of additional disturbance (F): 2,500

Step 3. Single disturbance regime.

Step 4. Density (D): 0.015 ha/plant

Step 5. Target area (A_0): 0.015 * 2,500 = 37.5 ha.

Step 6. Probability of additional fire (two fires within 4 years, exhausting the seed bank)

p = 0.3. The proportion of suitable habitat, $S = (1-0.3)^4 - (1-0.3)^{51} = 0.24$.

Step 7. Target area accounting for additional disturbance: $A_1 = A_0/S = 37.5/0.24 = 156.25$ ha.

Step 8. Trends that irreversibly affect the species' potential habitat include

Agricultural clearing (50% of habitat susceptible at 10% per year)

Changed hydrology (20% of habitat susceptible at 5% per year)

Weed invasion (6% of habitat susceptible at 5% per year)

$$A_2 = \frac{156.25}{0.5(1-0.1)^{50} + 0.2(1-0.05)^{50} + 0.06(1-0.05)^{50} + (1-0.76)} = 595 \text{ ha}$$

Step 9. The density of populations is not affected within their area of occupancy, so $A_3 = A_2$.

Step 10. There are no obvious catastrophes which may affect the populations.

Step 11. There is only one disturbance region.

The ratio of available habitat (H) to required habitat, (A_3), is 150/595 = 0.252. Because the index is less than 1, it suggests that under current disturbance conditions, the area of habitat available is not sufficient to ensure that the species has a better than 99% chance of surviving for the next 50 years. However, if all of the threats to which the species is subject and from which there is no recovery could be eliminated (land clearance, changed hydrology and

weed invasion: Step 8) then the target could be achieved by protecting all remaining habitat. Another alternative may be to manage the fire regime to reduce the incidence of too frequent fires.

Parsonsia dorrigoensis

This species is a sparsely distributed vine of forests on the north coast of New South Wales. It recruits continuously but infrequently and is killed by fire. There is no persistent seed bank and age to maturity is about 4 years. Plants produce fewer than 1 pod per plant per year. About 1500 plants were found within a search of 375 ha of potential habitat.

Step 1. Area of potential habitat (H): 3,500 ha

Step 2. Required population target in the absence of additional disturbance (F): 4,000

Step 3. Three disturbance regions.

Region 1. Ballinger River, New England, Ballinger River, Horseshoe Road (2000 ha)

Region 2. Dorrigo Tops (500 ha)

Region 3. Conglomerate - Orara (1000 ha)

For Region 1.

Step 4. Density (D): 0.25 ha/plant

Step 5. Target area (A_0): 0.25 * 4,000 = 1,000 ha.

Step 6. Probability of fire, $p = 0.02$. The proportion of suitable habitat, $S= (1-0.02)^4 = 0.922$.

Step 7. Target area accounting for additional disturbance: $A_1 = A_0/S = 1000/.922 = 1,084$ ha.

Step 8. There are no trends that irreversibly affect the species' potential habitat, so $A_2 = A_1$

Step 9. The density of populations is not affected within their area of occupancy, so $A_3 = A_2$.

For Region 2.

Step 4. Density (D): 0.25 ha/plant

Step 5. Target area (A_0): 0.25 * 4,000 = 1,000 ha.

Step 6. Probability of fire, $p = 0.04$. The proportion of suitable habitat, $S= (1-0.04)^4 = 0.781$.

Step 7. Target area accounting for additional disturbance: $A_1 = A_0/S = 1000/.781 = 1,177$ ha.

Step 8. There are no trends that irreversibly affect the species' potential habitat, so $A_2 = A_1$

Step 9. The density of populations is not affected within their area of occupancy, so $A_3 = A_2$.

For Region 3.

Step 4. Density (D): 0.25 ha/plant

Step 5. Target area (A_0): 0.25 * 4,000 = 1,000 ha.

Step 6. Probability of fire, $p = 0.05$. The proportion of suitable habitat, $S= (1-0.05)^4 = 0.774$.

Step 7. Target area accounting for additional disturbance: $A_1 = A_0/S = 1000/.781 = 1,227$ ha.

Step 8. There are no trends that irreversibly affect the species' potential habitat, so $A_2 = A_1$

Step 9. The density of populations is not affected within their area of occupancy, so $A_3 = A_2$.

Combining all three disturbance regions

Step 10. There are no obvious catastrophes which may affect the populations.

Step 11. There are three disturbance regions, so there are numerous solutions that will satisfy the required target area. For example, option 1 may be to select all of the required land from disturbance region 1, giving

$$\frac{1084}{1084}+\frac{0}{1177}+\frac{0}{1227}=1$$

Alternatively, the strategy may be to select equally valuable parcels of land from each of the three disturbance regions,

$$\frac{361}{1084}+\frac{392}{1177}+\frac{409}{1227}=1$$

More land is required from disturbance region 3 because it experiences more frequent fires and a larger proportion of the habitat on average is unsuitable. In all cases, the amount of available habitat(H) exceeds the required habitat, (A_3), and both of the above solution provide a solution in which I = 1. This set of calculations assumes that the species is able to recolonise a burnt area immediately following fire. It is unlikely that this assumption is correct. It may well be worth recalculating the above equations, assuming that there is a lag between a fire and reappearance of mature adults that includes both developmental time from seed and the average time taken to recolonise. If the delay is, say, 20 years, then this could be introduced by changing the power in step 6 from 4 to 24.

Austromyrtus gonoclada

This species is a small tree endemic to Queensland and considered by both State and National classifications systems to be endangered. Its extent of occurrence is 90km^2, its area of occupancy is 8 ha and its area of potential habitat is 20 ha. Its life expectancy is probably 50-100 years, it resprouts following fire and has a short-lived seed bank. It has limited reproductive capacity and seed is dispersed by birds and mammals. A total of 90 mature individuals are known from 6 populations on riverine alluvial soils.

Step 1. Area of potential habitat (H): 20 ha

Step 2. Required population target in the absence of additional disturbance (F): 1,500

Step 3. Single disturbance regime.

Step 4. Density (D): 0.22 ha/plant

Step 5. Target area (A_0): 0.22 * 1,500 = 330 ha.

Step 6. The species experiences no stochastic impacts from which recovery is possible.

Step 7. Target area accounting for additional disturbance: $A_1 = A_0 = 330$ ha.

Step 8. Trends that irreversibly affect the species' potential habitat include clearing for urban development (50% of habitat susceptible at 4% per year)

$$A_2 = \frac{330}{0.5(1-0.04)^{50}+(1-0.5)} = 584 \text{ ha}$$

Step 9. The density of populations is not affected within their area of occupancy, so $A_3 = A_2$.

Step 10. There are no obvious catastrophes which may affect the populations.

Step 11. There is only one disturbance region.

The ratio of available habitat (H) to required habitat, (A_3), is 20/584 = 0.034. The index is very much less than 1, suggesting that the species has a much less than 99% chance of surviving for the next 50 years. Even if the land clearance threat was to be eliminated, the area of available habitat would still fall far short of the required target, suggesting that active management in the form of habitat rehabilitation, replanting and *ex situ* conservation measures are required.

These examples make it clear that application of a common set of rules does more than produce a number. The protocol serves to focus attention on the causes of threat, and may lead to recommendations that directly affect the most important processes. In addition, the protocol serves to put the threats faced by different species in perspective, compared to the threats faced by others. There may be many species on a list of endangered taxa, but the prospects for *Austromyrtus gonoclada* are such that conservation resources should perhaps be directed towards it before the other two species evaluated here. A further advantage is that the assumptions made in reaching conclusions are explicit and the equations provide a means by which these assumptions may be relaxed. For example, we assumed immediate recolonisation of disturbed sites by *Parsonsia dorrigoensis.* The assumption is in plain view and we may re-evaluate our priorities after relaxing this assumption and recalculating the equations.

In general, it would be wise to calculate target areas and rank priorities for species using a range of values, from best guesses to lower bounds. If ranges are collected for all variables, then area targets may be estimated with appropriate minimum and maximum ranges. Apart from representing the reliability of target area estimates, this makes it clear that estimates from the equity equation are only approximations, and that they should be used to support decisions, rather than to be the sole basis for decisions. The equity equation results are only to be used as guides for reservation/management targets. In the end, all decisions should be tempered by expert judgement and constrained by information and priorities that are not part of these few simple equations.

In conservation planning, life-history attributes govern the kinds of management actions that are identified as likely to be detrimental or beneficial for the chances of persistence of a species. With the method above, we intend to provide a general protocol that may act as a decision-support tool for plant conservation that is sensitive to the life-history of the species and the disturbance regime it experiences. It is not intended to be a panacea. It would never be possible to capture the full spectrum of ecological and management processes with a few equations. The models are too simple to be reliable in all circumstances. Decisions should be tempered by expert judgement and information on priorities gleaned from as many additional sources as possible. Data are usually insufficient to address adequately questions such as the long-term viability of species. The data for the parameters above will only rarely be based on reliable field measurements. Expert judgement will play an important part. Experts may apply the equations using both best estimates and lower bounds representing the most risky end of the distribution of each parameter. By ranking on both these estimates, the results will provide information on the sensitivity of priorities to the reliability of the data. They will also represent estimates of the relative conservation requirements of the species for the medium term using a transparent and explicit methodology that can assess species in a consistent manner, and provide quantitative objectives that may be improved through ongoing survey, research and monitoring.

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References

Austin, M. P., Nicholls, A. O. and Margules, C. R. (1990) Measurement of the realised qualitative niche: Environmental niches of five *Eucalyptus* species. *Ecological Monographs* 60, 161-177.

Bierzychudek, P. (1982) The demography of jack-in-the-pulpit, a forest perennial that changes sex. *Ecological Monographs 52*, 335-351.

Boyce, M. S. (1992) Population viability analysis. *Annual Review of Ecology and Systematics* 23, 481-506.

Briggs, J. D. and Leigh, J. H. (1996) *Rare or Threatened Australian plants*. CSIRO, Canberra.

Burgman, M. A. and Gerard, V. A. (1988) A stage-structured, stochastic population model for the giant kelp *Macrocystis pyrifera*. *Marine Biology* 105, 15-23.

Burgman, M. A. and Lamont, M. A. (1992) A stochastic model for the viability of *Banksia cuneata* populations: environmental, demographic and genetic effects. *Journal of Applied Ecology* 29, 719-727.

Burgman, M. A., Ferson, S. and Akçakaya, H. R. (1993) *Risk assessment in conservation biology*. Chapman and Hall, London.

CoA (1992) *National Forest Policy Statement*. Commonwealth of Australia. Australian Government Publishing Service, Canberra.

Drechsler, M., Lamont, B. B., Burgman, M. A., Akçakaya, H. R., Witkowski, E. T. F. and Supriyadi. (in press) When the 'persistence niche' fails: modelling the recovery of *Banksia goodii* after fire and land clearing. *Biological Conservation*.

Eriksson, O. (1996) Regional dynamics of plants: a review of evidence for remnant, source-sink and metapopulations. *Oikos* 77, 248-258.

Ferson, S. (1991) RAMAS/Stage. *Generalised stage-based modeling for population dynamics*. Applied Biomathematics, New York.

Gardner, R. H., Milne, B. T., Turner, M. G. and O'Neill, R. V. (1987). Neutral models for the analysis of broad-scale landscape patterns. *Landscape Ecology* 1, 19-28.

Groenendael, J. M. van and Slim, P. (1988) The contrasting dynamics of two populations of *Plantago lanceolata* classified by age and size. *Journal of Ecology* 76, 585-599.

Hartshorn, G. S. (1975) A matrix model of tree population dynamics. In, F. B. Golley and E. Medina (eds) *Tropical Ecological Systems*. Springer-Verlag, New York.

IUCN (1994) *IUCN Red List Categories. As approved by the 40th Meeting of the IUCN Council*. International Union for the Conservation of Nature, Species Survival Commission, Gland, Switzerland.

JANIS (1997) Nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system for forests in Australia. A report by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee. *National forest conservation reserves: Commonwealth proposed criteria*. Commonwealth of Australia, Canberra.

Johnson, E. A. and Gutsell, S. L. (1994). Fire frequency models, methods and interpretations. *Advances in Ecological Research* 25, 239-287.

Keith, D. (1990) Rare and biogeographically significant vascular plant species of the Eden Region, south-eastern New South Wales: a listing for the fine-filter approach.

Klemow, K. M. and Raynal, D. J. (1983) Population biology of an annual plant in a temporally variable environment. *Journal of Ecology* 71, 691-703.

Lynch, A. J. J. (1994) *Conservation biology and management of 16 rare or threatened Fabaceae species in Tasmania*. MSc thesis, Department of Geography and Environmental Studies, University of Tasmania, Hobart.

Menges, E. S. (1990) Population viability analysis for an endangered plant. *Conservation Biology* 4, 52-62.

Menges. E. S. (1998) Evaluating extinction risks in plant populations. In, P. L. Fiedler and P. M. Kareiva (eds) *Conservation Biology*, 2nd edition. Chapman and Hall, New York. pp 49-65.

Margules, C. R., Nicholls, A. O. and Pressey, R. L. (1988) Selecting networks of reserves to maximise biological diversity. *Biological Conservation* 43, 663-676.

Mack, R. N. and Pyke, D. A. (1983) The demography of *Bromus tectorum*: variation in time and space. *Journal of Ecology* 71, 69-93.

McCarthy, M. A. and Burgman, M. A. (1995). Coping with uncertainty in forest wildlife planning. *Forest Ecology and Management* 74, 23-36.

McCarthy, M. A. and Gill, A. M.. (1997). Fire modelling and biodiversity. In: Klomp, N. and Lunt, I. (eds). *Frontiers in Ecology: Building the Links.* Elsevier Science Ltd., Oxford. p. 67-79.

Moloney, K. A. (1988) Fine-scale spatial and temporal variation in the demography of a perennial bunchgrass. *Ecology* 69, 1588-1598.

Nantel, P., Gagnon D. and Nault, A. (1996) Population viability analysis of American ginseng and wild leek harvested in stochastic environments. *Conservation Biology* 10, 608-621.

Noble, I. R. and Slatyer, R. O. (1981) Concepts and models of succession in vascular plant communities subject to recurrent fire. In, A. M. Gill, R. H. Groves and I. R. Noble (eds) *Fire and the Australian biota*. pp. 331-335. Australian Academy of Science, Canberra.

Oostermeijer, J. G. B., Brugman, M. L., Boer, E. R. and den Nijs, H. C. M. (1996) Temporal and spatial variation in the demography of *Gentiana pneumonanthe*, a rare perennial herb. *Journal of Ecology* 84, 153-166.

Ouborg, N. J. (1993) Isolation, population size and extinction: the classical and metapopulation approaches applied to vascular plants along the Dutch-Rhine system. *Oikos* 66, 298-308.

Pacala, S. W., Canham, C. D., Saponara, J., Silander, J. A., Kobe, K. K. and Ribbens, E. 1996. Forest models defined by field measurements: estimation, error analysis and dynamics. *Ecological Monographs* 66, 1-43.

Possingham, H. P., Lindenmayer, D. B. and Norton, T. W. (1993) A framework for the improved management of threatened species based on population viability analysis. *Pacific Conservation Biology* 1, 39-45.

Pressey, R. L. (1994) *Ad hoc* reservations: forward or backward steps in developing representative reserve systems. *Conservation Biology* 8, 662-668.

Pressey, R. L. (1995) Conservation reserves in NSW. Crown jewels or leftovers? *Search* 26, 47-51.

Pressey, R. L., Possingham, H. P. and Margules, C. R. (1996) Optimality in reserve selection algorithms: when does it matter and how much? Biological Conservation 76, 259-267.

Pressey, R. L., Possingham, H. P. and Day, J. R. (1997) Effectiveness of alternative heuristic algorithms for identifying indicative minimum requirements for conservation reserves. *Biological Conservation* 80, 207-219.

Quintana-Ascencio, P. F. and Menges, E. S. (1996) Inferring metapopulation dynamics from patch-level incidence of Florida scrub plants. *Conservation Biology* 10, 1210-1219.

Roerdink, J. B. T. M. (1989) The biennial life strategy in a random environment. *Journal of Mathematical Biology* 27, 309-319.

Shaffer, M. L. (1981) Minimum population sizes for species conservation. *Bioscience* 31, 131-134.

Silvertown, J., Franco, M. and Menges, E. (1996) Interpretation of elasticity matrices as an aid to the management of plant populations for conservation. *Conservation Biology* 10, 591-597.

Taylor, B. L. (1995) The reliability of using population viability analysis for risk classification of species. *Conservation Biology* 9, 551-558.

Venable, D. L. and Brown, J. S. (1988) Th selective interactions of dispersal, dormancy, and seed size as adaptations for reducing risks in variable environments. *American Naturalist* 1, 360-384. Appendix 1.2 Review of Conservation Protocols

APPENDIX 1.2 REVIEW OF CONSERVATION PROTOCOLS

Threatened Flora Expert Panel Review of the

Flora Prescription Component of Existing Conservation Protocols

applied to Forestry Activities in North-Eastern New South Wales:

Outcomes and Recommendations from the

Threatened Flora Conservation Requirements Workshop

Convened by CRA Unit, NPWS Northern Zone,

Coffs Harbour, 13th-17th July 1998.

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Introduction

The Comprehensive Regional Assessment (CRA) of forests in NorthEastern NSW has significantly revised scientific understanding of the flora of the region, particularly the status of threatened or regionally significant vascular plant taxa. In particular, the CRA *Threatened Plant Surveys* project and the Environment Australia-led *Response To Disturbance* project have together allowed a panel of regional flora experts to evaluate the conservation status, plant ecology and life history attributes of the threatened, rare and regionally significant flora of Upper and Lower North-Eastern NSW on a species-by-species basis. This knowledge, combined with the expertise of panel members, provides the best available basis for the development of ecologically-based and scientifically credible management strategies that provide for the conservation of threatened plant species within production forest areas.

The Conservation Protocols were developed to facilitate the ecologically sustainable management of production forests and, in the case of flora, to achieve a balance between the conservation requirements of threatened plant species and timber production imperatives. All members of the Threatened Flora Expert Panel recognised that existing flora prescriptions fell short of achieving these outcomes.

The panel therefore presents the following recommendations for revision of the existing flora prescriptions and protocols as part of the *ESFM Review of Management* project. These recommendations represent the current level of knowledge of the relevant species, and are based as much as possible on sound ecological and botanical principles. Every effort has been made to ensure that the proposed strategy is straightforward, unambiguous and, most importantly, simple to implement at the operational level. Buffer sizes, population definitions and their intent is based on clear logic and expert knowledge of forest ecological processes. It must be emphasised that the arbitrary 'dilution' of any part of the recommended prescriptions will compromise their ecological integrity and the expert consensus on which they are based.

Overview

- Information from this forum will provide expert botanical and ecological knowledge that can be applied to an agreed administrative framework for the implementation of Conservation Protocols for threatened flora species.
- Continual review of the flora prescriptions, and the Conservation Protocols in general, is essential.
- There must be confidence in the adequacy and quality of the protocol survey effort and in the application of protocol prescriptions.
- The best approach is straightforward, unambiguous and simple to implement at the operational level.

Protocol Flora Species

The current protocol flora species list appears to have been hastily compiled, with a minimum of consultation with botanical experts. This list requires in-depth review in order to assess those plant species that are currently considered *not* to be threatened by 'specified' forestry activities, and to consider the addition of other threatened species to the protocols. Specifically, the panel recommends that the following taxa be included on the Conservation Protocols flora species list:

- Threatened species listed on Schedule 1 & 2 of the TSC Act;
- Threatened species recommended by the Threatened Flora Expert Panel for listing on the TSC Act;
- Threatened species that occur largely on private property. This is intended to provide information for the possible future application of conservation protocols to private land forestry;
- Newly discovered species or species newly recorded for the State. If the species is poorly known, the precautionary principle shall apply, and the most conservative prescription implemented to minimise the impact of forestry activities on the species and its habitat;
- Species for which very few records or no recent records exist. The panel considers that such species may prove to be of conservation significance, and that their inclusion on the list will increase general awareness of their conservation status.

It is recommended that the full list of species outlined above be appended to the Conservation Protocols. Those species that are unlikely to occur within the net harvest area or that are unlikely to be otherwise impacted on by specified forestry activities shall be identified as such on this list.

Specified Forestry Activities

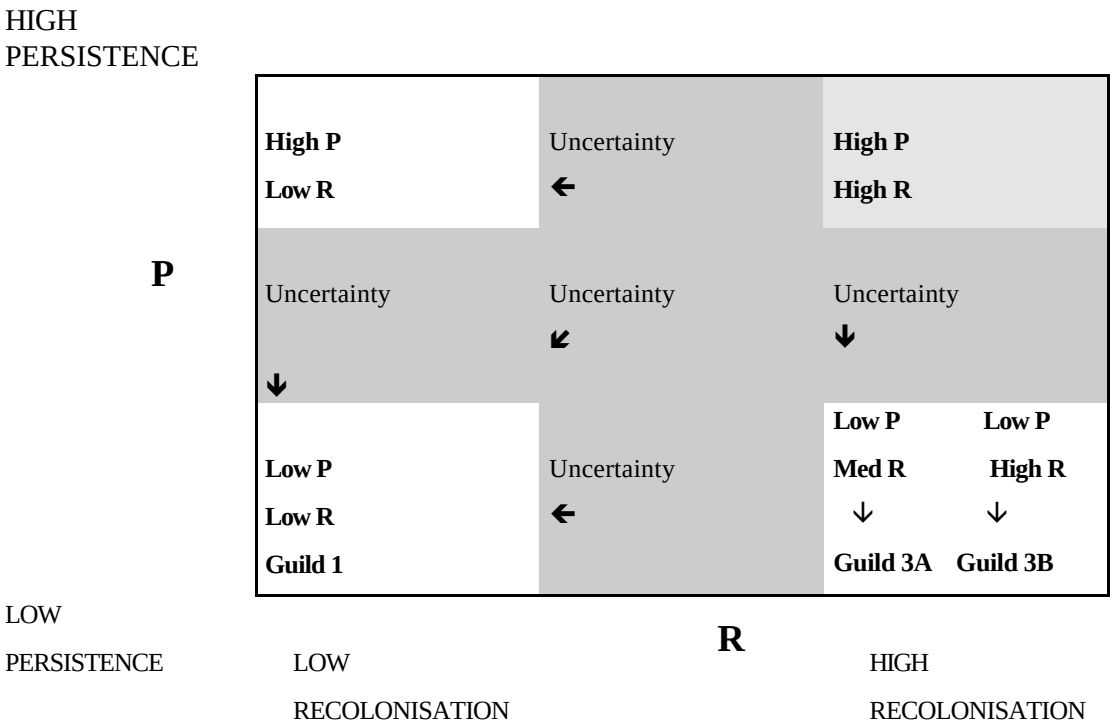
The panel agreed that, as well as the existing activities defined under the term 'specified forestry activities', the following activities must also be included in the protocol definition:

- Road maintenance, grading, drain construction, and spraying of herbicides;
- Grazing; and
- Development of recreational facilities.

The Functional Guilds

It was generally agreed that the present grouping of species into groups of functional guilds is problematic, although the actual life-attribute classes used are logical. An alternative functional guild classification is recommended. This system incorporates the ecological concept of species resilience, which is a combination of a plant species persistence, including longevity and the ability to recover from disturbance, and recolonisation, including the ability to recruit into habitat post-disturbance (Figure 1). This scheme is analogous to that outlined by Noble and Slatyer (1980), although it should be noted that they use the term 'tolerance' where 'recolonisation' is used in this report.

Figure 9d: Chart of Functional Guilds based upon Vital Attributes (cf. Noble & Slatyer, 1980)



The actual functional guilds that will have prescriptions applied are the unshaded boxes in the above diagram. By providing a continuum of nine classes into which a plant species may be placed, the precautionary principle is more easily applied when assessing a species that may fall into one of the 'uncertainty' categories, which in lay-terms would equate to such categorisations as 'fairly good recolonisation', 'moderately low persistence', 'probably able to recolonise disturbed sites quickly', etc. Thus, for a species to be definitively categorised into 'High P, High T', for instance, knowledge of the species' autecology, response to disturbance and demographics must be considered to be very good, otherwise uncertainty would tend to relegate it to a lower resilience category.

The panel considers that two to three days would be required to classify the full list of species, as discussed above, into functional guilds.

It is recommended that this panel be re-convened to carry out a classification of protocol flora species into functional guilds for the purpose of assigning flora prescriptions to those functional guilds.

Prescriptions for Threatened Plant Taxa

The panel unanimously agrees that the current flora prescriptions fail to achieve a balance between the requirements of threatened plant conservation objectives and the operational imperatives of timber production. An alternative set of prescriptions are presented here, as agreed by all panel members. Figure 2 illustrates how the agreed prescriptions are to be applied to each of the functional guilds defined in Figure 1.

Chart of Prescriptions based upon Functional Guilds

HIGH PERSISTENCE

P

High P **Low R** **BASELINE** **PRESCRIPTION 1**	Uncertainty ←	**High P** **High R** **NO PRESCRIPTION-** **DUE CARE**
Uncertainty ↙	Uncertainty ↓	Uncertainty ↓
Low P **Low R** **BASELINE** **PRESCRIPTION 1**	Uncertainty ←	**Low P** **Low P** **Med R** **High R** **2A** **2B** **PRESCRIPTION**

LOW PERSISTENCE

R

LOW RECOLONISATION

HIGH RECOLONISATION

Buffers

When considering the width of an exclusion buffer around plant populations and individuals, the panel took into consideration the ecology of the species, the logic of minimising microclimatic changes within plant populations, and the operational need for the unambiguous placement of boundaries. The baseline buffer radius of 50 metres, into which no trees may be felled and within which specified forestry activities are excluded, is related to the general upper stratum height in production forests and is a logical compromise which obviates the need to apply potentially complex forestry strategies, such as a 50% canopy retention rule, around what would often be a relatively small area.

In recognition of the ability of more resilient species to recolonise disturbed habitat, the buffers around populations and individuals in these guilds have been reduced accordingly. When stipulating that 90% of adult individuals must be buffered as a *population*, the intent is to adequately protect the population without excluding specified forestry activities from other areas due to the presence of the more scattered, isolated individuals.

Field Population Definition

The panel recommends that where the buffers applied to individual plants of a species merge, then the scattered individuals constitute a population.

Prescriptions and Functional Guilds

Prescription 1 - Baseline

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.
- The exclusion of all specified forestry activities within a radius of 50 metres around threatened plant populations and individuals.

Application of Baseline Prescription No.1 to Functional Guilds

- Functional Guild 1 - low persistence, poor recolonisation.
- Functional Guild 2 - high persistence, low recolonisation. The panel agreed that this group requires a larger area of undisturbed habitat and that prescription 1 is appropriate.

Prescription 2A - 20m / 90%

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.
- The exclusion of all specified forestry activities within a radius of 20 metres around threatened plant populations and individuals. Where buffers around individuals merge, then these individuals are regarded as part of a population, in which case at least 90% of the population area shall be buffered. No specific prescriptions apply to individuals scattered outside the main buffered population.

Application of prescription 2A to Functional Guilds

- Functional Guild 3A - low persistence, moderate recolonisation.

In considering these species, the panel agreed that extra protection of extant plants is essential, due to the species' lower recolonisation ability.

Prescription 2B - No Buffer

- The exclusion of all specified forestry activities from areas occupied by threatened plant populations and individuals.

No exclusion buffer is to be applied, but due care is required not to interfere with the species.

Application of prescription 2B to Functional Guilds

- Functional Guild 3B - low persistence, high recolonisation.

Species Management Strategy

In adopting a precautionary approach to the development of the functional guild classification and management prescriptions for threatened plant species, the panel recognised the need for a mechanism which facilitates the input of new research findings on the ecology and life history of protocol species to the revision of the Conservation Protocols. **As a consequence, the panel recommends that Species Management Strategies be prepared where specific changes to the protocols are proposed. Species Management Strategies must be reviewed by independent experts in consultation with SFNSW and NPWS.** A Species Management Strategy could, for example, include details of relevant autecological research and propose a broad landscape management approach to the conservation of a threatened plant species incorporating, for example, dedicated reserves across its distributional range and a weed control program. A Species Management Strategy could also include proposed measures to mitigate the impact of specified forestry activities or present scientific data to substantiate or refute the classification of a taxon to a particular functional guild.

Additional Considerations: Protocol Surveys and Monitoring

The expert panel also identified and discussed additional issues considered critical to the success of the flora protocols. Two key subjects were identified: protocol surveys and monitoring.

Protocol Surveys

Methods

- Validated records from flora databases are required to inform the protocol survey effort. Database integrity and record validity is of great concern in all landscape management exercises that must rely upon point locality information to direct surveys.
- CRA habitat models for protocol species were considered useful in directing the overall search effort and in delineating a potential search area for each species. Their use may save considerable time and resources, particularly as the models are further refined.
- The current minimum distance and time per compartment for flora traverses was considered adequate.

Who will conduct the surveys?

- Regional botanical experience is vital.
- Particular plant groups (eg. orchids) will require specialist identification skills.
- Protocol surveys for rare plant surveys must only be conducted by recognised, competent field botanists.

Where and how will the surveys be conducted?

- It was considered preferable to survey across a contiguous block of compartments, notwithstanding the current situation of local supply commitments. This method allows populations to be more effectively surveyed, mapped and buffered without the need to consider compartment boundaries. It was however recognised that SFNSW are currently attempting to follow this approach, which is to be commended.
- Seasonality is an important factor that must be considered when surveying for ephemeral, annual, geophytic or otherwise cryptic species.

Monitoring the Efficacy of Conservation Protocols

- Ecologically sustainable forest management (ESFM) cannot be demonstrated without the results of a program to monitor the efficacy of the Conservation Protocols.
- In the case of threatened plant species, relatively simple, species and population-based studies are required to provide key autecological and life history information (eg. pollination ecology) and data on population and seed bank dynamics in relation to forestry activities.
- Simple comparative studies (Before-After-Control-Impact) should be carried out by SFNWS in conjunction with NPWS staff. If necessary, populations of protocol species on Service estate could be used as control sites for such studies.
- It follows from the above points that both pre-logging and post-logging surveys are required as an integral part of the Conservation Protocols.
- Methodological principles for monitoring are detailed by Burgman *et al*. (1998).
- A simple, efficient and effective methodology for monitoring protocol flora species can be jointly devised by SFNSW and NPWS once the importance of monitoring is accepted by production forest managers.
- Feedback and collation of autecological and distributional data will assist in the ongoing review of the conservation status of protocol species, which may ultimately reduce the number of threatened taxa that production forest managers must specifically address through ESFM protocols.

References

Burgman, M., Ades, P., Hickey, J., Williams, M., Davies, C. and Maillardet, R. (1998). **Methodological guidelines for the utility and statistical validity of survey and monitoring programs.** Report prepared by the University of Melbourne for the Forest & Wood Products Research and Development Corporation.

Noble, I.R. & Slatyer, R.O. (1980). The use of vital attributes to predict successional changes in plant communities subject to recurrent disturbances. Vegetatio 43: 5-21. Appendix 1.2 Review of Conservation Protocols

APPENDIX 2

APPENDIX 2.1 FAUNA SPECIES ASSESSED IN THE RESPONSE TO DISTURBANCE PROJECT FOR THE UNE AND LNE REGIONS

Group	Species	Assessed in in in UNE	Assessed in LNE	Assessed in workshop 1	Assessed in workshop 2
Arb Mamm	Squirrel Glider	YES	YES	YES	YES
Arb Mamm	Greater Glider	YES	YES	YES	YES
Arb Mamm	Yellow-bellied Glider	YES	YES	YES	YES
Arb Mamm	Eastern Pygmy Possum	YES	YES	YES	YES
Arb Mamm	Koala	YES	YES	YES	YES
Bat	*Syconycteris australis*	YES	YES	YES	YES
Bat	*Mormopterus norfolkensis*	YES	YES	YES	YES
Bat	*Chalinolobus nigrogriseus*	YES	YES	YES	YES
Bat	*Pteropus poliocephalus*	YES	YES	YES	YES
Bat	*Vespadelus troughtoni*	YES	YES	YES	YES
Bat	*Chalinolobus dwyeri*	YES	YES	YES	YES
Bat	*Scotoeanax rueppellii*	YES	YES	YES	YES
Bat	*Falsistrellus tasmaniensis*	YES	YES	YES	YES
Bat	*Nyctophilus timoriensis*	YES	YES	YES	NO
Bat	*Scotorepens balstoni*	YES	YES	YES	YES
Bat	*Scotorepens greyii*	YES	YES	YES	YES
Bat	*Mormopterus planiceps*	YES	YES	YES	NO
Bat	*Scotorepens sp 1*	YES	YES	YES	YES
Bat	*Vespadelus pumilus*	YES	YES	YES	YES
Bat	*Kerivoula papuensis*	YES	YES	YES	YES
Bat	*Saccolaimus flaviventris*	YES	YES	YES	NO
Bat	*Scotorepens orion*	YES	YES	YES	NO
Bat	*Mormopterus sp 1*	YES	YES	YES	NO
Bat	*Myotis adversus*	YES	YES	YES	YES
Bat	*Mormopterus beccarii*	YES	YES	YES	NO
Bat	*Rhinolophus megaphyllus*	YES	YES	YES	YES
Bat	*Miniopterus schreibersii*	YES	YES	YES	YES
Bat	*Miniopterus australis*	YES	YES	YES	YES
Bat	*Nyctinomus australis*	YES	YES	YES	YES
Bat	*Nyctimene robinsoni*	YES	NO	YES	YES
Bat	*Nyctophilus bifax*	YES	NO	YES	YES
Bat	*Pteropus alecto*	YES	NO	YES	YES
Bird	Double-eyed Fig-parrot	YES	YES	YES	YES
Bird	Rufous Scrub-bird	YES	YES	YES	YES
Bird	Barred Cuckoo-shrike	YES	YES	YES	YES
Bird	Brush Bronzewing	YES	YES	YES	YES
Bird	Chestnut-rumped Heathwren	YES	YES	YES	YES
Bird	Little Bronze-Cuckoo	YES	YES	YES	YES

Group	Species	Assessed in in in UNE	Assessed in LNE	Assessed in workshop 1	Assessed in workshop 2
Bird	Red Goshawk	YES	YES	YES	YES
Bird	Superb Fruit-dove	YES	YES	YES	YES
Bird	Wompoo Fruit-dove	YES	YES	YES	YES
Bird	Square-tailed Kite	YES	YES	YES	YES
Bird	Glossy Black-Cockatoo	YES	YES	YES	YES
Bird	Paradise Riflebird	YES	YES	YES	YES
Bird	Turquoise Parrot	YES	YES	YES	YES
Bird	Hooded Robin	YES	YES	YES	YES
Bird	Regent Honeyeater	YES	YES	YES	YES
Bird	Olive Whistler	YES	YES	YES	YES
Bird	Yellow-tufted Honeyeater	YES	YES	YES	YES
Bird	Black-necked Stork	YES	YES	YES	YES
Bird	Black Bittern	YES	YES	YES	YES
Bird	Mangrove Honeyeater	YES	YES	YES	YES
Bird	Osprey	YES	YES	YES	YES
Bird	Painted Honeyeater	YES	YES	YES	YES
Bird	Pacific Baza	YES	YES	YES	YES
Bird	Forest Raven	YES	YES	YES	YES
Bird	Forest Kingfisher	YES	YES	YES	YES
Bird	Little Shrike-thrush	YES	YES	YES	YES
Bird	Grey-crowned Babbler	YES	YES	YES	YES
Bird	Swift Parrot	YES	YES	YES	YES
Bird	Pale-yellow Robin	YES	YES	YES	YES
Bird	Rose-crowned Fruit-dove	YES	YES	YES	YES
Bird	Gang-gang Cockatoo	NO	YES	YES	YES
Bird	Musk Lorikeet	YES	YES	YES	YES
Bird	Brahminy Kite	YES	YES	YES	NO
Bird	Regent Bowerbird	YES	YES	YES	NO
Bird	Noisy Pitta	YES	YES	YES	NO
Bird	Russet-tailed Thrush	YES	YES	YES	NO
Bird	Grey Goshawk	YES	YES	YES	NO
Bird	Black-eared Cuckoo	YES	YES	YES	NO
Bird	Lewin's Rail	YES	YES	YES	NO
Bird	Peregrine Falcon	YES	YES	YES	NO
Bird	Red-backed Kingfisher	YES	YES	YES	NO
Bird	Oriental Cuckoo	YES	YES	YES	NO
Bird	Black-breasted Button-quail	YES	NO	YES	YES
Bird	Eastern Bristlebird	YES	NO	YES	YES
Bird	Albert's Lyrebird	YES	NO	YES	YES
Bird	Black-throated Finch	YES	NO	YES	NO
Bird	Red-tailed Black-Cockatoo	YES	NO	YES	YES
Bird	White-eared Monarch	YES	NO	YES	YES
Bird	Superb Lyrebird (edwardsii)	YES	NO	YES	YES
Bird	Bush-hen	YES	NO	YES	NO
Bird	Collared Kingfisher	YES	NO	YES	NO
Frog	*Litoria castanea*	YES	YES	YES	NO
Frog	*Litoria piperata*	YES	YES	YES	YES
Frog	*Mixophyes iteratus*	YES	YES	YES	YES
Frog	*Litoria booroolongensis*	YES	YES	YES	YES
Frog	*Litoria brevipalmata*	YES	YES	YES	YES
Frog	*Assa darlingtoni - sth*	YES	YES	YES	YES
Frog	*Mixophyes balbus*	YES	YES	YES	YES
Frog	*Pseudophryne bibronii*	YES	YES	YES	YES
Frog	*Litoria aurea*	YES	YES	YES	YES
Frog	*Litoria jervisiensis*	YES	YES	YES	YES
Frog	*Philoria sphagnicolus - sth**	NO	YES	YES	YES

Group	Species	Assessed in in in UNE	Assessed in LNE	Assessed in workshop 1	Assessed in workshop 2
Frog	*Litoria littlejohni*	NO	YES	YES	YES
Frog	*Heleioporus australiacus*	NO	YES	YES	YES
Frog	*Litoria revelata*	YES	YES	YES	YES
Frog	*Philoria sphagnicolus - nth**	YES	YES	YES	YES
Frog	*Litoria subglandulosa - nth**	YES	YES	YES	YES
Frog	*Crinia tinnula*	YES	YES	YES	YES
Frog	*Litoria subglandulosa - sth**	NO	YES	YES	YES
Frog	*Litoria freycineti*	YES	YES	YES	YES
Frog	*Paracrinia haswelli*	YES	YES	YES	NO
Frog	*Litoria pearsoniana*	YES	YES	YES	NO
Frog	*Litoria barringtonensis*	YES	YES	YES	NO
Frog	*Limnodynastes terraereginae*	YES	YES	YES	NO
Frog	*Pseudophryne australis*	NO	YES	YES	NO
Frog	*Mixophyes fleayi*	YES	NO	YES	YES
Frog	*Philoria kundagungan*	YES	NO	YES	YES
Frog	*Philoria sp 2 (undescribed)*	YES	NO	YES	YES
Frog	*Litoria olongburensis*	YES	NO	YES	YES
Frog	*Philoria loveridgei*	YES	NO	YES	YES
Frog	*Philoria sp 3 (undescribed)*	YES	NO	YES	YES
Frog	*Assa darlingtoni - nth**	YES	NO	YES	YES
Noct Bird	Barking Owl	YES	YES	YES	YES
Noct Bird	Bush Stone-curlew	YES	YES	YES	YES
Noct Bird	Sooty Owl	YES	YES	YES	YES
Noct Bird	Masked Owl	YES	YES	YES	YES
Noct Bird	Marbled Frogmouth	YES	NO	YES	YES
Noct Bird	Powerful Owl	YES	YES	YES	YES
Reptile	*Elseya sp2 (Gwydir & Namoi Rivers)*	YES	YES	YES	YES
Reptile	*Cautula zia*	YES	YES	YES	YES
Reptile	*Hoplocephalus bitorquatus*	YES	YES	YES	YES
Reptile	*Hoplocephalus stephensii*	YES	YES	YES	YES
Reptile	*Coeranoscincus reticulatus*	YES	YES	YES	YES
Reptile	*Elseya georgesi*	NO	YES	YES	YES
Reptile	*Elseya purvisi*	NO	YES	YES	YES
Reptile	*Emydura sp (Bellingen River)*	NO	YES	YES	YES
Reptile	*Lampropholis caligula*	NO	YES	YES	YES
Reptile	*Lampropholis elongata*	NO	YES	YES	YES
Reptile	*Tympanocryptis lineata pinguicollis*	NO	YES	YES	NO
Reptile	*Hoplocephalus bungaroides*	NO	YES	YES	YES
Reptile	*Underwoodisaurus sphyrurus*	YES	YES	YES	YES
Reptile	*Saproscincus oriarus "North Coast sp"*	YES	YES	YES	YES
Reptile	*Austrelaps ramsayi*	YES	YES	YES	YES
Reptile	*Emydura sp1*	YES	YES	YES	YES
Reptile	*Eulamprus tenuis (northern)**	YES	YES	YES	YES
Reptile	*Drysdalia coronoides*	YES	YES	YES	YES
Reptile	*Saproscincus galli*	YES	YES	YES	YES
Reptile	*Saproscincus rosei*	YES	YES	YES	YES
Reptile	*Hypsilurus spinipes*	YES	YES	YES	YES
Reptile	*Ophioscincus truncatus*	YES	YES	YES	YES
Reptile	*Eulamprus kosciuskoi*	YES	YES	YES	YES
Reptile	*Saltuarius swaini*	YES	YES	YES	YES
Reptile	*Varanus rosenbergi*	NO	YES	YES	YES
Reptile	*Tympanocryptis diemensis (northern)**	NO	YES	YES	YES
Reptile	*Tropidechis carinatus*	YES	YES	YES	YES
Reptile	*Eulamprus murrayi*	YES	YES	YES	YES
Reptile	*Calyptotis ruficauda*	YES	YES	YES	NO
Reptile	*Cacophis krefftii*	YES	YES	YES	NO

Group	Species	Assessed in in in UNE	Assessed in LNE	Assessed in workshop 1	Assessed in workshop 2
Reptile	*Eulamprus tryoni*	YES	NO	YES	YES
Reptile	*Acanthophis antarcticus (north of Hunter)**	YES	NO	YES	YES
Reptile	*Cacophis harriettae*	YES	NO	YES	YES
Reptile	*Ctenotus eurydice*	YES	NO	YES	YES
Reptile	*Saltuarius wyberba*	YES	NO	YES	YES
Reptile	*Saproscincus challengeri*	YES	NO	YES	YES
T. mammal	Brush-tailed Rock-wallaby	YES	YES	YES	YES
T. mammal	Dingo	YES	YES	YES	YES
T. mammal	Hastings River Mouse	YES	YES	YES	YES
T. mammal	Eastern Chestnut Mouse	YES	YES	YES	YES
T. mammal	Broad-toothed Rat	NO	YES	YES	YES
T. mammal	Rufous Bettong	YES	YES	YES	YES
T. mammal	Red-legged Pademelon	YES	YES	YES	YES
T. mammal	Parma Wallaby	YES	YES	YES	YES
T. mammal	New Holland Mouse	YES	YES	YES	YES
T. mammal	Common Wombat	YES	YES	YES	YES
T. mammal	Dusky Antechinus	YES	YES	YES	YES
T. mammal	Grassland Melomys	YES	YES	YES	NO
T. mammal	Common Planigale	YES	YES	YES	YES
T. mammal	Platypus	YES	YES	YES	NO
T. mammal	Pale Field-rat	YES	YES	YES	YES
T. mammal	Black-striped Wallaby	YES	NO	YES	YES
T. mammal	Whiptail Wallaby	YES	NO	YES	YES
T. mammal	Eastern Quoll	YES	YES	YES	NO
T. mammal	Long-nosed Potoroo	YES	YES	YES	YES
T. mammal	Brush-tailed Phascogale	YES	YES	YES	YES
T. mammal	Tiger Quoll	YES	YES	YES	YES

APPENDIX 3

APPENDIX 3.1 CRITICAL HABITAT REQUIRMENTS OF THE ARBOREAL MAMMALS

Species	**HABITAT DESCRIPTION**
Koala	
Breeding	Critical Habitat resources- breeding, juveniles, (considered together)- can only identify good habitat for breeding populations, not break down into breeding, feeding etc. Evidence for distinct breeding habitat is scarce, the full range of breeding habit
Feeding	In coastal forested environments (not woodland) there is a preference for stands with a high diversity of known food trees (three or more) including Tallowwood, Grey Gum, Forest Oak, Sydney Blue Gum, Swamp Mahogany and Red Gums. In Tableland woodland pre
Sheltering	Sleeping Koalas more often found in larger trees with big lateral branches (not necessarily food trees).
Dispersing	Any open habitat, (incl. pasture, grassland), as long as scattered trees are present.
Squirrel Glider	
Breeding	Tree hollows- preference for small hollow entrances. A single study found that densities declined linearly when the abundance of trees with hollows fell below 6/ha (Smith, 1998).
Feeding	Preferred habitat contains winter flowering eucalypts or banksias including Swamp Mahogany, Spotted Gum, Coast Banksia, Ironbarks, Hairpin Banksia, Swamp Paperbark. Probable association with larger trees with high nectar flows. Prefers areas with late se
Sheltering	Hollow bearing trees.

Species	HABITAT DESCRIPTION
Dispersing	Can disperse through a broad range of open and disturbed habitats (incl. Paddocks, grassland).
Yellow-bellied glider	
Breeding	Large hollow trees.
Feeding	High eucalypt species diversity, winter flowering eucalypts, smooth-barked eucalypts, sap trees. Larger trees have higher nectar/sap yields.
Dispersing	Can disperse through regrowth forest. Requires trees within gliding distance (on flat ground in tall forest- >140 m. In steep forest, glides may be much longer (up to 300 m). Trees may be quite scattered. Will not walk across open ground like the Squirre
Greater Glider	
Breeding	Large hollow trees (strong positive association with tree size).
Dispersing	Requires trees within gliding distance.
Eastern Pygmy Possum	
Breeding	Tree hollows- preference for small hollow entrances.
Sheltering	Not dependent on tree hollows

APPENDIX 3.2 CRITICAL HABITAT REQUIREMENTS OF THE BATS

Species	HABITAT DESCRIPTION
Nyctimene robinsoni	
Breeding	Subtropical rainforest - large area with high abundance of food (esp figs)
Feeding	fruit, esp figs, occasionally blossom; will range out to wet sclerophyll
Sheltering	Roosts in rf foliage
Nyctimene robinsoni	
Breeding	Subtropical rainforest - large area with high abundance of food (esp figs)
Feeding	fruit, esp figs, occasionally blossom; will range out to wet sclerophyll
Sheltering	Roosts in rf foliage
Pteropus alecto	
Breeding	Subtropical rainforest and swamp forest; complex mosaic of rf, swamp and sclero forest resources <40-50km from roost; high site fidelity - roosts often riverine rainforest
Feeding	Subtrop rf with mosaic of resources - rf fruit, nectar and pollen
Sheltering	as for breeding
Syconycteris australis	
Breeding	Subtrop and littoral rf; breed twice - spring coastal complex and riverine rf, autumn coastal complex; needs diverse array of nectivorous plant communities nearby

Species	HABITAT DESCRIPTION
Feeding	Diverse range of nectar producing plant communities year round; occasionally eat some rainforest fruits
Sheltering	Subtrop and littoral rainforest; in foliage
Pteropus poliocephalus	
Breeding	Mainly rainforest and moist forest (riparian); odd ones don't occur here; complex mosaic of rf, swamp and sclero forest resources <40-50km from roost; high site fidelity - roosts often riverine rainforest
Feeding	Subtrop rf with mosaic of resources - rf fruit, nectar and pollen
Sheltering	as for breeding
Kerivoula papuensis	
Breeding	Subtrop and warm temp rf and riparian forest; hollows in rf treesf and others? and sometimes bird nests; strong assoc with riparian areas
Feeding	insects and spiders in forest interior and sometimes on edge
Sheltering	Breeding habitat; have been found in birds nests
Chalinolobus nigrogriseus	
Breeding	dry forest types; hollows
Feeding	as for breeding; aerial insects; generally more open forest types
Myotis adversus	
Breeding	any forested riparian and adjacent vegetation, waterbodies and coastal lakes; >first order streams; breed in hollows, as well as under bridges etc and in caves
Feeding	still waterbodies with associated vegetation (treeline); aquatic and other flying insects, small fish (excluding trout!)
Sheltering	as for breeding
Mormopterus beccarii	
Breeding	hollows in trees; coastal dry forest types?
Feeding	as for breeding; flying insects; open forest
Sheltering	dead stags
Vespadelus troughtoni	
Breeding	caves, mines; generally sandstone and volcanic escarpment areas
Feeding	Predominantly dry forest with some moist forest; prob specialist insectivore
Sheltering	as for breeding, plus used fairy martin nests
Miniopterus australis	
Breeding	Limestone caves, usually in association with M. shreibersii; congregate in high numbers in maternity roosts (in 1000s); may be a threshold number of indivs to successfully breed
Feeding	forested areas, predom swamp, moist euc, rf, also some dry forest; flying insects
Sheltering	range of artificial structures including culverts, drains, mines etc, plus caves. Complex social structure - range of roost sites for diff functions eg maternity,

Species	HABITAT DESCRIPTION
	wintering, acclimatisation
Chalinolobus dwyeri	
Breeding	caves, possibly mines; generally sandstone and volcanic escarpment areas
Feeding	Predominantly dry forest with some moist forest; prob specialist insectivore
Sheltering	as for breeding, plus used fairy martin nests
Vespadelus pumilus	
Breeding	moist forest - euc, rf and swamp; hollows in large trees
Feeding	as for breeding; small flying insects
Sheltering	as for breeding; most maternity roosts near creeklines; outside breeding will move to midslopes
Rhinolophus megaphyllus	
Breeding	in deep, humid caves and mines; females congregate to breed; sandstone, limestone and volcanics; range of forest types
Feeding	Aerial insects in range of forest types - more common in moister types
Sheltering	as for breeding plus culverts, drains, moist tree hollows
Saccolaimus flaviventris	
Breeding	Hollows - very little known about species
Feeding	Flying insects
Sheltering	Hollows
Nyctophilus timoriensis	
Breeding	dry scl forest and woodland; in hollows
Feeding	Flying insects and gleans insects from leaves and bark; prefer structurally complex forest
Sheltering	Roosts in hollows and under bark
Nyctophilus bifax	
Breeding	Littoral and subtrop rf and other assoc moist forest and coastal swamp forest; in hollows;
Feeding	Flying insects and gleans insects from leaves and bark; prefer structurally complex forest
Sheltering	in hollows; will roost communally in foliage
Scotorepens orion	
Breeding	Hollows in large, mature trees; dry and moist forest types
Feeding	Flying insects; same forest as breeding
Falsistrellus tasmaniensis	
Breeding	Hollows; eucalypt forest - mid-high altitude
Feeding	Beetles and moths; productive forest

Species	HABITAT DESCRIPTION
Sheltering	
Scotoeanax rueppellii	
Breeding	Hollows; dry scl and moist euc forest; also alleuvial redgum forest
Feeding	dry sclerophyll, moist euc forest and rainforest; eats beetles, moths and possibly other bats
Sheltering	Hollows
Miniopterus schreibersii	
Breeding	Usually occur in low densities; use select limestone cave systems; normally near moister forests; will congregate in maternity roosts in high numbers (up to 100 000); may be a threshold number of indivs to successfully breed
Feeding	Aerial insects partic moths; range of habitats;
Sheltering	Range of artificial structures including culverts, drains, mines etc, plus caves. Complex social structure - range of roost sites for diff functions eg maternity, wintering, acclimatisation
Scotorepens balstoni	
Breeding	hollows - dead stags, poss live trees; dry forest types
Feeding	as for breeding; flying insects; open forest
Sheltering	dead stags
Scotorepens greyii	
Breeding	hollows in trees; coastal dry forest types?
Feeding	as for breeding; flying insects; open forest
Sheltering	dead stags
Mormopterus norfolkensis	
Breeding	large mature tree hollows; in dry forest woodland and poss moist forest
Feeding	as for breeding plus adjacent cleared areas; flying insects
Mormopterus planiceps	
Breeding	hollows - dead stags, poss live trees; dry forest types
Feeding	as for breeding; flying insects; open forest
Sheltering	dead stags
Nyctinomus australis	
Breeding	hollows in large, mature, emergent trees; dry and moist forest types
Feeding	predom above canopy - flying insects; same forest as breeding
Mormopterus sp 1	
Breeding	hollows in large, mature trees; dry and moist forest types
Feeding	flying insects; same forest as breeding
Sheltering	

Species	HABITAT DESCRIPTION
Scotorepens sp 1	
Breeding	hollows in trees; coastal dry forest types?
Feeding	as for breeding; flying insects; open forest
Sheltering	dead stags

APPENDIX 3.3 CRITICAL HABITAT REQUIREMENTS OF THE DIURNAL BIRDS

Species	HABITAT DESCRIPTION
Double-eyed Fig-parrot	
Breeding	Dead or senescent eucalypts near rainforest; rainforest trees; high density of fruiting figs; most habitat has been cleared; low elevations and drier extremes
Juvenile	Unknown. Probably high density of fruiting figs
Feeding	Fruiting figs (most important); other rainforest fruits; nectars;
Sheltering	Not known
Dispersing	Lowland habitat with figs and other fruiting species
Red Goshawk	
Breeding	Large trees (live euc's and melaleucas) in riparian floodplains; close to areas with high bird densities (prey)
Feeding	high densities of favoured prey species (waterbirds, pigeons, parrots & large passerines); open canopy forest, particularly gallery; will take mammals, reptiles and insects
Sheltering	Large trees in forest or woodland
Dispersing	Low elevation forest and woodlands; coastal heaths
Regent Honeyeater	
Breeding	Ironbark, spotted gum forest, whitebox and yellowbox; riparian habitats with predom of casuarina; close to nectar sources (food); trees used for nectar tend to be older since they have better nectar flows
Feeding	Use nectar of coastal banksia, melaleucas, winter flowering eucs, coastal heath; mistletoes on she-oaks and eucalypts; plus those described for breeding
Dispersing	Seasonal availability of nectar resources along latitudinal and elevational range from coast to slopes
Black-breasted Button-quail	
Breeding	Dry rainforest in association with eucalypt forest; well developed litter layer; associated with disturbed area with lantana understorey; edges of subtropical rainforest adjacent to eucalypt forest; dry rainforest with emergent layer dominated by hoop pine
Feeding	Invertebrates (most preferred including spiders, ants, centipedes, millipedes, landsnails - this is biased towars hard bodied invert's), seeds; veg types in breeding habitat; related to food availability which is related to moisture avail ie not a homogeneous distribution during drought
Sheltering	Dense litter layer

Species	HABITAT DESCRIPTION
Swift Parrot	
Breeding	Not relevant - breeds in Tasmania
Feeding	Winter flowering eucalypt; coastal banksias; previously found in large nos on tablelands & slopes; also feed on lerps and honeydew secretions as secondary food source; may resort to other foods eg fruit
Dispersing	Seasonal availability of nectar resources along latitudinal and elevational range from coast to slopes
Wompoo Fruit-dove	
Breeding	Subtropical, dry and warm-temp rainforests, wet sclerophyll; needs good fruit supply nearby
Juvenile	lower elevation feeding areas
Feeding	Subtropical, dry, warm-temp and littoral rainforests, wet sclerophyll, figs, laurels, quondongs, giant stinging trees; scattered figs in cleared habitat
Dispersing	Autumn/ winter dispersal from higher to lower elevations; partial elevational migration; movements track food availability
Rufous Scrub-bird	
Breeding	Associated with wet sclerophyll forest and canopy gaps in rainforest, both with an extremely dense ground cover to 2m. Requires a very high moisture regime in all seasons; elevations >800m, predom >1000m; moist litter layer.
Feeding	Litter invertebrates; moist litter layer and sheltered microclimate; dense ground cover vegetation
Sheltering	As for feeding and breeding
Dispersing	Some elevational dispersal down to 200m (likely to be subadults) - originally down to 40m
Albert's Lyrebird	
Breeding	Wet sclerophyll; temperate subtrop rf; dark southerly slopes sometimes abutting clifflines; sometimes in lawyer cane thickets, treeferns and stumps; in highest densities in cool, moist wet sclero and in declining densities with increasing temp, decreasing rainfall and increasing soil nutrients; usually use well developed litter layer - these gradients reflect decrease in litter layer accumulation rate and or moisture levels
Feeding	Litter invertebrates; corresponds with areas of high year-round moisture levels to maintain moist litter; wet sclerophyll, subtropical & warm-temp rf
Sheltering	tree crowns on ridge tops;
Dispersing	needs cover; avoids forest edges
Square-tailed Kite	
Breeding	Tall, open sclerophyll forest and woodland with or adjacent to high densities of passerine birds; typically tablelands and coastal plains; nests in tall trees with large branches
Feeding	high density of passerine birds partic. honeyeaters; will occasionally take lorikeets, quail, pippets, canopy foliage gleaners
Barred Cuckoo-shrike	
Breeding	low elevation subtropical and littoral rainforest; coastal wet sclerophyll; close to

Species	HABITAT DESCRIPTION
	fruiting figs
Feeding	fruit and large insects incl cicadas & phasmids; same habs as for breeding; small leaf and other small fruited figs preferred food items; mature canopy preferred habitat
Sheltering	emergent canopy trees, predom in rf
Dispersing	follows avail of fruiting figs in flocks 10-20 birds outside breeding; bulk of habitat has been cleared - uses remnant patches; may move north outside of state in winter - at least a portion does this
Rose-crowned Fruit-dove	
Breeding	lowland subtropical rainforest including remnants dominated by camphor laurel; also wet sclerophyll; near food source (esp laurels, figs, quandongs, lantana)
Feeding	as for breeding, with more emphasis on the coastal remnants; also littoral rf; camphor laurel has become very important in replacing lowland species previously used but now cleared
Dispersing	most move to coastal habitat outside breeding season; needs scattered patches of habitat
Glossy Black-Cockatoo	
Breeding	large trees with large hollows (dead and alive) near streams; within 5km (DM) - 20km (JS) of food source - will forage close to the nest but are capable of travelling up to 20km away
Juvenile	As for breeding
Feeding	dependent on adult *Allocasuarina littoralis* and *A. torulosa*; individual trees are selected on basis of N content in seeds; will occasionally use alternative foods
Sheltering	stands of tall trees in elevated locations like ridgelines within range of the feeding resource; there is an interaction between roost sites and surface water sites
Dispersing	movement corridors associated with forest cover
Paradise Riflebird	
Breeding	subtropical & warm temp rf, wet sclerophyll and moist open forest associated with rf; preference for large continuous tracts of forest with high proportion old growth forest elements such as epiphytes, decorticating bark and well developed tree canopy
Feeding	Broadly corresponds with breeding habitat; invertebrates under bark, under decorticating wood & in epiphytes; termites, fruit (partic laurels, Planchonela & quondongs)
Dispersing	movement to lower elevation part of juveniles; prefer to move through forest cover
Superb Fruit-dove	
Breeding	as for Rose-crowned Fruit-dove, but more restricted to Richmond and Clarence catchments
Dispersing	dispersal of young birds is common and often long distance; same req'ts as Rose-crowned f.d.
Olive Whistler (ssp macphersonianus)	
Breeding	thickets on ridges in cool and warm temp rf; shrub thickets in woodland and dry sclerophyll forest; wet sclerophyll with dense understorey; above 800m but mainly >1000; need high moisture availability all year

Species	HABITAT DESCRIPTION
Feeding	as for breeding; invertebrates predom in litter and under bark on trunks and in lower understorey layers; will also take foliage insects
White-eared Monarch	
Breeding	lowland subtropical rainforest edges and remnants; littoral and floodplain rf, swamp sclerophyl with mesomorphic midstorey, coastal wet sclerophyll; seems to prefer edges with rainforest. Edges defined as gaps, edges between forests and edges with cleared land
Feeding	hover gleaning of rainforest foliage insects; foraging extends into forest interiors; feeds through canopy or descends to above shrub layer
Dispersing	won't move into small remnants; prefers to move through areas of continuous forest cover
Turquoise Parrot	
Breeding	edges of woodlands and dry sclerophyll forest with high proportion of native grasses and forbs; preference for high nutrient sites. Edges includes grassy clearings within forests; frequently nests in dead trees; nests often <1m above ground (Foreshaw 1981)
Feeding	seeds of native grasses and forbs; takes some leafy native foliage; will take some exotic seeds
Sheltering	mosaic of foraging habitat and woody veg
Pacific Baza	
Breeding	large trees in wet sclerophyll forest, rainforest and remnants of either; only breed at low-mid altitudes; prefer higher nutrient sites
Feeding	large bodied foliage inverts particularly phasmids; also tree frogs; feeds in canopy and tall understorey
Dispersing	movements into dry sclerophyll forests, leafy suburbs and remnants over winter
Hooded Robin	
Breeding	dry, open sclerophyll forest and woodland with patchy, grassy ground cover; associated with intermediate and higher nutrient sites
Feeding	ground invertebrates and some aerial invertebrates
Grey-crowned Babbler	
Breeding	edges of dry open sclerophyll and woodlands; margins between floodplains and adjacent highlands (east of range only); associated with high nutrient sites; nests in midstorey - callitris, casuarina, melaleuca and tall shrubs
Feeding	insects under bark and on ground; small reptiles; spiders, centipedes and other inverts
Sheltering	same as breeding since they build nests for roosts
Musk Lorikeet	
Breeding	dry, open sclerophyll forest and woodland with a predominance of floriferous sp; preference for lower nutrient sites; medium sized hollows in live eucalypts; breeding is rarely recorded in region
Feeding	predominantly eucalypt nectar and exudates; takes fruit in sth part of range; on coastal lowlands and ranges spotted gum is important; in region favour drier forest
Prince Edward Lyrebird	

Species	HABITAT DESCRIPTION
Breeding	heathy woodlands and dry sclerophyll forest; breed on rocky ledges, burnt out tree trunks; presence of large granite outcrops important; does not occur on any geology other than leucogranites
Feeding	litter invertebrates; particularly forage in deep, moist litter around granite domes
Dispersing	no information available
Yellow-tufted Honeyeater	
Breeding	dense understorey and moist gullies in dry sclerophyll; associated with riparian vegetation with well developed understorey; colonial breeder - needs area large enough for a colony; lack of frequent fire and heavy grazing; colonies are small and localised
Feeding	generally same as for breeding; lerp and exudate dependent; will take nectar when available, but don't track flowering events; will hawk during breeding season

APPENDIX 3.4 CRITICAL HABITAT REQUIREMENTS OF THE FROGS

Species	HABITAT DESCRIPTION
Assa darlingtoni	
Breeding	Breeds in thick, deep, moist litter in subtropical to cool temperate rainforest
Feeding	Small leaf litter invertebrates in deep, moist litter on subtropical to cool temperate rainforest. Forages terrestrially
Crinia tinnula	
Breeding	Tadpoles are free living. Eggs are laid in acid paper bark swamps. Breeding habitat is the same as for *L. olongburensis.*
Feeding	Feeds around sedges and rushes adjacent to breeding habitat. Adults are terrestrial.
Other/general	Found up to 40 m altitude, closely associated with the coastal zone.
Heleioporus australiacus	
Breeding	Closely associated with Sydney sandstone basin. Mostly associated with hanging sandstone shelves and the upper laterals (first order streams) that run through heathland and woodland. Natural and man-made drainage lines. Eggs are deposited in a terrestri
Feeding	Forages widely. Adults forage terrestrially up to several hundred metres away from breeding sites. Forages in woodlands, wet heath, dry and wet sclerophyll forest. Feeds on large invertebrates.
Sheltering	Soil must be soft and sandy so that burrows can be constructed.

Species	HABITAT DESCRIPTION
Limnodynastes terraereginae	
Breeding	Breeds mostly in ponds but will use still ponds in second and third order streams. Will occupy cavities under stream banks to lay eggs. Eggs are in a raft (foaming egg mass).
Feeding	Terrestrial. Often found foraging well away from breeding sites (detected in road surveys).
Sheltering	Burrows in sandy soils or sandy stream edges.
Other/general	20-1000 m altitude- split distribution (tablelands and coastal zone, not inbetween)
Litoria aurea	
Breeding	Breeding is associated with marshes, ponds and small lakes, principally around permanent waters, usually with beds of tall reeds. Breeding sites are within woodlands with a grassy understorey, grasslands and wetland vegetation. Occurs in forest habitat
Feeding	Forages away from breeding areas (several hundred metres). Forages terrestrially, cannabalistic.
Other/general	Altitude below 800 m to sea level. Brumates (froggy equivalent of hibernation) under logs, up to several hundred metres from breeding habitat, or within reed beds of the breeding pond.
Litoria barringtonensis	
Breeding	Breeds in second order streams, associated with still pools between rapids or riffles. Known from mostly undisturbed sites, but will extend along riparian zones with natural vegetation within cleared areas. Males call from streamside vegetation.
	Breeding in spring and early summer. Tadpoles are free living and stream adapted. May be impacted by introduced fish (Plague Minnow, Carp, trout). Circumstantial evidence (never recorded on road transects) suggests this species may be reliant on riparian
Other/general	Occurs at altitudes from 20-1000 m. Probably (not recorded) brumates or overwinters in cavities.
Litoria booroolongensis	
Breeding	Breeds in second and third order streams. Known from mostly undisturbed sites, but will extend along riparian zones with natural vegetation within cleared areas. Large parts of its former habitat are now modified by agriculture.
	Breeding in spring and early summer. Tadpoles are free living and stream adapted. May be impacted by introduced fish (Plague Minnow, Carp, trout).
	Males call from exposed rocks and banks along riparian zone and rocky streams.
Feeding	Not known away from streams but studies of habitat use have not been possible in the last 20 years.
Other/general	Altitudes 400-1000 m. Predominantly a western slopes frog.
Litoria brevipalmata	
Breeding	Eggs are laid in water and tadpoles are free living. Tadpoles metamorphose rapidly (within 40 days). Associated with ephemeral pools, including artificial, disturbed, or modified ponds. Breeding sites are surrounded by forest vegetation. Calls from emerge
Feeding	Not much known, but presumably forages close to breeding sites. Appears to prefer

Species	HABITAT DESCRIPTION
	to forage in areas with a complex, dense, mesic understorey.
Sheltering	Probably depends on cavities in trees or under bark.
Other/general	Occurs from sea level up to 500 m.
Litoria castanea	
Breeding	Breeding is associated with marshes, ponds and small lakes, principally around permanent waters, usually with beds of tall reeds. Breeding sites are within woodlands with a grassy understorey, grasslands and wetland vegetation. Substantial parts of its
Feeding	Forages away from breeding areas (several hundred metres). Forages terrestrially, cannabalistic.
Other/general	Occurs at higher altitudes (800-1500 m). Not forest dependent, tablelands swamps were most likely to have been significant habitat areas, the majority of these have been severely modified by agricultural practises. Brumates (froggy equivalent of hibernati
Litoria daviesi	
Breeding	As for *L. subglandulosa*
Feeding	As for *L. subglandulosa*
Litoria freycineti	
Breeding	Tadpoles are free living, eggs are laid in water. Breeding is in wallum habitats and also non-acidic fresh water ponds (usually ephemeral but may occur in permanent ponds). Calling is from the ground.
Feeding	Forages widely terrestrially across open areas, heaths and woodlands adjacent to breeding habitat. Can occur across agricultural areas in flooded grasslands and paddocks.
Litoria jervisiensis	
Breeding	Tadpoles are free living, eggs are laid in water. Breeding is restricted to wallum habitats. Calling is from emergent vegetation.
Feeding	Feeds arboreally from emergent vegetation.
Sheltering	Cavity dependent, shelters in hollows or under bark of paper barks, adjacent or within breeding habitat. Cavity dependence is seasonal (occurs outside breeding season).
Litoria littlejohni	
Breeding	Eggs are laid in water and tadpoles are free living. It is likely that tadpoles metamorphose within one season (eggs laid in autumn, metamorphose in winter) which is relatively rapid for such a large frog. Associated with ephemeral pools but may occur in
Feeding	Only found in areas of natural vegetation (including production forest) adjacent to breeding sites.
Sheltering	Probably dependent on cavities in trees or under bark (not been observed in this species but occurs in similar species- *Litoria verreauxii*).
Litoria olongburensis	
Breeding	Marsh or swampy areas amongst emergent vegetation and reeds of wallum habitat (acidic, tannin stained water, typically associated with paper barks and tea trees). Breeding habitat is often, but not always, ephemeral. Tadpole is free living and only

Species	HABITAT DESCRIPTION
	foun
Feeding	Feeds around emergent low vegetation, sedges and rushes, and low foliage. Feeds adjacent to breeding habitat.
Other/general	Usually not associated with disturbed areas. Not known above 200 m, always found on coastal zone.
Litoria pearsoniana	
Breeding	Breeds in second order streams, associated with still pools between rapids or riffles. Known from mostly undisturbed sites, but will extend along riparian zones with natural vegetation within cleared areas. Males call from streamside vegetation. Breeding
	Breeding in spring and early summer. Tadpoles are free living and stream adapted. May be impacted by introduced fish (Plague Minnow, Carp, trout). Circumstantial evidence (never recorded on road transects) suggests this species may be reliant on riparian
Other/general	Occurs at altitudes from sea level to 1200 m. Have been recorded to brumate or overwinter in cavities.
Litoria piperata	
Breeding	Breeds in second order streams, associated with still pools between rapids or riffles. The majority of historical sites have been subject to partial clearing (mainly for grazing) and only one remaining site could be described as undisturbed. Males call f
	Breeding in spring and early summer. Tadpoles are free living and stream adapted. May be impacted by introduced fish (Plague Minnow, Carp, trout).
Feeding	Not known
Other/general	High altitude (800-1120 m). Recorded brumating or overwintering in cavities or in fallen timber, close to streams.
Litoria revelata	
Breeding	Eggs are laid in water and tadpoles are free living. Tadpoles metamorphose rapidly (within 30 days). Associated with ephemeral pools but may occur in permanent ponds, including artificial, disturbed, or modified ponds. Breeding sites are surrounded by for
Feeding	Only found in areas of natural vegetation (including production forest) adjacent to breeding sites.
Sheltering	Probably dependent on cavities in trees or under bark.
Other/general	Occurs from almost sea level and high altitudes (above 1000 m). Possibly arboreal most of the time.
Litoria subglandulosa	
Breeding	Breeds in second and third order streams. Eggs are deposited underwater attached to boulders or substrate. Tadpoles are stream adapted, with specialised feeding apparatus.
	Males call from streamside vegetation.
Feeding	Circumstantial evidence (rarely detected in road transects) indicates the species relies primarily on the riparian zone.
Sheltering	Possibly in yabbie burrows (one record)
Other/general	500-1400 m altitude

Species	HABITAT DESCRIPTION
Mixophyes balbus	
Breeding	Breeds in first to third order streams (gen. 1st-2nd). Eggs are deposited in depressions in riffles. Tadpoles are aquatic and take at least 12 months to metamorphose.
	Breeds in spring, summer and autumn.
Feeding	Terrestrial. Forages in thick, moist litter.
Sheltering	Shelters under thick moist leaf litter. Will dig a shallow burrow in loose soil under litter.
Other/general	Occurs at altitudes from 20-1050 m. Restricted to higher altitudes in the north and tends to be found at lower altitudes in the south.
Mixophyes fleayi	
Breeding	Breeds in first to third order streams (gen. 1st-2nd). Eggs are deposited in depressions in riffles and also onto flat bedrock under shallow, running water. Tadpoles are aquatic and take at least 12 months to metamorphose.
	Breeds in spring, summer and autumn.
Feeding	Terrestrial. Forages in thick, moist litter.
Sheltering	Shelters under thick moist leaf litter. Will dig a shallow burrow in loose soil under litter.
Other/general	Occurs at altitudes from 120-1000 m.
Mixophyes iteratus	
Breeding	Breeds in first to third order streams (gen. 2nd-3rd), associated with still pools. Eggs are deposited out of water onto the underside of overhanging banks. Tadpoles are aquatic and take 12 months to metamorphose.
	Breeds in spring and summer.
Feeding	Terrestrial. Forages in thick, moist litter.
Sheltering	Shelters under thick moist leaf litter. Will dig a shallow burrow in loose soil under litter.
Other/general	Occurs below 550 m altitude.
Paracrinia haswelli	
Breeding	Breeding habitat is the same as for L. olongburensis. Tadpoles are free-living. Eggs are laid in acid paper bark swamps.
Feeding	Feeds around sedges and rushes adjacent to breeding habitat. Adults are terrestrial.
Philoria kundagungan	
Breeding	Boggy headwaters of high altitude, rainforest streams (up to first order, with some rare exceptions); springs; seepages; streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within a constr
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
Philoria loveridgei	

Species	HABITAT DESCRIPTION
Breeding	Boggy headwaters of high altitude, rainforest streams (up to first order, with some rare exceptions); springs; seepages; streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within a constr
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
***Philoria* sp 1 (undescribed)**	
Breeding	Boggy headwaters of high altitude, rainforest streams (up to second order); springs; seepages (in mud, rock cracks, and rubble); streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
***Philoria* sp 2 (undescribed)**	
Breeding	Boggy headwaters of high altitude, rainforest streams (up to first order, with some rare exceptions); springs; seepages; streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within a constr
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
***Philoria* sp 3 (undescribed)**	
Breeding	Boggy headwaters of high altitude, rainforest streams (up to first order, with some rare exceptions); springs; seepages; streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within a constr
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
Philoria sphagnicolus	
Breeding	Boggy headwaters of high altitude, rainforest streams (up to second order); springs; seepages (in mud, rock cracks, and rubble); streamside sphagnum bogs. Requires high moisture all year round. No free living tadpole, embryonic development occurs within
Feeding	Deep, moist leaf litter; forest cover. Eat small leaf litter invertebrates. Forages terrestrially adjacent to breeding habitat (but up to several hundred metres away from breeding habitat).
Pseudophryne australis	
Breeding	Ephemeral seepages and first order streams in sandstone country, generally just below ridge tops.
Feeding	Requires forest or heath cover. May be linked with termites. Feed adjacent to breeding areas. Forages terrestrially
Pseudophryne bibronii	
Breeding	Swamps or bogs in open forests on tablelands and coast. Ephemeral water bodies. Formerly found in cleared agricultural areas, curretly only found in undisturbed

Species	HABITAT DESCRIPTION
	areas.

APPENDIX 3.5 CRITICAL HABITAT REQUIREMENTS OF THE NOCTURNAL BIRDS

Species	HABITAT DESCRIPTION
Marbled Frogmouth	
Breeding	Palm gullies and permanent surface water; vine tangles; large horizontal branches for nests
Juvenile	Palm gullies and permanent surface water; vine tangles; large horizontal branches for nests
Feeding	large nocturnal insects (these tend to be in higher abundance in old growth), sparse understorey, high cover of canopy, little or no midstorey.
Sheltering	High canopy cover; vine tangles, large rainforest trees, small horizontal branches
Dispersing	Continuous forest cover
Bush Stone-Curlew	
Breeding	woodlands and very dry forest with an absence of shrubs; leaf litter, dead and down woody material; tall grass tussocks (dispersed); mosaic of clumps of low vegetation & open litter & grassy feeding area
Feeding	woodlands and very dry forest with an absence of shrubs; leaf litter, dead and down woody material; tall grass tussocks (dispersed); mosaic of clumps of low vegetation & open litter & grassy feeding area; open pasture; open grasslands; insects, spiders.
Sheltering	woodlands and very dry forest with an absence of shrubs; leaf litter, dead and down woody material; tall grass tussocks (dispersed); mosaic of clumps of low vegetation & open litter & grassy feeding area
Powerful Owl	
Breeding	large, live, old trees; hollows (branch and trunk); high density of arboreal mammals; nests tend to be in drainage lines (incl minor), simetimes well upslope; dense thickets to protect breeding roosts; 1st, 2nd & 3rd order streams;
Juvenile	patches of tall, dense shrubs
Feeding	Wide range of wet and dry forest types; arboreal mammals, large birds, flying foxes
Sheltering	Tall thickets where available; near drainage lines; rainforest veg near waterfalls and rock ledges
Sooty Owl	
Breeding	wet forest (rainforest & wet sclerophyll) with a well developed mesomorphic understorey; very large, live, old trees with hollows; in big gullies, where eucalypts come out of rainforest; more likely on 2nd & 3rd order streams; will also use caves
Juvenile	Patches of dense, tall understorey; strangler figs
Feeding	forage out of roosting habitat into drier areas; principally forage in wet gullies; small & medium sized terrestrial & arboreal mammals, very few birds

Species	HABITAT DESCRIPTION
Sheltering	Patches of dense, tall understorey; strangler figs; hollows in live and dead trees; vine tangles; dense treefern heads; caves and rocky ledges; rainforest veg near waterfalls and rock ledges; very dense, dark gorges.
Masked Owl	
Breeding	hollows in large, live trees; hollows tend to be vertical in trunks
Feeding	Sclerophyl forest with sparse, open, understorey, particularly ecotone between wet and dry forest, and non-forest habitat; medium & small terrestrial mammals; some arboreal mammals and more birds
Sheltering	Primarily hollows, but also in densely foliaged understorey trees including exotics
Barking Owl	
Breeding	large hollows in large, live trees; near or on floodplains; associated with redgum forest types and sparse groundcover; dry forest woodland with dense thickets of eucalypt, paperbark or viney scrub; cypress pine
Juvenile	Thickets for roosting
Feeding	diverse diet - rabbits, variety of birds, insects; some ground mammals, arboreals and bats
Sheltering	thickets

APPENDIX 3.6 CRITICAL HABITAT REQUIREMENTS OF THE REPTILES

Species	HABITAT DESCRIPTION
Acanthophis antarcticus	
Breeding	litter, rocks, logs, surface cover, ground layer vegetation; wet and dry sclerophyll forest, subtropical and dry rainforest, heath; low to high elevation
Feeding	lizards, frogs, small mammals, small birds
Sheltering	litter, rocks, rock crevices, logs, surface cover, ground layer vegetation
Dispersing	requires some ground vegetation
Other/general	basks on rock slabs and crevices
Austrelaps ramsayi	
Breeding	tussocks, rocks, logs; grassland, swamps, soaks, creeks and seepages in dry open sclerophyll forest and wooland; high elevation
Feeding	lizards, frogs and small mammals, riparian vegetation, water/frogs
Sheltering	logs, rocks, holes in ground, tussocks
Dispersing	requires some ground vegetation
Other/general	basks in open areas in low vegetation
Cacophis harriettae	
Breeding	logs, litter; wet sclerophyll, dry sclerophyll, woodland and heath; low to medium elevation

Species	HABITAT DESCRIPTION
Feeding	lizards and lizard eggs- mainly skinks
Sheltering	logs, litter, other surface shelter
Dispersing	open forest and woodland
Other/general	basks in sheltered sites in trees
Cacophis krefftii	
Breeding	logs, rocks, litter, surface cover; grassland, dry and wet sclerophyll forest, subtropical and temperate rainforest including dry rainforest; low to high elevation; moderate to high moisture levels
Feeding	lizards and some frogs
Sheltering	logs, rocks and litter, surface cover; moderate to high moisture levels
Dispersing	requires some ground vegetation; moderate to high moisture levels
Other/general	basks in sheltered ground cover vegetation
Calyptotis ruficauda	
Breeding	friable soil/leaf litter/rotting log interface; dry open forest, wet sclerophyll forest; soils with moderate to high moisture levels; medium to low elevation
Feeding	small litter and soil invertebrates; friable soil/leaf litter/rotting log interface; dry open forest, wet sclerophyll forest; soils with moderate to high moisture levels; medium to low elevation
Sheltering	soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Cautula zia	
Breeding	leaf litter, flat stones, logs; subtropical and temperate rainforest, wet sclerophyll forest; soils with moderate to high moisture levels; high to low elevation
Feeding	small litter and soil invertebrates, smooth skin caterpillars
Sheltering	high to medium foliage cover; soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Coeranoscincus reticulatus	
Breeding	friable soil/leaf litter/large log interface; subtropical and temperate rainforest, wet sclerophyll forest, open coastal forest (?); soils with moderate to high moisture levels; high to low elevatio
Feeding	small litter and soil invertebrates, beetle larvae and earthworms
Sheltering	soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Ctenotus eurydice	
Breeding	granite slabs and outcrops with tussocks, logs, fallen timber; open dry sclerophyll forest, woodland, grassland associated with granite outcrops; high elevation
Feeding	invertebrates

Species	HABITAT DESCRIPTION
Sheltering	granite slabs and outcrops with tussocks, logs, fallen timber
Dispersing	rock outcropping, woodland
Other/general	basks on rocks in relatively open areas
Drysdalia coronoides	
Breeding	tussocks, rocks, logs; grassland, dry open sclerophyll forest and woodland and heath; high elevation
Feeding	lizards
Sheltering	logs, rocks, tussocks, litter
Dispersing	requires some ground vegetation
Elseya georgesi	
Breeding	undisturbed banks and sand bars on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Juvenile	adjacent wetlands and small channels; aquatic vegetation very important; needs connectivity with main channel
Feeding	sand banks on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows; aquatic vegetation
Sheltering	logs, deep holes, aquatic vegetation
Other/general	basking sites, emergent rocks or logs
Elseya purvisi	
Breeding	undisturbed banks and sand bars on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Juvenile	adjacent wetlands and small channels; aquatic vegetation very important; needs connectivity with main channel
Feeding	sand banks on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows; aquatic vegetation
Sheltering	logs, deep holes, aquatic vegetation
Other/general	basking sites, emergent rocks or logs
***Elseya* sp2 (Gwydir & Namoi Rivers)**	
Breeding	undisturbed banks and sand bars on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Juvenile	adjacent wetlands and small channels; aquatic vegetation very important; needs connectivity with main channel
Feeding	sand banks on rivers; upper reaches of river; environmental flows; possibly high site fidelity; old, dead wood; deep holes associated with water flows; aquatic vegetation
Sheltering	logs, deep holes, aquatic vegetation

Species	HABITAT DESCRIPTION
Other/general	basking sites, emergent rocks or logs
***Emydura* sp (Bellingen River)**	
Breeding	undisturbed banks and sand bars on rivers; upper reaches of river; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Juvenile	adjacent wetlands and small channels; aquatic vegetation very important; needs connectivity with main channel
Feeding	undisturbed banks and sand bars on rivers; upper reaches of river; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Sheltering	logs, deep holes, aquatic vegetation
Other/general	basking sites, emergent rocks or logs
***Emydura* sp1**	
Breeding	undisturbed banks and sand bars on rivers; upper reaches of river; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Juvenile	adjacent wetlands and small channels; aquatic vegetation very important; needs connectivity with main channel
Feeding	undisturbed banks and sand bars on rivers; upper reaches of river; possibly high site fidelity; old, dead wood; deep holes associated with water flows;streamside vegetation
Sheltering	logs, deep holes, aquatic vegetation
Other/general	basking sites, emergent rocks or logs
Eulamprus kosciuskoi	
Breeding	tussocks, rocks, logs; open dry sclerophyll woodland with swamps, seepages and creeks; high elevation
Feeding	invertebrates
Sheltering	tussocks, rocks, logs; open dry sclerophyll woodland with swamps, seepages and creeks; high elevation
Dispersing	tussocks, rocks, logs; open dry sclerophyll woodland with swamps, seepages and creeks; high elevation
Other/general	basks on rocks and logsin relatively open areas
Eulamprus murrayi	
Breeding	leaf litter, rocks, logs, live tree bases, low hollows; subtropical and temperate rainforest, wet sclerophyll forest; soils with moderate to high moisture levels; low to high elevation
Feeding	small invertebrates
Sheltering	high to medium foliage cover; soil, logs, rocks, tree hollows, medium to high moisture levels; epiphytes
Dispersing	needs continuous forest cover
Other/general	basking- logs, tree trunks, rocks, large vines

Species	HABITAT DESCRIPTION
Eulamprus tenuis	
Breeding	logs, live trees with hollows and crevices, stags; subtropical and temperate rainforest, wet sclerophyll forest; soils with moderate to high moisture levels; low to medium elevation
Feeding	small invertebrates
Sheltering	high to medium foliage cover; tree hollows and crevices, rotting logs, medium to high moisture levels
Dispersing	needs continuous forest cover
Other/general	basking- tree trunks, stags
Eulamprus tryoni	
Breeding	logs and rocks on forest floor; subtropical and temperate rainforest; soils with moderate to high moisture levels; high elevation
Feeding	small invertebrates
Sheltering	high to medium foliage cover; rotting logs, medium to high moisture levels
Dispersing	needs continuous forest cover
Other/general	basking- logs and rocks on forest floor
Hoplocephalus bitorquatus	
Breeding	stags, hollow bearing trees, decorticating bark; wet and dry sclerophyll forest and woodland; low to medium elevation
Feeding	lizards, frogs, small mammals
Sheltering	stags, hollow bearing trees, decorticating bark
Dispersing	forest and woodland
Other/general	basks in sheltered sites in trees and creeper masses and sedges
Hoplocephalus bungaroides	
Breeding	rocky outcrops, rock flakes and slabs, crevices; open sclerophyll forest, woodland and heath, sandstone outcrops; low to high elevation
Feeding	geckos, small mammals and lizards
Sheltering	rocky outcrops, rock flakes and slabs, crevices, tree hollows, stags
Dispersing	rock outcrops, hollow trees
Hoplocephalus stephensii	
Breeding	stags, Strangler Figs, creepers and vines, hollow bearing trees, decorticating bark, stumps, rock crevices and slabs; rainforest, wet and dry sclerophyll forest,woodland and heath; low to high elevation
Feeding	small mammals, frogs and lizards, riparian vegetation, water/frogs
Sheltering	stags, Strangler Figs, creepers and vines,hollow bearing trees, decorticating bark, stumps, rock crevices and slabs, arboreal termitaria
Dispersing	forest and woodland
Other/general	basks on sheltered sites in low vegetation and on rocks

Species	HABITAT DESCRIPTION
Hypsilurus spinipes	
Breeding	edges of cleared areas, road edges; subtropical and temperate rainforest, wet sclerophyll forest; soils with moderate to high moisture levels; low to high elevation
Feeding	small vertebrates and invertebrates, ants, caterpillars
Sheltering	high to medium foliage cover; vines and saplings; medium to high moisture levels
Dispersing	needs continuous forest cover
Lampropholis caligula	
Breeding	tussocks, rocks, logs; open dry sclerophyll woodland, old growth forest; high elevation
Feeding	invertebrates
Sheltering	tussocks, rocks, logs; open dry sclerophyll woodland, old growth forest
Dispersing	tussocks, rocks, logs; open dry sclerophyll woodland, old growth forest
Other/general	basks on rocks, fallen timber and logs in relatively open areas
Lampropholis elongata	
Breeding	tussocks, rocks, logs; open dry sclerophyll woodland and adjacent ecotones; high elevation
Feeding	invertebrates
Sheltering	tussocks, rocks, logs; open dry sclerophyll woodland and adjacent ecotones
Dispersing	tussocks, rocks, logs; open dry sclerophyll woodland and adjacent ecotones
Other/general	basks on rocks, fallen timber and logs in relatively open areas
Ophioscincus truncatus	
Breeding	friable soil/leaf litter/rotting log interface; subtropical rainforest, dry open forest, wet sclerophyll forest; soils with moderate to high moisture levels; medium to low elevation
Feeding	small litter and soil invertebrates; friable soil/leaf litter/rotting log interface; subtropical rainforest, dry open forest, wet sclerophyll forest; soils with moderate to high moisture levels; medium to low elevation
Sheltering	soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Saltuarius swaini	
Breeding	rock crevices, exfoliating rock slabs, large trees with crevices and buttresses, Strangler Figs, stinging trees with medium to high moisture levels; dry rainforest, wet and dry sclerophyll forest; low to high elevation
Feeding	invertebrates particularly arthropods
Sheltering	rock crevices, exfoliating rock slabs, large trees with crevices and buttresses, Strangler Figs, stinging trees, low cliffs and outcrops with medium to high moisture levels
Dispersing	needs continuous forest cover
Saltuarius wyberba	

Species	HABITAT DESCRIPTION
Breeding	rock crevices, exfoliating rock slabs, large trees, decorticating bark; open dry sclerophyll forest, woodland, heathland; high elevation
Feeding	invertebrates particularly arthropods
Sheltering	rock crevices, exfoliating rock slabs, large trees, decorticating bark, low cliffs and outcrops
Dispersing	rock outcropping
Saproscincus challengeri	
Breeding	leaf litter, flat stones, logs, live tree bases; subtropical and temperate rainforest, littoral rainforest; wet sclerophyll forest; soils with moderate to high moisture levels; low to medium elevation
Feeding	most small invertebrates on surface and litter, moths, cockroaches
Sheltering	high to medium foliage cover; soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Saproscincus galli	
Breeding	leaf litter, flat stones, logs, live tree bases; subtropical and temperate rainforest, littoral rainforest; wet sclerophyll forest; soils with moderate to high moisture levels; high to low elevation
Feeding	most small invertebrates on surface and litter, moths, cockroaches
Sheltering	slightly arboreal, uses bark, crevices and hollows; high to medium foliage cover; soil, logs, rocks, deep leaf litter with medium to high moisture levels; more common in riparian zone
Dispersing	needs continuous forest cover
Saproscincus oriarus **"North Coast sp"**	
Breeding	swamp sclerophyll forest, wet heath and shrubland and adjacent grassland, with high moisture levels; microhabitat unknown
Feeding	invertebrates
Sheltering	swamp sclerophyll forest, wet heath and shrubland and adjacent grassland, with high moisture levels; microhabitat unknown
Dispersing	swamp sclerophyll forest, wet heath and shrubland and adjacent grassland, with high moisture levels
Saproscincus rosei	
Breeding	leaf litter, flat stones, logs, live tree bases; subtropical and temperate rainforest, littoral rainforest; wet sclerophyll forest; soils with moderate to high moisture levels; high to low elevation
Feeding	most small invertebrates on surface and litter, moths, cockroaches
Sheltering	high to medium foliage cover; soil, logs, rocks, deep leaf litter with medium to high moisture levels
Dispersing	needs continuous forest cover
Tropidechis carinatus	

Species	HABITAT DESCRIPTION
Breeding	dense vegetation, trees, lantana, riparian vegetation; subtropical and temperate rainforest, wet, dry and swamp sclerophyll forest and heath; low to high elevation
Feeding	frogs, small mammals and lizards, riparian vegetation, water/frogs
Sheltering	logs, lantana, rocks, tree hollows, ground holes, dense ground vegetation
Dispersing	forest, dense vegetation
Other/general	basks in open areas in low vegetation and on logs and rocks
Tympanocryptis diemensis	
Breeding	heathland and woodland with heathy understorey in the Sydney region, Barrington region ?; logs, rocks (?), tussocks; medium to high elevation
Feeding	invertebrates
Sheltering	heathland and woodland with heathy understorey in the Sydney region, Barrington region ?; logs, rocks (?), tussocks
Dispersing	heathland and woodland with heathy understorey in the Sydney region, Barrington region ?; logs, rocks (?), tussocks
Other/general	basks on logs ad rocks in open areas
Tympanocryptis lineata pinguicollis	
Breeding	native grasslands with rocks, tussocks, rocks, spider burrows and cracking soil; high elevation
Feeding	invertebrates
Sheltering	native grasslands with rocks, tussocks, rocks, spider burrows and cracking soil
Dispersing	native grasslands with rocks, tussocks, rocks
Other/general	basks ?
Underwoodisaurus sphyrurus	
Breeding	exfoliating rock slabs, fallen timber, rocks, bark on ground, stumps, deep leaf litter; open dry sclerophyll forest, woodland, grassland associated with rock outcrops, scree slopes; high elevation
Feeding	invertebrates
Sheltering	exfoliating rock slabs, fallen timber, rocks, bark on ground, stumps, deep leaf litter
Dispersing	rock outcropping, woodland
Varanus rosenbergi	
Breeding	Sydney sandstone woodland, heathland; terrestrial termitaria
Feeding	vertebrates and invertebrates
Sheltering	rocks, hollow logs, dense ground layer vegetation, burrows
Dispersing	dispersal requires some rocks, hollow logs, dense ground layer vegetation, burrows etc
Other/general	requires logs in open areas for basking

APPENDIX 3.7 CRITICAL HABITAT REQUIREMENTS OF THE TERRESTRIAL MAMMALS

Species	HABITAT DESCRIPTION
Eastern Quoll	
Breeding	rockpiles, crevices, hollows
Feeding	Forest-grassland ecotone; grassy, open forest and woodland
Sheltering	As for breeding
Rufous Bettong	
Breeding	grass tussocks and logs; piles of fallen trees; scattered clumps dense veg (eg blackberry)
Feeding	grassy open forest and woodland without foxes, and with quolls or dingoes - declined at higher elevation (foxes?)
Sheltering	grass, tussocks and logs
Red-legged Pademelon	
Breeding	as for feeding
Feeding	fallen leaves in wet sclerophyll and rainforest on high nutrient soil; distributed throughout forest, not just ecotones; positive association with undisturbed forest
Sheltering	as for feeding
Brush-tailed Rock-wallaby	
Breeding	north facing cliffs with caves and rock shelters with multiple entrances
Feeding	grassland or grassy open forest adjacent to rocky escarpments; distance from shelter foraged related to predatory pressure from foxes
Sheltering	as for breeding
Black-striped Wallaby	
Breeding	dense understorey
Feeding	ecotone of wet sclero/ rainforest with dense understorey adjacent to pasture - diet 80% grass plus lomandra, sedge and dicot leaf
Sheltering	dense understorey component of feeding hab
Long-nosed Potoroo	
Breeding	areas of dense understorey veg
Feeding	Coastal heath or dense moist escarpment forest - fragmented distribution; dense ground cover in areas with foxes; dense riparian and alluvial plains veg (tussock, sedge, rush)
Sheltering	as for breeding
Parma Wallaby	
Breeding	as for shelter and feeding
Feeding	wet sclerophyll/ rainforest edge, with a mosaic of dense understorey interspersed with grassy patches where foxes absent - forages mostly in grassy patches; areas away from agriculture
Sheltering	uses dense understorey for shelter

Species	HABITAT DESCRIPTION
Whiptail Wallaby	
Breeding	as for feeding
Feeding	Grassy dry sclero woodland on slopes
Sheltering	as for feeding
Tiger Quoll	
Breeding	rockpiles, crevices, hollows
Feeding	Broad range of habitats; more abundant in larger, less disturbed forests (for arboreal prey species)
Sheltering	mainly rock piles and crevices, also logs, tree hollows, burrows of other species, holes
Common Wombat	
Breeding	Cool-cold burrows (numerous per indiv) - sensitive to high temperature
Feeding	high elevation grassy wet and dry forests
Sheltering	Cool-cold burrows (numerous per indiv) - sensitive to high temperature
Platypus	
Breeding	overhanging earth banks for burrows; streamside veg and trees (for bank stabilisation)
Feeding	mesotrophic creeks, deep pools
Sheltering	As for breeding
Hastings River Mouse	
Breeding	as for shelter, adjacent to feeding areas
Feeding	open forest and woodland with a grass/ rush/ sedge/ heath understorey in close proximity to shelter; highest densities occur around permanent shelter adjacent to feeding areas with a dense cover of grass/sedge/ rush which has not been burnt for approx 10years; often near drainage lines, swamps or moist grassy flats with some natural protection from fire; diet predom seed and fruit in summer, leaves of nutritious herbs particularly *Glycine* during winter
Sheltering	rockpiles, hollow logs, yabbie burrows, cavities in old growth tree butts
Brush-tailed Phascogale	
Breeding	tree hollows
Feeding	broad range of habitats, more common in dry sclero forest and woodlands; associated with flatter landscapes; foxes scarce or absent
Sheltering	tree hollows
Eastern Chestnut Mouse	
Breeding	? - as for shelter
Feeding	grassy forests, woodlands and wet heaths; prefers early post fire serial stage; in areas where foxes scarce or absent; seeds and stems important
Sheltering	grass nest on surface of ground or burrow network
Broad-toothed Rat	

Species	**HABITAT DESCRIPTION**
Breeding	as for shelter and feeding
Feeding	thickets of grasses and sedges in heathland, woodland, sedgeland and wet sclerophyll at higher elevations where foxes scarce or absent; areas with high water tables; eat grasses, sedges, bark and seeds
Sheltering	nests of shredded grass under logs or dense veg - use runways under dense veg to avoid predation
Common Planigale	
Breeding	as for shelter
Feeding	dry sclerophyll, swamp sclerophyll, heathland and grassland at ecotone with rainforest; dense leaf litter or ground cover
Sheltering	nest of euc leaves in logs or under bark, cracks in soil, grass tussocks, also building debris
Pale Field-rat	
Breeding	burrows, presence of food plants, suitable soil
Feeding	wet heath, dry heath, dry sclerophyll and wet sclerophyll on sandy soils; feeds on grass roots, stems and seeds
Sheltering	burrow complexes in sandy soil - living in patchy refugial colonies
Grassland Melomys	
Breeding	as for shelter
Feeding	coastal complex, swamp sclerophyll forest, sclerophyll shrubland, sclerophyll woodland, wet heath, sedgeland and grassland; moist sites with dense low or mid stratum; diet includes grass stems, insects, seeds and berries - agile climbers
Sheltering	above ground spherical nests of shredded leaves and grass; also in short burrows
New Holland Mouse	
Breeding	as for shelter; high plant species diversity
Feeding	coastal heaths, elsewhere dry sclerophyll with heath understorey; typically on coarse grained, low nutrient soils eg coastal sands, sandstone and granite; early post fire succession; diet of weeds, seeds (partic *Acacia suaveolens*), fungi, leaves, flowers, roots and insects
Sheltering	nest chamber at end of burrow <5m long; dense understorey shrub cover
Dusky Antechinus	
Breeding	logs, shallow burrows dug under logs and creek banks
Feeding	moist litter in mid-high elevation rainforest and wet sclero forest
Sheltering	as for breeding

APPENDIX 4

APPENDIX 4.1 DISTURBANCES IDENTIFIED FOR ARBOREAL MAMMALS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER.

Species	Disturbance	Rank	Comments
Koala	Habitat clearing	1	
	Introduced predator- foxes and dogs	2	
	Wildfire	4	
	Disease	6	
	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive)	3	Logging that fails to retain stems in the 30-80 DBH size class
	Roadkills	5	
Squirrel Glider	Habitat clearing	1	
	High frequency burning	2	
	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive)	3	Removal of large trees and hollows, includes firewood collection
	Apiary- competition for hollows	4	
	Introduced predator- foxes, dogs and cats	5	
Yellow-bellied Glider	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive)	1	Logging that fails to retain a high proportion of large trees and hollows
	High frequency burning	3	
	Habitat clearing	2	
Greater Glider	High frequency burning	2	
	Intensive logging that removes the critical tree size classes from the stand (may be frequent or single and intensive)	1	Logging that fails to retain a high proportion of large trees and hollows
Eastern Pygmy-possum	High frequency burning	1	
	Habitat clearing	2	

APPENDIX 4.2 DISTURBANCES IDENTIFIED FOR BATS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER.

Species	Disturbance	Rank	Comments
Nyctimene robinsoni	Clearing	1	esp rainforest
	Logging of wet sclerophyll	2	of wet sclerophyll
	Wildfire	5	
	Regeneration burn	5	regeneration
	Fragmentation	3	predation (owls)
	Weed invasion	3	lantana and others
	Dams	5	
	Roading	5	
	Barbed wire fences	4	
	Roadkills	5	
	Climate change	5	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
Pteropus alecto	Shooting	3	
	disease	5	lyssavirus
	Powerlines	3	
	Direct disturbance to camps	2	proximity to humans
	Clearing - habitat loss	1	
	Clearing resulting in fragmentation	4	
	Logging of sclerophyll	3	of sclerophyll - loss of older trees
	Wildfire	4	
	Apiary	5	competition for nectar
	Barbed wire fences	5	
	Climate change	6	
	Weed invasion	4	
	Drainage of swamps	2	
	management burns	3	
Syconycteris australis	Clearing resulting in fragmentation	2	increased predation, decreased food
	Clearing - habitat loss	1	
	Logging of sclerophyll	3	coastal sclerophyll with banksia understorey
	Wildfire	2	
	Apiary	2	
	Barbed wire fences	5	
	management burns, including illegal	1	

Species	Disturbance	Rank	Comments
	Weed invasion	2	
	weed spraying	3	Aerial spraying of bitou bush
	Drainage of swamps	2	
	mining - sand	2	
	Recreational 4WD	4	Sand dune disturbance
	introduced predators	5	
Pteropus poliocephalus	Shooting	3	
	Powerlines	3	
	Direct disturbance to camps	2	
	Clearing - habitat loss	1	
	Clearing resulting in fragmentation	4	
	Logging of sclerophyll	3	
	disease	5	lyssavirus
	Wildfire	4	
	Apiary	5	
	Barbed wire fences	5	
	Climate change	6	
	Weed invasion	5	less restricted to rainforest remnants than P. alecto
	Drainage of swamps	2	
	management burns	3	
Kerivoula papuensis	Clearing resulting in fragmentation	2	
	Clearing - habitat loss	1	esp rainforest
	Logging - loss of hollows	2	
	Logging - loss of understorey	2	
	Wildfire	3	
	Weed invasion	3	
	weed spraying	4	
	introduced predators	4	
	grazing	2	
	dams	4	
	Roadkills	4	
	Frequent burning	1	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
Chalinolobus nigrogriseus	Clearing - habitat loss	1	

Species	Disturbance	Rank	Comments
	Clearing - fragmentation	3	
	Logging - loss of hollows & oldgrowth	2	
	Logging - loss of understorey complexity	4	
	Frequent burning	4	
	Grazing	4	
	Wildfire	5	
	Pesticides	5	
	mining – sand	5	
Myotis adversus	Altered hydrol old-regrowth - altered flow	3	
	Altered hydrol old-regrowth – sedimentation	3	
	Clearing - habitat loss	1	riparian vegetation
	Use of chemicals	2	
	Clearing – fragmentation	1	
	Logging - loss of hollows	4	
	Bridge removal	3	
	Frequent burning	4	
	Recreational activities	5	fly fishing, boating
	Eutrophication	3	from agriculture, grazing and sewage
	Weeds	5	
	grazing	2	
	dams	3	
	Use of chemicals	2	mosquito control, pesticides
	fish	6	trout
Mormopterus beccarii	Clearing - loss of habitat	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows	1	
	Logging - loss of understorey complexity	5	
	Wildfire	5	
	Frequent burning	3	impact on invertebrates
	Pesticides	3	
	grazing	3	
Vespadelus troughtoni	Clearing - habitat loss	3	
	Clearing - fragmentation	4	
	Frequent burning	3	
	grazing	3	

Species	Disturbance	Rank	Comments
	Wildfire	4	
	Pesticides	4	
	Recreational activities	2	That disturb caves
	Disturbance to camps/ caves	4	
	introduced predators	5	
	logging - loss of foraging habitat	3	
Miniopterus australis	Clearing - habitat loss	1	
	Clearing - fragmentation	3	
	logging - loss of foraging habitat	3	
	logging - loss of hollows	5	
	Frequent burning	3	
	grazing	4	
	Wildfire	4	
	Pesticides	4	
	Disturbance to camps/ caves	2	By limestone mining (cave collapse, altered air flow, noise, dust etc) and recreational activities
	introduced predators	5	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
	mining - sand	5	
Chalinolobus dwyeri	Clearing - habitat loss	3	
	Clearing - fragmentation	3	
	Frequent burning	2	
	grazing	2	
	Wildfire	2	
	Pesticides	3	
	Recreational activities	2	That disturb caves
	Disturbance to camps/ caves	1	Disturbance to caves - collapse due to mining
	introduced predators	3	
	logging - loss of foraging habitat	3	
Vespadelus pumilus	Clearing - habitat loss	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows & oldgrowth	2	.
	Logging - loss of understorey	3	
	Frequent burning	3	
	Weed invasion	4	
	grazing	3	

Species	Disturbance	Rank	Comments
	weed spraying	5	
	Wildfire	4	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
Rhinolophus megaphyllus	Clearing - habitat loss	1	
	Clearing - fragmentation	2	
	logging - loss of foraging habitat	3	
	logging - loss of hollows	5	
	Frequent burning	4	
	grazing	5	
	Wildfire	4	
	Pesticides	5	
	Disturbance to camps/ caves	3	
	introduced predators	4	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
Saccolaimus flaviventris	Clearing - habitat loss	2	
	Logging - loss of hollows & oldgrowth	1	
	Frequent burning	3	
	grazing	3	
	disease	5	lyssavirus
	Barbed wire	5	
	Pesticides	4	
Nyctophilus timoriensis	Clearing - loss of habitat	1	
	Clearing - fragmentation	2	
	Logging - loss of hollows	1	
	Logging - loss of understorey complexity	2	
	Wildfire	3	
	Frequent burning	3	
	Pesticides	3	
	grazing	2	
	mining - coal	3	
	introduced predators	4	
Nyctophilus bifax	Clearing - habitat loss	1	
	Clearing - fragmentation	2	
	Logging - loss of hollows	4	

Species	Disturbance	Rank	Comments
	Logging - loss of understorey	3	
	Frequent burning	3	
	Weed invasion	4	
	grazing	3	
	dams	5	
	mining - sand	3	
	weed spraying	4	
	Wildfire	5	
	Roadkills	5	
Scotorepens orion	Clearing - habitat loss	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows & oldgrowth	2	
	Logging - loss of understorey	4	
	Frequent burning	4	
	Pesticides	4	
	grazing	4	
	Wildfire	5	
	Altered hydrology/microclimate - oldgrowth-regrowth	5	
Falsistrellus tasmaniensis	Clearing - habitat loss	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows & oldgrowth	1	
	Logging - loss of understorey	3	
	Frequent burning	3	
	Weed invasion	4	
	grazing	3	
	Wildfire	4	
	Altered hydrology/microclimate - oldgrowth-regrowth	4	
	Climate change	2	
Scotoeanax rueppellii	Clearing - habitat loss	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows & oldgrowth	1	
	Logging - loss of understorey	3	
	Frequent burning	3	
	Weed invasion	4	
	grazing	3	

Species	Disturbance	Rank	Comments
	Wildfire	4	
	Altered hydrology/microclimate - oldgrowth-regrowth	4	
	Barbed wire	4	
Miniopterus schreibersii	Clearing - habitat loss	1	
	Clearing - fragmentation	4	
	logging - loss of foraging habitat	4	
	logging - loss of hollows	5	
	Frequent burning	4	
	grazing	5	
	Wildfire	5	
	Pesticides	3	
	Disturbance to camps/ caves	2	
	introduced predators	5	
	Altered hydrology/microclimate - oldgrowth-regrowth	3	
Scotorepens balstoni	Clearing - loss of habitat	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows	2	
	Logging - loss of understorey	4	
	Pesticides	3	
	grazing	4	
	mining - coal	2	
	Barbed wire	5	
Scotorepens greyii	Clearing - loss of habitat	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows	2	
	Logging - loss of understorey	4	
	Pesticides	4	
	grazing	4	
	Frequent burning	5	
	mining - sand	3	
	Altered hydrology/microclimate - oldgrowth-regrowth	5	
Mormopterus norfolkensis	Clearing - loss of habitat	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows	1	

Species	Disturbance	Rank	Comments
	Wildfire	5	
	Pesticides	3	
	Logging - loss of understorey	4	
	grazing	3	
Mormopterus planiceps	Clearing - loss of habitat	1	
	Clearing - fragmentation	5	
	Logging - loss of hollows	2	
	Logging - loss of understorey	4	
	Pesticides	3	
	grazing	4	
	mining - coal	2	
	Barbed wire	5	
Nyctinomus australis	Clearing - loss of habitat	2	
	Logging - loss of hollows	1	
	Wildfire	5	
	Frequent burning	3	
	Pesticides	3	
	grazing	4	
	Barbed wire	5	
Mormopterus sp 1	Clearing - loss of habitat	1	Coastal
	Logging - loss of hollows	2	
	Pesticides	3	
	Logging - loss of understorey	4	
	grazing	4	
	Wildfire	5	
Scotorepens sp 1	Clearing - loss of habitat	1	
	Clearing - fragmentation	3	
	Logging - loss of hollows	2	
	Logging - loss of understorey	4	
	Pesticides	4	
	grazing	4	
	Frequent burning	5	
	mining - sand	3	
	Altered hydrology/microclimate - oldgrowth-regrowth	5	

APPENDIX 4.3 DISTURBANCES IDENTIFIED FOR DIURNAL BIRDS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER

Species	Disturbance Description	Rank	Comments
Double-eyed Fig-parrot	Clearing for agriculture	1	
	Urban development	2	
	intensive horticulture	3	
	weed invasion	4	in lowland remnants (exotic vines)
	logging	5	eucalypt adjacent to lowlands - subtropical and dry rainforest
Black-throated Finch	Grazing and associated burning	1	.
	Pasture improvement and cropping	1	
	Predation by exotics	2	
	Illegal trapping	2	
	Introduced herbivores	2	
	Clearing for agriculture	1	
Red Goshawk	Clearing for agriculture	1	
	Drainage of swamps	3	lowers densities of waterbirds (prey)
	egg collecting	8	
	Urban development	2	
	logging	4	
	intensive horticulture	3	
	agricultural chemical use	6	
	weed invasion	7	
	changed fire regimes	5	
Regent Honeyeater	Clearing for agriculture	1	
	grazing	5	
	Urban development	2	
	firewood collection	3	
	logging that reduces age classes	3	reduced age class, decreased nectar
	changed fire regimes	4	
	apiary	5	
	native predators	4	nest predation by birds
Black-breasted Button-quail	Clearing for agriculture	1	
	grazing	3	by cattle and macropods
	weed invasion	4	in lowland remnants by exotic vines

Species	Disturbance Description	Rank	Comments
	any logging	3	alters microclimate and removes shelter
	introduced predators	4	
	high frequency burning	2	
Swift Parrot	Clearing for agriculture	1	
	mining coastal sands	3	
	Urban development	2	
	grazing and associated burning	2	
	intensive horticulture	3	
	logging that reduces size class of trees	2	
	firewood collection	2	
Black-necked Stork	Drainage of wetlands	1	
	Dams	1	
	Pesticide contamination of wetlands	3	
	Powerlines	2	
	Intensive horticulture	2	Tea trees
	Urban development	3	
	Loss of nest trees	3	
	Shooting	4	
Wompoo Fruit-dove	Urban development	2	
	Clearing for agriculture	1	
	weed invasion	2	In lowland remnants
	logging that reduces size class of trees	1 (2 JS)	Of fleshy fruit trees in wet sclerophyll forest
	loss of habitat trees in agric land	2	loss of fig trees
	intensive horticulture	3	
Rufous Scrub-bird	logging	2	that alters microclimate and litter dynamics - of wet sclerophyll
	climate change	1	
	Clearing for agriculture	3	
	exotic predators	3	cats
	management burns	2	
Albert's Lyrebird	exotic predators	4	
	management burns	3	
	logging	3	that alters microclimate and litter dynamics
	climate change	2	
	clearing resulting in fragmentation	1	
	roadkills	4	

Species	Disturbance Description	Rank	Comments
	weed invasion	2	by lantana following logging of wet sclerophyll on higher nutrient sites
Eastern Bristlebird	Grazing and associated burning	1	
	Predation by exotics	2	
	Clearing for agriculture	1	
	Climate change	2	
	Altered fire regimes	1	
Varied Triller	Clearing for agriculture	1	
	Urban development	1	
Square-tailed Kite	Clearing for agriculture	1	
	grazing and associated burning	2	
	egg collecting	4	
	logging	2 (3 JS)	increases structural density through reducing age classes, decreased nectar prod.
	intensive horticulture	2	
	Urban development	3	
	nest site loss	2	
	firewood collection	3	
Black Bittern	Clearing for agriculture	1	
	Pollutants	2	Pollutants
	Urban development	1	
	Grazing	1	Cattle grazing and damage to riparian areas
	Diversion of irrigation water	1	Reduces stream flow
Red-tailed Black-Cockatoo	Grazing and associated burning	2	
	Clearing for agriculture	1	
	Intensive horticulture	1	
	Urban development	1	
	Logging	2	loss of large, old, dead trees
Osprey	Drainage of wetlands	1	
	Chemical pollutants	1	
	Urban development	1	
	Loss of nest sites	1	
	Commercial fishing	1	Removal of mullet, loss of food
Barred Cuckoo-shrike	Clearing for agriculture	1	and plantations
	Urban development	1	

Species	Disturbance Description	Rank	Comments
	weed invasion	1	
	loss of habitat trees in agric land	1	fig trees
	intensive horticulture	1	
Painted Honeyeater			
	Grazing and associated burning	2	
	Clearing for agriculture	1	
	Pasture improvement and cropping	2	
	Apiary	3	
	Firewood collecting	2	
	logging	2	Yellowbox forest only
Rose-crowned Fruit-dove	Clearing for agriculture	1	
	Urban development	1	
	weed invasion	1	
	logging that reduces age classes	2	of mesomorphic midstorey
	loss of habitat trees in agric land	1	
	intensive horticulture	1	
Glossy Black-Cockatoo	Clearing for agriculture	1	
	grazing and associated burning	1	
	Urban development	1	
	logging that reduces age classes	1 (DM,SG) 2 (HR,JS)	of eucalypts and allocasuarina
	Cats	3	climbing into nests
	firewood collection	3	
Paradise Riflebird	clearing resulting in fragmentation	2 (1 JS)	
	logging that reduces age classes	1	
	management burns	3 (1 JS)	
Collared Kingfisher	Chemical pollutants	2	
	Urban development	1	
	Increased sedimentation	2	
Superb Fruit-dove	Clearing for agriculture	1	
	Urban development	1	
	weed invasion	1	
	logging that reduces age classes	2	of mesomorphic midstorey
	loss of habitat trees in agric land	1	

Species	Disturbance Description	Rank	Comments
	intensive horticulture	1	
Regent Bowerbird	Logging	1	Logging that affects fruit lower strata
	Logging	2	Logging that affects fruit lower strata
	Clearing for agriculture	2	
	Urban development	1	
	Intensive horticulture	2	
	Weeds	1	In remnants and gallery strips
Brahminy Kite	Drainage of wetlands	1	
	Chemical pollutants	1	
	Urban development	1	
	Loss of nest sites	1	
Olive Whistler	climate change	1	
	Cats	2	
	management burns	2	
	clearing resulting in fragmentation	2	
	logging	3	immediate response only
White-eared Monarch	intensive horticulture	3	
	clearing resulting in fragmentation	1	
	Urban development	2	and rural residential
	weed invasion	2	of remnants
Turquoise Parrot	grazing and associated burning	2	
	Clearing for agriculture	1	
	firewood collection	2	
	exotic predators	3	
	pasture improvement and cropping	1	
	predation by native fauna	3	increased abundance of native predators
Pale-yellow Robin	Clearing for agriculture	1	Particularly fragmentation
	Logging	1	Logging that encourages dense low stratum
	Logging		
	Intensive horticulture	2	
	Urban development	2	
Pacific Baza	Clearing for agriculture	1	
	logging that reduces age classes	2	
	roadkills	3	
	weed invasion	2	of remnant gallery forest
Bush-hen	Predation by exotics	1	

Species	Disturbance Description	Rank	Comments
	Chemical pollutants	2	
	Grazing	1	In riparian vegetation
	Urban development	1	
Mangrove Honeyeater	Urban development	1	With associated mangrove loss
Grey Goshawk	Clearing for agriculture	1	
	Logging that reduces age classes	2	
	Urban development	2	
	Loss of nest sites	1	
Forest Raven	Clearing for agriculture	1	Causes disadvantages to this bird when competing with other corvids
	Urban development	1	Causes disadvantages to this bird when competing with other corvids
Gang-gang Cockatoo	Grazing and associated burning	2	
	Clearing for agriculture	1	
	Logging that reduces age classes	2	Loss of old trees
Noisy Pitta	Predation by exotics	2	
	Clearing for agriculture	1	
	Intensive horticulture	2	
	Weeds	1	
	Urban development	2	
	Logging	3	Removes the large rainforest trees changing microclimate and reducing food supply
Brush Bronzewing	Predation by exotics	2	
	Clearing for agriculture	2	
	Urban development	1	
	Altered fire regimes	2	
Black-eared Cuckoo	Clearing for agriculture	1	
	Grazing	1	Changes to understorey density- woody understorey
Oriental Cuckoo	Grazing and associated burning	1	
	Clearing for agriculture	1	
Forest Kingfisher	Clearing for agriculture	1	
	Intensive horticulture	2	
	Loss of nest trees	2	
	Grazing	2	prevents recruitment of woodland trees
	Predation by exotics	3	
Little Shrike-thrush	Clearing for agriculture	1	

Species	Disturbance Description	Rank	Comments
	Intensive horticulture	2	
	Urban development	1	
	Logging	1	Loss of older age classes
	Grazing	2	Removes native vines and encourages weed vines
	Weeds	1	
Peregrine Falcon	Cheemical pollutants	1	pesticides
	Shooting	1	
Little Bronze-Cuckoo	Clearing for agriculture	1	
	Intensive horticulture	1	Tea trees
	Urban development	2	
	Weeds	2	
Russet-tailed Thrush	Clearing for agriculture	1	
	Predation by exotics	2	
	Logging	2	Increases understorey density and changes moisture regimes
	Urban development	2	
	Intensive horticulture	2	
Hooded Robin	Clearing for agriculture	2	leading to fragmentation
	pasture improvement and cropping	3	
	grazing and associated burning	1	
	exotic predators	2	
	firewood collection	3	
	native predators	2	
Grey-crowned Babbler	Clearing for agriculture	1	
	grazing and associated burning	1	
	exotic predators	2	
	firewood collection	2	
	pasture improvement and cropping	1	
	intensive horticulture	2	
Musk Lorikeet	clearing for agriculture	1	
	grazing and associated burning	2	
	firewood collection	2	
	logging that reduces size class of trees	2	
	apiary	3	
Chestnut-rumped Heathwren	Grazing and associated burning	1	

Species	Disturbance Description	Rank	Comments
	Predation by exotics	2	
	Clearing for agriculture	2	
	Mining	3	Open cut mining
	Altered fire regimes	1	
	Pasture improvement	2	
Prince Edward Lyrebird	grazing and associated burning	2	
	exotic predators	1	
	management burns	2	
	Clearing for agriculture	3	
Yellow-tufted Honeyeater	grazing and associated burning	1	
	native predators	2	
	management burns	1	
	high intensity logging	3	
	weed invasion	3	lantana - suppressing understorey recovery
Red-backed Kingfisher	Grazing and associated burning	1	
	Predation by exotics	2	
	Clearing for agriculture	1	
	Logging	2	Change in forest structure with young regeneration
Lewin's Rail	Predation by exotics	2	
	Clearing for agriculture	2	
	Drainage of wetlands	1	
	Urban development	1	

APPENDIX 4.4 DISTURBANCES IDENTIFIED FOR FROGS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER

Species	Disturbance Description	Rank	Comments
Litoria castanea	habitat clearing	4	
	wetland swamp drainage - other	2	
	increased UV radiation	1	
	disease	1	

Species	Disturbance Description	Rank	Comments
	siltation from grazing	4	
	silt from urban devel	5	
	trampling	5	
	introduced weeds	5	
	fish	1	
	altered hydrology - earthworks	2	
	pollution from nutrients	2	
	pollution from chemicals	3	
	droughts	1	
	unknown decline	1	
Litoria brevipalmata	disease	?	
	habitat clearing	?	
	altered hydrol - earthworks	?	
	altered hydrol - oldgr - regrowth	?	
	oldgrowth logging	?	
	changes in soil moist - roading	?	
	changes in soil moist -logging	?	
	rare/ poorly known	1	
	increased UV radiation	?	
	fish	?	
	logging - removal large dead fallen trees	?	
	logging - reduced leaf litter input	?	
Litoria piperata	unknown decline	1	
	rare/ poorly known	1	
	habitat clearing	?	
	increased UV radiation	?	
	disease	?	
	siltation from logging	?	
	siltation from roading	?	
	siltation from grazing	?	
	trampling	?	
	introduced weeds	?	
	fish	?	
	pollution from nutrients	?	
	any other site specific potential threats should be addressed	1	
Mixophyes fleayi	increased UV radiation	4	

Species	Disturbance Description	Rank	Comments
	disease	1	
	unknown decline	1	
	change in soil moist - logging	2	
	change in soil moist - roadding	2	
	logging - reduced litter input	2	
	introduced weeds - lantana	3	lantana
	fish	4	
Litoria aurea	habitat clearing	4	
	wetland swamp drainage - other	2	
	increased UV radiation	1	
	disease	1	
	trampling	2	
	introduced weeds	5	
	fish	1	
	pollution from nutrients	3	
	pollution from chemicals	5	
	droughts	1	
	mining	2	sandmining
	unknown decline	1	
Assa darlingtoni	changes in soil/litter moisture	1	
	clearing for agriculture	2	
	droughts	3	
	climate change	4	
	increased UV radiation	4	
	disease	4	
Philoria sphagnicolus	changes in soil/litter moisture	1	
	clearing for agriculture	3	
	droughts	4	
	climate change	5	
	increased UV radiation	5	
	disease	5	
	altered hydrology and stream flow	2	
	siltation from logging	6	
	siltation from roading	6	
Mixophyes iteratus	increased UV radiation	4	
	disease	1	

Species	Disturbance Description	Rank	Comments
	unknown decline	1	
	change in soil moist - logging	1	
	change in soil moist - roadding	1	
	logging - reduced litter input	1	
	introduced weeds - lantana	3	
	trampling	2	
	siltation from logging	3	
	siltation from roading	3	
	siltation from grazing	3	
	pollution - nutrients	4	
	altered hydrology - oldgr-regr	3	
	habitat clearing	2	
	introduced predators - foxes, cats	5	
	fish	4	
	burning rainforest	5	
Philoria loveridgei	increased UV	5	
	disease	5	
	altered hydrol - oldgr-regr	2	
	change in soil/ litter moist-log	1	
	change in soil/ litter moist - road	1	
	siltation from logging	5	
	siltation from roading	5	
	droughts	3	
Litoria subglandulosa & daviesi	habitat clearing	4	
	increased UV radiation	4	
	disease	2	
	siltation from logging	1	
	siltation from roading	1	
	siltation from grazing	1	
	trampling	4	
	fish	2	
	pollution from nutrients	3	
	pollution from chemicals	4	
	altered hydrology- old-regrowth	3	
	change in soil moist - logging	4	
	change in soil moist - roading	4	

Species	Disturbance Description	Rank	Comments
	burning - frequent	2	
	oldgrowth logging - removal hollows	3	
	logging - removal fallen trees	2	
	mining - gold	4	
Mixophyes balbus	increased UV radiation	3	
	disease	1	
	unknown decline	1	
	change in soil moist - logging	2	
	change in soil moist - roadding	2	
	logging - reduced litter input	2	
	introduced weeds - lantana	3	
	trampling	2	
	siltation from logging	3	
	siltation from roading	3	
	siltation from grazing	2	
	pollution - nutrients	4	
	altered hydrology - oldgr-regr	3	
	habitat clearing	2	
	introduced predators - foxes, cats	5	
	fish	4	
	burning rainforest	3	
	mining - gold	5	
Philoria kundagungan	increased UV	5	
	disease	5	
	altered hydrol - oldgr-regr	2	
	change in soil/ litter moist-log	1	
	change in soil/ litter moist - road	1	
	siltation from logging	5	
	siltation from roading	5	
	droughts	3	
	habitat clearing	2	
	logging - removes fallen trees	3	
	logging - reduced litter	3	
Litoria olongburensis	habitat clearing	1	
	wetland swamp drainage-mossie control	1	Drainage for mosquito control
	altered hydrology etc earthworks	1	

Species	Disturbance Description	Rank	Comments
	fish	3	
	pollution	3	
	mining/ quarrying	2	Sand mining
	tea tree harvesting	4	
Philoria sp 2 (undescribed)	increased UV	5	
	disease	5	
	altered hydrol - oldgr-regrowth	2	
	change in soil/ litter moist - road	1	
	change in soil/ litter moist -logging	1	
	siltation from roading	5	
	siltation from logging	5	
	droughts	3	
	logging - removes fallen trees	3	
	logging - reduced litter	3	
	mining - gold	3	
	wetland swamp drainage - other	5	
	habitat clearing	2	
	trampling	3	
	dams	5	
	pollution - nutrients	5	
	pollution - chemicals	4	
Philoria sp 3 (undescribed)	increased UV	5	
	disease	5	
	altered hydrol - earthworks	2	
	change in soil/ litter moist - road	1	
	siltation from roading	4	
	droughts	3	
Litoria littlejohni	rare/poorly known	1	
	habitat clearing	1	
	wetland swamp drainage-mossie control	1	
	altered hydrology etc earthworks	2	
	fish	3	
	pollution	5	
	mining/ quarrying	2	Sand mining
	trampling	4	

Species	Disturbance Description	Rank	Comments
	droughts	6	
Paracrinia haswelli	habitat clearing	1	
	wetland swamp drainage-mossie control	1	
	altered hydrology etc earthworks	1	
	pollution	3	
	fish	3	
	mining/quarrying	2	
	tea tree harvesting	4	
Crinia tinnula	habitat clearing	1	
	wetland swamp drainage - mosquitos	1	
	altered hydrol - earthworks	1	
	fish	3	
	pollution	3	
	mining/quarrying	2	
	tea tree harvesting	4	
Litoria revelata	disease	?	
	habitat clearing	?	
	altered hydrol - oldgr - regrowth	?	
	oldgrowth logging	?	removal of hollows/n cavities
	changes in soil moist - roading	?	
	rare/ poorly known	1	
	fish	?	
Litoria jervisiensis	habitat clearing	1	
	wetland swamp drainage-mossie control	1	
	altered hydrology etc earthworks	1	
	pollution	3	
	fish	3	
	mining/quarrying	2	
	tea tree harvesting	4	
Litoria booroolongensis	habitat clearing	?	
	increased UV	?	
	Disease	?	
	fish	?	
	dams	?	
	pollution - chemical	?	
	pollution - nutrients	?	

Species	Disturbance Description	Rank	Comments
	droughts	?	
	unknown decline	?	
	rare/poorly known	1	
Pseudophryne bibronii	increased UV radiation	?	
	disease	?	
	grazing	?	
	trampling	?	
	fish	?	
	pollution - nutrients	?	
	pollution - chemical	?	
	altered hydrology - earthworks	?	
	change in soil moist - logging	?	
	change in soil moist - roading	?	
	mining - sand	?	
	unknown decline	1	
Litoria pearsoniana	habitat clearing	5	
	disease	1	
	siltation from logging	4	
	siltation from roading	4	
	fish	3	
	altered hydr - oldgrowth-regrowth	2	
	change in soil moist - logging	4	
	change in soil moist - roading	4	
	old growth logging - removal cavities	4	
	logging - removes large fallen trees	4	
	logging - reduced litter input	4	
	unknown decline	1	
Limnodynastes terraereginae	habitat clearing	?	
	poorly known	1	not rare, just poorly known
	competition - cane toads	?	mistaken ID
Heleioporus australiacus	habitat clearing	1	
	increased UV radiation	5	
	disease	5	
	siltation from logging	3	
	siltation from roading	3	

Species	Disturbance Description	Rank	Comments
	siltation from urban devel	2	
	weeds	3	
	pollution - nutrients	3	
	pollution - chemical	1	
	altered hydrology - earthworks	3	
	burning - frequent	2	
	change in soil moisture - roading	3	
	change in soil moisture - logging	3	
Pseudophryne australis	habitat clearing	1	
	increased UV radiation	5	
	disease	5	
	siltation from logging	3	
	siltation from roading	3	
	siltation from urban devel	2	
	weeds	3	
	pollution - nutrients	3	
	pollution - chemical	1	
	altered hydrology - earthworks	3	
	burning - frequent	2	
	logging - reduced litter	5	
	bush rock collecting	2	
Litoria barringtonensis	habitat clearing	5	
	disease	1	
	siltation from logging	4	
	siltation from roading	4	
	fish	3	
	altered hydr - oldgrowth-regrowth	2	
	change in soil moist - logging	4	
	change in soil moist - roading	4	
	old growth logging - removal cavities	4	
	logging - removes large fallen trees	4	
	logging - reduced litter input	4	
	unknown decline	1	

APPENDIX 4.5 DISTURBANCES IDENTIFIED FOR NOCTURNAL BIRDS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER

Species	Disturbance Description	Rank	Comments
Marbled Frogmouth	selective logging wet scler	1	
	Aust group selection	1	
	reducing forest age	1	
	weed invasion	1	
Marbled Frogmouth	thinning	1	
Bush Stone-curlew	habitat clearing	2	
	grazing	1	
	grazing burn	1	
	illegal grazing burn	1	
	predation by foxes	1	
	rabbits	1	
Powerful Owl	logging which reduces prey mammals	1	Where arboreal mammals are reduced - dependent on regime and location
	fire which reduces prey	2	Where it reduces prey
	nest and roost site dist	3	by logging and recreational birdwatching
	habitat clearing	4	
	habitat fragmentation	5	
	introduced predators	6	dog and fox on juveniles
	roadkills	7	on adults
	cultivation for agriculture	8	in juveniles
Sooty Owl	logging which reduces prey mammals	1	Where arboreal and terrestrial prey are affected
	nest and roost site dist	2	
	wildfire	3	.
	fire which reduces prey	4	frequent burning where reduces ground mammal abundance
	birdwatching	5	including survey playback
Masked Owl	clearing for agriculture	1	
	clearing for urban development	4	
	logging which increases structural density of forest	2	Where affects mid to ground layer - affects manoeuvrability
	fire - high frequency	3	
		4	
	roadkills	5	
	nest and roost site dist	6	
Barking Owl	clearing for agriculture	1	

Species	Disturbance Description	Rank	Comments
	fire - high frequency	2	
		4	
	firewood collecting	3	through loss of nests
	grazing	2	where compromises some sapling regrowth
	drainage of swamps	5	

APPENDIX 4.6 DISTURBANCES IDENTIFIED FOR REPTILES AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER

Species	Disturbance Description	Rank	Comments
Turtles			
Elseya georgesi	Grazing - trampling banks, riparian damage	1	
	Grazing - eutrophication	1	
	Predation - fox	1	
	Illegal netting	2?	
	Grazing - increased sedimentation	1	
	Roading - construction and maintenance assoc with logging	1	
	Logging - siltation - local	2	
	Logging - siltation - upstream	2	
	Human interference with communal nesting sites	2?	
	Fishing - recreational for bass	2?	
	Fire - resulting in increased sediment	3	
	Dam construction - impoundment	1?	immediate potential threat
Elseya purvisi	Grazing - trampling banks, riparian damage	1	
	Grazing - eutrophication	1	
Species	**Disturbance Description**	**Rank**	**Comments**
	Predation - fox	1	
	Illegal netting	2?	
	Grazing - increased sedimentation	1	
	Roading - construction and maintenance assoc with logging	1	
	Logging - siltation - local	2	

	Logging - siltation - upstream	2	
	Human interference with communal nesting sites	2?	
	Fishing - recreational for bass	2?	
	Fire - resulting in increased sediment	3	
	Dam construction - impoundment	1?	
Elseya sp2 (Gwydir & Namoi Rivers)	Grazing - trampling banks, riparian damage	1	
	Grazing - eutrophication	1	
	Predation - fox	1	
	Illegal netting	2?	
	Grazing - increased sedimentation	1	
	Roading - construction and maintenance assoc with logging	3	
	Logging - siltation - local	3	
	Logging - siltation - upstream	3	
	Human interference with communal nesting sites	2?	
	Fishing - recreational for bass	2?	
	Fire - resulting in increased sediment	3	
	Disease	1	.
Emydura sp (Bellingen River)	Grazing - trampling banks, riparian damage	1	
	Grazing - eutrophication	1	
	Predation - fox	1	
	Illegal netting	2?	
	Grazing - increased sedimentation	1	
	Roading - construction and maintenance assoc with logging	3	
	Logging - siltation - local	3	
	Logging - siltation - upstream	3	
	Human interference with communal nesting sites	2?	
	Fishing - recreational for bass	2?	
Species	**Disturbance Description**	**Rank**	**Comments**
	Fire - resulting in increased sediment	3	
	Dam construction - impoundment	1?	immediate potential threat
	Urban runoff	1	
	Intensive horticulture - tea tree plantations	1	

Emydura sp1	Grazing - trampling banks, riparian damage	1	
	Grazing - eutrophication	1	
	Predation - fox	1	
	Illegal netting	2?	
	Grazing - increased sedimentation	1	
	Roading - construction and maintenance assoc with logging	3	
	Logging - siltation - local	3	
	Logging - siltation - upstream	3	
	Human interference with communal nesting sites	2?	
	Fishing - recreational for bass	2?	
	Fire - resulting in increased sediment	3	
	Dam construction - impoundment	1?	
	Agriculture - use of pesticides	1	
	Agriculture - fertilisers	1	
	Agriculture - siltation	1	
	Urban runoff	1	
	Intensive horticulture - tea tree plantations	1	
Lizards			
Ophioscincus truncatus	Any fire	1	
	Predation by introduced species	3	
	Clearing for agriculture	1	
	Clearing - partial for grazing	1	
	Weed invasion - lantana	3?	
	Grazing and associated burning	1	
	Firewood collecting	2	
	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
Species	**Disturbance Description**	**Rank**	**Comments**
Cautula zia	Any fire	2	
	Predation by introduced species	3	
	Grazing and associated burning	3	
	Logging - changing canopy structure	1	
	Logging - loss of large ground logs	1	

	Logging - dessication - altered microhab	1	
	Logging that reduces age/size structure	1	
	Climate change	1	for potential to be affected
Coeranoscincus reticulatus	Clearing for urban development	3	
	Roadkills	3	
	Any fire	2	
	Predation by introduced species	2	
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	
	Grazing and associated burning	3	
	Logging - changing canopy structure	1	
	Logging - loss of large ground logs	1	
	Logging - dessication - altered microhab	1	
	Weed invasion	3	
	Logging that reduces age/size structure	1	
	Feral pigs	3	
Ctenotus eurydice	Fire - any except wildfire	2	
	Predation by introduced species	3	
	Clearing for agriculture	1	
	Grazing and associated burning	1	
	Mining	3	
	Bush rock collecting	3	
Saproscincus challengeri	Clearing for urban development	3	
	Any fire	2	
	Predation by introduced species	3	
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	
	Logging - changing canopy structure	1	
	Logging - loss of large ground logs	1	
	Logging - dessication - altered microhab	1	
	Logging that reduces age/size structure	1	
Species	**Disturbance Description**	**Rank**	**Comments**
Saproscincus galli	Clearing for urban development	3	
	Any fire	1	
	Predation by introduced species	3	
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	

	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Logging that reduces age/size structure	1	
	Grazing and associated burning	3	
Saproscincus rosei	Clearing for urban development	3	
	Any fire	1	
	Predation by introduced species	3	
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	
	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Logging that reduces age/size structure	1	
	Grazing and associated burning	2	
Underwoodisaurus sphyrurus	Any fire	1	
	Predation by introduced species	3	
	Clearing for agriculture	1	including loss of habitat, partial clearing for grazing, resulting in fragmentation; clearing dead wood and debris from paddocks
	Grazing and associated burning	1	
	Mining	3	
	Bush rock collecting	3	
	Firewood collecting	2	
	Dam construction - large ones	3	
Varanus rosenbergi	Any fire	3	
	Predation by introduced species	1	
	Grazing and associated burning - loss of litter	3	
	Grazing and associated burning - changes structure of understorey	3	
	Clearing for urban development	1	
	Roadkills	2	
	Mining - sand extraction	2	
Species	**Disturbance Description**	**Rank**	**Comments**
Eulamprus kosciuskoi	Any fire	3	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	Grazing and associated burning	1	
	Pasture improvement and cropping	1	
	Weed invasion	3	

	Firewood collecting	2	
	Dam construction	2	
	logging - altered microhab - altered flow	1	
	Drainage of swamps	1	
	Altered flow regimes-diversion of water	1	
	Clearing of riparian vegetation	1	
	Climate change	2	potential to influence reserve selection
Hypsilurus spinipes	Any fire	1	
	Predation by introduced species	2	foxes, cats and dogs
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	
	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Grazing and associated burning	2	
	Weed invasion	2	
	Road maintenance	1	
	Roadkills	2	
Lampropholis caligula	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	Grazing and associated burning	1	
	Pasture improvement and cropping	1	
	Weed invasion	1	scotch broome
	Firewood collecting	2	
	Climate change	1	
	Logging - altered microhab - old-regrowth	1	
Lampropholis elongata	Any fire	2	
	Predation by introduced species	3	
	Clearing for agriculture	1	
	Grazing and associated burning	1	
Species	**Disturbance Description**	**Rank**	**Comments**
	Pasture improvement and cropping	1	
	Firewood collecting	2	
	Climate change	1	
Saltuarius swaini	Any fire	3	
	Predation by introduced species	3	

	Clearing for agriculture	3	
	clearing - partial for grazing	3	
	Grazing and associated burning	3	loss of logs; litter reduction; changes in structure of understorey and ground cover; changes in invert avail
	Clearing for urban development	3	
	Weed invasion	3	
	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Logging - loss of large trees and hollows	1	
Saltuarius wyberba	Any fire	2	
	Predation by introduced species	2	
	Clearing for agriculture	1	loss of hab; partial for grazing; resulting in frag
	Grazing and associated burning	2	changes structure of understorey and ground cover; changes invert avail and litter cover
	Pasture improvement and cropping	1	
	Firewood collecting	3	
	Climate change	2	
	Logging - altered microhab - old-regrowth	2	
	Roadkills	3	
	Logging that reduces size and age class	2	
	Logging - loss of hollows	2	
	Mining - gold	3	
Calyptotis ruficauda	Any fire	2	
	Predation by introduced species	3	
	Clearing for agriculture	1	
	Clearing - partial for grazing	1	
	Grazing and associated burning	1	
	Firewood collecting	2	
	Logging - changing canopy structure	2	
	Logging - dessication - altered microhab	2	
Species	**Disturbance Description**	**Rank**	**Comments**
Eulamprus murrayi	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	Clearing - partial for grazing	1	
	Grazing and associated burning	3	

	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Weed invasion	2	
	Logging that reduces age/size structure	1	
Eulamprus tenuis (N pop only)	Any fire	1	
	Predation by introduced species	3	
	Clearing for agriculture	3	
	Clearing - partial for grazing	3	
	Grazing and associated burning	3	
	Logging - changing canopy structure	1	
	Logging - dessication - altered microhab	1	
	Weed invasion	3	
	Logging that reduces age/size structure	1	
	Logging - loss of hollows	1	
Eulamprus tryoni	Climate change	1	
	Predation by introduced species	3	
Tympanocryptis diemensis (northern)	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	3?	
	clearing - partial for grazing	3?	
	Grazing and associated burning - loss of litter	1?	
	Grazing and associated burning - changes structure of understorey	1?	
	Logging - altered microhabitat - reduced ground cover and litter	1?	
Tympanocryptis diemensis southern pop not considered at risk			
Tympanocryptis lineata pinguicollis	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	loss of habitat; partial for grazing; resulting in fragmentation
	Grazing and associated burning	1	
Species	**Disturbance Description**	**Rank**	**Comments**
	Pasture improvement and cropping	1	
	Weed invasion	1	
Saproscincus oriarus "North Coast sp"	Any fire	1	
	Clearing for agriculture	1	

	clearing - partial for grazing	1	
	Grazing and associated burning - changes structure of understorey	2	
	Clearing for urban development	1	
	Drainage of swamp forests, wet heath, wetlands and shrublands	1	
Cacophis harriettae	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	clearing - partial for grazing	1	
	Grazing and associated burning - loss of logs and litter	1	
	Grazing and associated burning - changes structure of understorey	1	
	Clearing for urban development	2	
	Logging - loss of fallen logs	1	
	Roadkills	3	
	Firewood collecting	2	
Hoplocephalus bitorquatus	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	clearing - partial for grazing	1	
	Grazing and associated burning - loss of logs and litter	2	
	Grazing and associated burning - changes structure of understorey	1	
	Clearing for urban development	3	
	Logging - loss of large treesl, stags and hollows	1	
	Logging - loss of fallen logs	1	
	Roadkills	2	
	Mining - coal	2	
	Drainage of swamps	1	
	Firewood collecting	2	
Species	**Disturbance Description**	**Rank**	**Comments**
	Pigs - predation and hab dist	2	
Hoplocephalus stephensii	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	3	

	clearing - partial for grazing	3	
	Grazing and associated burning	1	changes structure of understorey and ground cover
	Clearing for urban development	2	
	Weed invasion	3	
	Logging - changing canopy structure	2	
	Logging - loss of large treesl, stags and hollows	1	
	Logging - loss of fallen logs	1	
	Roadkills	2	
Tropidechis carinatus	Any fire	2	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	clearing - partial for grazing	1	
	Grazing and associated burning - loss of logs and litter	2	
	Grazing and associated burning - changes structure of understorey	2	
	Clearing for urban development	1	
	Logging - loss of large treesl, stags and hollows	2	
	Logging - loss of fallen logs	2	
	Roadkills	2	
	Drainage of swamps	2	
Austrelaps ramsayi	Any fire	3	
	Predation by introduced species	3	
	Clearing for agriculture	1	
	Grazing and associated burning	2	changes structure of understorey and ground cover
	Pasture improvement and cropping	1	
	logging - altered microhab - altered flow	3	
	Drainage of swamps	1	
	Altered flow regimes-diversion of water	1	
	Clearing of riparian vegetation	1	
	Climate change	2	
Species	**Disturbance Description**	**Rank**	**Comments**
	roadkills	3	
Drysdalia coronoides	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	

	Grazing and associated burning	1	
	Climate change	2	
	firewood collecting	2	
Cacophis krefftii	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	2	
	Clearing - partial for grazing	2	
	Grazing and associated burning	1	loss of logs and leaf litter
	Roadkills	2	
	Logging - loss of large logs	2	
	Clearing for urban devlopment	2	
Acanthophis antarcticus	Any fire	1	
	Predation by introduced species	2	
	Clearing for agriculture	1	
	clearing - partial for grazing	1	
	Grazing and associated burning - loss of litter	1	
	Grazing and associated burning - changes structure of understorey	1	
	Clearing for urban development	1	
	Roadkills	2	
	Logging - altered microhabitat - reduced ground cover and litter	2	
	Deliberate killing	2	
	Cane toad consumption	2?	
Hoplocephalus bungaroides	Any fire	1	
	Clearing for urban development	1	
	Bush rock collecting	1	
	Feral goats - degrading of ridgelines	3	
	logging - loss of large trees, hollows and stags	1	

APPENDIX 4.7 DISTURBANCES IDENTIFIED FOR TERRESTRIAL MAMMALS AND THEIR IMPACTS RANKED RELATIVE TO EACH OTHER

Species	**Disturbance**	**Rank**	**Comments**
Eastern Quoll	grazing and associated frequent burning	2	loss of logs

Species	Disturbance	Rank	Comments
	exotic predators	1	competition and predation by foxes, cats and dogs
	baiting for dingoes	2	against dingoes, favouring foxes
	disease	3	toxoplasmosis - spread by feral cats
	clearing - loss of habitat	2	
	roadkills	6	
	lack of source population	1	
Rufous Bettong	predation - fox	1	
	clearing - loss of habitat	3	
	intensive horticulture	4	for tea tree cultivation
	altered fire regimes	2	frequent encourages bladey grass - poor forage
	clearing - fragmentation	3	
Red-legged Pademelon	predation - fox	1	.
	logging - reduction of midstorey	3	in rf and wet sclerophyll - reduced leaf litter etc
	clearing - loss of habitat	4	
	clearing - fragmentation	4	
	predation - domestic dogs	1	
Brush-tailed Rock-wallaby	predation - fox	1	
	baiting for dingoes	1	
	exotic competitors	2	goats
	hunting	5	
Black-striped Wallaby	predation - fox	1	
	shooting	3	
	clearing - loss of habitat	2	
	predation - domestic dogs	1	
Long-nosed Potoroo	predation - fox	1	
	clearing - loss of habitat	1	
	clearing - fragmentation	2	
	grazing and associated frequent burning	1	
	clearing for urban development	1	
	baiting for dingoes	3	
Parma Wallaby	predation - fox	1	
	baiting for dingoes	1	
Whiptail Wallaby	partial clearing for grazing	1	
	Altered fire regimes	2	
	exotic competitors	2	cattle

Species	Disturbance	Rank	Comments
Tiger Quoll	grazing and associated frequent burning	3	
	exotic predators	1	competition and predation by foxes, cats and dogs
	baiting for dingoes	1	
	disease	4	toxoplasmosis - spread by feral cats
	clearing - loss of habitat	2	
	clearing - fragmentation	3	
	roadkills	5	correlated with fragmented habitat
Common Wombat	predation - dingo	?	
	clearing - loss of habitat	?	
	climate change	?	
	shooting	?	
	exotic competitors	?	cattle grazing
	disease	?	mange from foxes
Platypus	roading	3	sedimentation from gravel roads
	pollution by chemicals	4	
	grazing - destruction of creek banks by trampling	2	
	altered water flow regimes	2	
	clearing of riparian vegetation	1	
	fishing	2	that uses nets - both commercial and illegal
	mining - sand and river gravel	5	
	fish	4	carp affecting water quality
Hastings River Mouse	grazing and associated burning	2	frequent burning
	wildfire	2	in absence of refuges
	predation - cat	1	
	predation - fox	1	
	logging - loss of hollows	3	need hollows in butt cavities of old growth
	baiting for dingoes	1	increased foxes when remove dingoes
	roading	2	exotic predator ingress
Brush-tailed Phascogale	predation - cat	1	
	predation - fox	1	
	baiting for dingoes	1	
	intensive horticulture	2	clearing for tea tree horticulture
	clearing - loss of habitat	1	
Eastern Chestnut Mouse	mining - sand	3	
	predation - cat	1	

Species	Disturbance	Rank	Comments
	predation - fox	1	
	clearing - loss of habitat	2	
	altered fire regimes	2	
	baiting for dingoes	1	increased foxes when remove dingoes
	grazing and associated burning	1	inducing changes in floristics and ground cover structure
Broad-toothed Rat	predation - fox	1	
	climate change	3	
	baiting for dingoes	1	increased foxes when remove dingoes
	grazing and associated burning	2	
Common Planigale	predation - cat	1	potential interaction between predators and other processes
	altered fire regimes	2	
	baiting for dingoes	2	increased cats when remove dingoes
	clearing - loss of habitat	1	coastal - usually urban or tea tree clearing
	predation - cane toad	4	
	exotic competitors	3	cane toad
Pale Field-rat	altered flood regimes	3	
	intensive horticulture	2	tea tree clearing
	clearing - loss of habitat	1	
	altered fire regimes	3	
Grassland Melomys	mining - sand	2	
	predation - cat	2	
	predation - fox	2	
	clearing - loss of habitat	1	
	urban development and infrastructure	2	
	baiting for dingoes	1	increased foxes when remove dingoes
	drainage	1	
New Holland Mouse	mining - sand	2	
	predation - cat	2	
	exotic competitors	4	house mouse
	baiting for dingoes	2	increased cats when remove dingoes
	clearing - hab fragmentation	2	
	clearing - loss of habitat	1	
	altered fire regimes	3	
	urban development and infrastructure	4	
Dusky Antechinus	predation - cat	3	
	predation - fox	3	

Species	Disturbance	Rank	Comments
	logging - altered hydrology oldgr-regr	2	affects litter moisture - reduces food (see Alberts Lyrebird)
Dingo	baiting for dingoes	1	
	Clearing- loss of habitat	3	
	Clearing- fragmentation	2	
	Hybridisation	2	
	Roading	3	

APPENDIX 5

APPENDIX 5.1 RESERVATION PRIORITY RANKS FOR FUANA SPECIES

Aboreal Mammals

Species	Final UNE	Final LNE
Squirrel Glider	1	1
Greater Glider	1	1
Yellow-bellied Glider	1.5	1.5
Eastern Pygmy Possum	2.5	3
Koala	3	3

Bats

Species	Final UNE	Final LNE
Miniopterus australis - roost	1	1
Miniopterus schreibersii - roost	1	1
Nyctimene robinsoni	1	-
Syconycteris australis	1.5	1.5
Pteropus poliocephalus - camp	1.5	1.5
Pteropus alecto - camp	1.5	-
Chalinolobus dwyeri - roost	2	1
Mormopterus norfolkensis	2	2
Chalinolobus nigrogriseus	2	2
Vespadelus troughtoni - roost	2	2
Rhinolophus megaphyllus - roost	2	2
Falsistrellus tasmaniensis	2	3
Nyctophilus bifax	2	-
Pteropus poliocephalus	2.5	2.5
Vespadelus troughtoni	2.5	2.5
Chalinolobus dwyeri	2.5	2.5
Scotoeanax rueppellii	2.5	2.5
Nyctophilus timoriensis	3	3
Scotorepens balstoni	3	3
Scotorepens greyii	3	3
Mormopterus planiceps	3	3
Scotorepens sp 1	3	3
Vespadelus pumilus	3	3
Kerivoula papuensis	3	3
Saccolaimus flaviventris	3	3
Scotorepens orion	3	3
Mormopterus sp 1	3	3
Pteropus alecto	3	-
Myotis adversus	3.5	3.5
Mormopterus beccarii	3.5	3.5
Rhinolophus megaphyllus	3.5	3.5
Miniopterus schreibersii	3.5	3.5
Miniopterus australis	4	4
Nyctinomus australis	4	4

Diurnal Birds

Species	Final UNE	Final LNE
Double-eyed Fig-parrot	1	1
Rufous Scrub-bird	1	1
Black-breasted Button-quail	1	-
Eastern Bristlebird	1	-
Barred Cuckoo-shrike	2	2
Brush Bronzewing	2	2
Chestnut-rumped Heathwren	2	2
Little Bronze-Cuckoo	2	2
Red Goshawk	2	2
Superb Fruit-dove	2	2
Olive Whistler	2	3
Yellow-tufted Honeyeater	2	3
Albert's Lyrebird	2	-
Black-throated Finch	2	-
Red-tailed Black-Cockatoo	2	-
Wompoo Fruit-dove	2.5	2.5
Square-tailed Kite	2.5	2.5
Glossy Black-Cockatoo	2.5	2.5
Paradise Riflebird	2.5	2.5
Turquoise Parrot	2.5	2.5
Hooded Robin	2.5	2.5
Regent Honeyeater	2.5	2.5
Black-necked Stork	3	3
Black Bittern	3	3
Mangrove Honeyeater	3	3
Osprey	3	3
Painted Honeyeater	3	3
Pacific Baza	3	3
Forest Raven	3	3
Forest Kingfisher	3	3
Little Shrike-thrush	3	3
Grey-crowned Babbler	3	3
Swift Parrot	3	3
White-eared Monarch	3	-
Rose-crowned Fruit-dove	3.5	3.5
Musk Lorikeet	3.5	4
Superb Lyrebird (edwardsii)	3.5	-
Pale-yellow Robin	4	3
Brahminy Kite	4	4
Regent Bowerbird	4	4
Noisy Pitta	4	4
Russet-tailed Thrush	4	4
Grey Goshawk	4	4
Bush-hen	4	-
Collared Kingfisher	4	-
Black-eared Cuckoo	5	4
Lewin's Rail	5	5
Peregrine Falcon	5	5
Red-backed Kingfisher	5	5
Oriental Cuckoo	5	5
Gang-gang Cockatoo	-	3.5

Frogs

Species	Final UNE	Final LNE
Litoria castanea	1	1
Litoria piperata	1	1
Mixophyes iteratus	1	1
Litoria booroolongensis	1	1
Mixophyes fleayi	1	-
Philoria kundagungan	1	-
Philoria sp 2 (undescribed)	1	-
Litoria brevipalmata	1.5	1.5
Litoria olongburensis	1.5	-
Assa darlingtoni - sth	2	2
Mixophyes balbus	2	2
Pseudophryne bibronii	2	2
Litoria aurea	2	2
Litoria jervisiensis	2	2
Philoria loveridgei	2	-
Philoria sp 3 (undescribed)	2	-
Litoria revelata	3	3
Philoria sphagnicolus - nth	3	3
Litoria subglandulosa - nth	3	3
Crinia tinnula	3	3
Litoria freycineti	4	4
Paracrinia haswelli	4	4
Litoria pearsoniana	4	4
Litoria barringtonensis	4	4
Assa darlingtoni - nth	4	-
Limnodynastes terraereginae	5	5
Philoria sphagnicolus - sth	-	2
Litoria littlejohni	-	2
Heleioporus australiacus	-	2
Litoria subglandulosa - sth	-	3
Pseudophryne australis	-	5

Nocturnal Birds

Species	Final UNE	Final LNE
Barking Owl	1	1
Bush Stone-curlew	1.5	1.5
Sooty Owl	2	2
Masked Owl	3	3
Marbled Frogmouth	1	-
Powerful Owl	1	1

Reptiles

Species	Final UNE	Final LNE
Elseya sp2 (Gwydir & Namoi	1	1
Cautula zia	1	1
Hoplocephalus bitorquatus	1	1
Hoplocephalus stephensii	1	1
Eulamprus tryoni	1	-
Acanthophis antarcticus (north of	1	-
Underwoodisaurus sphyrurus	1.5	1.5
Cacophis harriettae	1.5	-
Coeranoscincus reticulatus	2	1
Saproscincus oriarus "North	2	2
Austrelaps ramsayi	2	2
Emydura sp1	2	2
Eulamprus tenuis (northern)	2	2

Species	Final UNE	Final LNE
Drysdalia coronoides	2	3
Ctenotus eurydice	2	-
Saltuarius wyberba	2	-
Saproscincus galli	3	3
Saproscincus rosei	3	3
Hypsilurus spinipes	3	3
Ophioscincus truncatus	3	3
Eulamprus kosciuskoi	3	3
Saltuarius swaini	3	3
Saproscincus challengeri	3	-
Tropidechis carinatus	3.5	3.5
Eulamprus murrayi	4	4
Calyptotis ruficauda	5	5
Cacophis krefftii	5	5
Elseya georgesi	-	1
Elseya purvisi	-	1
Emydura sp (Bellingen River)	-	1
Lampropholis caligula	-	1
Lampropholis elongata	-	1
Tympanocryptis lineata	-	1
Hoplocephalus bungaroides	-	1
Varanus rosenbergi	-	3
Tympanocryptis diemensis	-	3

Terrestrial Mammals

Species	Final UNE	Final LNE
Brush-tailed Rock-wallaby	1	1
Dingo	1	1
Hastings River Mouse	1	1
Eastern Chestnut Mouse	1	1
Common Wombat	1	3
Black-striped Wallaby	1	-
Long-nosed Potoroo	1	1
Rufous Bettong	2	2
Red-legged Pademelon	2	2
Parma Wallaby	2	2
New Holland Mouse	2.5	2.5
Dusky Antechinus	2.5	3
Grassland Melomys	3	3
Whiptail Wallaby	3	-
Common Planigale	3.5	3.5
Platypus	4	4
Pale Field-rat	5	5
Broad-toothed Rat	-	1
Eastern Quoll	e	e
Brush-tailed Phascogale	1	1
Tiger Quoll	1	1

APPENDIX 6

APPENDIX 6.1 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR ARBOREAL MAMMAL SPECIES

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Koala	1	13	5	2.5
Squirrel Glider	1	6	2.5	4
Yellow-bellied Glider	1	6	3	2
Greater Glider	1	9	4	3
Eastern Pygmy Possum	1	3	1.5	6

APPENDIX 6.2 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR BAT SPECIES

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Chalinolobus dweryi	1	8	2.5	3
Chalinolobus nigrogriseus	1	9	2.5	2
Falsistrellus tasmaniensis	1	6	2.5	2
Kerivoula papuensis	1	5	2	3
Miniopterus australis	1	8	2.5	2
Miniopterus schreibersii	1	8	2.5	2
Mormopterus norfolkensis	1	8	2.5	3
Myotis adversus	1		1.5	3
Nyctimene robinsoni	1	7	4	4
Nyctinomus australis	1	8	2.5	2
Nyctophilus bifax	1	8	1.5	2
Pteropus alecto	1	10	3	4
Pteropus poliocephalus	1	10	3	4
Rhinolophus megaphyllus	1	8	2.5	2
Scotoeanax rueppellii	1	6	2.5	2
Scotorepens balstoni	1	8	2.5	2
Scotorepens greyii	1	8	2.5	2
Scotorepens sp 1	1	8	2.5	2
Syconycteris australis	1	8	2	5
Vespadelus pumilus	1	15	2.5	2
Vespadelus troughtoni	1	8	2.5	3

APPENDIX 6.3 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR DIURNAL BIRD SPECIES

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Double-eyed Fig-parrot	1	15	10	6
Red Goshawk	1	15	12	1
Regent Honeyeater	1	10	3	3
Black-breasted Button-quail	1	6	2	6
Swift Parrot	1	15	10	3
Wompoo Fruit-dove	1	6	3	4
Rufous Scrub-bird	1	10	3	2
Albert's Lyrebird	1	15	9	2
Square-tailed Kite	1	15	12	1
Barred Cuckoo-shrike	1	10	3	3
Rose-crowned Fruit-dove	1	6	3	4
Glossy Black-Cockatoo	1	30	20	4
Paradise Riflebird	1	15	10	3
Superb Fruit-dove	1	6	3	4
Olive Whistler	1	10	3	2
White-eared Monarch	1	10	3	2
Turquoise Parrot	1	10	3	8
Pacific Baza	1	10	5	2
Hooded Robin	1	10	5	2
Grey-crowned Babbler	1	20	15	2
Musk Lorikeet	1	10	3	4
Prince Edward Lyrebird	1	15	9	2
Yellow-tufted Honeyeater	1	8	3	3
Black-throated Finch	1	5	2	8
Black-necked stork	1	35		1
Eastern Bristlebird	1	10	3	3
Varied Triller	1	15	5	3
Black Bittern	1	15	8	1
Red-tailed Black-Cockatoo	1	30	20	6
Osprey	1	20	10	1
Painted Honeyeater	1	10	2	3
Collared Kingfisher	1	15	8	1.5
Regent Bowerbird	1	20	9	4
Brahminy Kite	1	20	10	1
Pale-yellow Robin	1	15	12	2
Bush-hen	1	7	3	4
Mangrove Honeyeater	1	11	5	3
Grey Goshawk	1	20	10	1
Forest Raven	1	20	10	4
Gang-gang Cockatoo	1	30	20	6
Noisy Pitta	1	8	3	3
Brush Bronzewing	1	8	4	8
Forest Kingfisher	1	12	8	1.5
Little Shrike-thrush	1	18	10	3
Peregrine Falcon	1	20	2	1
Little Bronze-Cuckoo	1	8	4	2
Russet-tailed Thrush	1	15	6	3
Chestnut-rumped Heathwren	1	15	5	2
Red-backed Kingfisher	1	12	7	1.5
Lewin's Rail	1	10	3	1.5
Black-eared Cuckoo	non-breeding visitor			
Oriental Cuckoo	non-breeding visitor			

APPENDIX 6.4 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR FROG SPECIES.

Species	Reproductive Life Span			Trophic
Assa darlingtoni	1	3	2	2
Crinia tinnula	0.5	4	1	2
Heleioporus australiacus	1	10	6	2
Litoria aurea	1		3	2
Litoria booroolongensis	1	4	2	2
Litoria brevipalmata	1		3	2
Litoria freycineti	1	4	2	2
Litoria jervisiensis	1	4	2	2
Litoria littlejohni	1	4	3	2
Litoria olongburensis	1	3	1	2
Litoria piperata	1		2	2
Litoria revelata	1	3	2	2
Litoria subglandulosa	1	7	3	2
Mixophyes balbus	1	8	4	2
Mixophyes fleayi	1	8	4	2
Mixophyes iteratus	1	10	5	2
Philoria kundagungan	1	4	2	2
Philoria loveridgei	1	4	2	2
Philoria sp 2 (pughi)	1	4	2	2
Philoria sp 3 (richmondensis)	1	4	2	2
Philoria sphagnicolus	1	4	2	2
Pseudophryne bibronii	1	4	2	2

APENDIX 6.5 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR NOCTURNAL BIRD SPECIES.

Species	**Reproductive Life Span**			**Trophic level (T)**
	Min	**Max**	**Mean**	
Marbled Frogmouth	1	10	5	2
Bush Stone-curlew	1	10	4	4
Powerful Owl	1	15	7	1
Sooty Owl	1	15	7.5	1
Masked Owl	1	12	6	1.5
Barking Owl	1	10	5	1.5

APPENDIX 6.6 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR TERRESTRIAL MAMMAL SPECIES.

Species	**Reproductive Life Span**			**Trophic level (T)**
	Min	**Max**	**Mean**	
Eastern Quoll	1	3	2	1.5
Rufous Bettong	1	5	2	4
Red-legged Pademelon	1	6	2	4
Brush-tailed Rock-wallaby	1	10	3	4
Black-striped Wallaby	1	10	3	4
Long-nosed Potoroo	1	6	2	4

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Parma Wallaby	1	8	2	4
Whiptail Wallaby	1	10	3	4
Tiger Quoll	1	3	2	1.5
Common Wombat	1	4	3	4
Platypus	1	10	7	2
Hastings River Mouse	1	3	2	6
Brush-tailed Phascogale	1	2	1	2
Eastern Chestnut Mouse	1	3	2	8
Broad-toothed Rat	1	3	2	4
Common Planigale	1	1	1	2
Pale Field-rat	1	1	1	6
Grassland Melomys	1	3	2	6
New Holland Mouse	1	2	1	6
Dusky Antechinus	1	2	1	2

APPENDIX 6.7 ESTIMATES OF REPRODUCTIVE LONGEVITY AND TROPHIC LEVEL FOR REPTILE SPECIES.

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Elseya georgesi	1	22	10	2-3
Elseya purvisi	1	22	10	2-3
Elseya sp2(Gwydir & Namoi Rivers)	1	22	10	2-3
Emydura sp (Bellingen River)	1	22	10	2-3
Emydura sp1	1	22	10	2-3
Ophioscincus truncatus	1	3	1.5	2
Cautula zia	1	3	1.5	2
Coeranoscincus reticulatus	1	7	4	2
Ctenotus eurydice	1	3	1.5	2
Saproscincus challengeri	1	1	1	2
Saproscincus galli	1	1	1	2
Saproscincus rosei	1	1	1	2
Underwoodisaurus sphyrurus	1	7	4	2
Varanus rosenbergi	1	11	5	1
Eulamprus kosciuskoi	1	3	1.5	2
Hypsilurus spinipes	1	11	5	2
Lampropholis caligula	1	1	1	2
Lampropholis elongata	1	1	1	2
Saltuarius swaini	1	7	4	2
Saltuarius wyberba	1	7	4	2
Calyptotis ruficauda	1	1	1	2
Eulamprus murrayi	1	3	1.5	2
Eulamprus tenuis	1	3	1.5	2
Eulamprus tryoni	1	3	1.5	2
Tympanocryptis diemensis	1	3	1.5	2
Tympanocryptis lineata	1	3	1.5	2
Saproscincus sp "North Coast"	1	1	1	2
Cacophis harriettae	1	7	4	1
Hoplocephalus bitorquatus	1	11	5	1
Hoplocephalus stephensii	1	11	5	1
Tropidechis carinatus	1	11	5	1
Austrelaps ramsayi	1	11	5	1

Species	Reproductive Life Span			Trophic level (T)
	Min	Max	Mean	
Drysdalia coronoides	1	7	4	1
Cacophis krefftii	1	7	4	1
Acanthophis antarcticus	1	11	5	1
Hoplocephalus bungaroides	1	11	5	1

APPENDIX 7

APPENDIX 7.1 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR ARBOREAL SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Koala	1	UNE	0.033	33541	0.010	111803	0.003	335410
Koala	2	UNE	0.033	33541	0.010	111803	0.003	335410
Koala	3	LNE	0.033	33541	0.010	111803	0.003	335410
Koala	4	LNE	0.033	33541	0.010	111803	0.003	335410
Koala	5	LNE	0.033	33541	0.010	111803	0.003	335410
Koala	6	LNE	0.033	33541	0.010	111803	0.003	335410
Koala	7	LNE	0.005	223607	0.002	559017	0.000	N/A
Squirrel Glider	1	UNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	2	UNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	3	UNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	4	LNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	5	LNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	6	LNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	7	LNE	0.020	126491	0.010	252982	0.000	N/A
Squirrel Glider	8	LNE	0.013	189737	0.007	379473	0.000	N/A
Yellow-bellied Glider	1	UNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	2	UNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	3	UNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	4	LNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	5	LNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	6	LNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	7	LNE	0.010	115470	0.005	230940	0.003	461880
Yellow-bellied Glider	8	LNE	0.005	230940	0.000	N/A	0.000	N/A
Greater Glider	1	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	2	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	3	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	4	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	5	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	6	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	7	UNE	0.500	3000	0.250	6000	0.010	150000
Greater Glider	8	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	9	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	10	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	11	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	12	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	13	LNE	0.167	9000	0.000	N/A	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Greater Glider	14	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	15	LNE	0.167	9000	0.000	N/A	0.000	N/A
Greater Glider	16	LNE	0.500	3000	0.200	7500	0.010	150000
Greater Glider	17	LNE	0.500	3000	0.200	7500	0.010	150000
Eastern Pygmy Possum	1	UNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	2	UNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	3	UNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	4	LNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	5	LNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	6	LNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	7	LNE	0.100	48990	0.050	97980	0.000	N/A
Eastern Pygmy Possum	8	LNE	0.050	97980	0.000	N/A	0.000	N/A

APPENDIX 7.2 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR BAT SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Chalinolobus dwyeri	1	UNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	2	UNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	3	UNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	4	UNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	5	LNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	6	LNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	7	LNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus dwyeri	8	LNE	0.013	151789	0.006	303579	0.003	607157
Chalinolobus nigrogriseus	1	UNE	0.013	101193	0.008	151789	0.003	404772
Falsistrellus tasmaniensis	1	UNE	0.017	75895	0.003	379473	0.000	N/A
Falsistrellus tasmaniensis	2	UNE	0.017	75895	0.003	379473	0.000	N/A
Falsistrellus tasmaniensis	3	LNE	0.017	75895	0.003	379473	0.000	N/A
Falsistrellus tasmaniensis	4	LNE	0.008	151789	0.000	N/A	0.000	N/A
Falsistrellus tasmaniensis	5	LNE	0.008	151789	0.000	N/A	0.000	N/A
Kerivoula papuensis	1	UNE	0.100	21213	0.010	212132	0.000	N/A
Kerivoula papuensis	2	UNE	0.100	21213	0.010	212132	0.000	N/A
Kerivoula papuensis	3	LNE	0.100	21213	0.010	212132	0.000	N/A
Kerivoula papuensis	4	LNE	0.100	21213	0.010	212132	0.000	N/A
Kerivoula papuensis	5	LNE	0.100	21213	0.010	212132	0.000	N/A
Kerivoula papuensis	6	LNE	0.010	212132	0.000	N/A	0.000	N/A
Kerivoula papuensis	7	LNE	0.100	21213	0.000	N/A	0.000	N/A
Miniopterus australis	1	UNE	0.050	25298	0.020	63246	0.000	N/A
Miniopterus australis	2	UNE	0.050	25298	0.020	63246	0.000	N/A
Miniopterus australis	3	LNE	0.050	25298	0.020	63246	0.000	N/A
Miniopterus australis	4	LNE	0.050	25298	0.010	126491	0.000	N/A
Miniopterus schreibersii	1	UNE	0.025	50596	0.025	50596	0.025	50596
Miniopterus schreibersii	2	LNE	0.025	50596	0.025	50596	0.025	50596
Miniopterus schreibersii	3	LNE	0.025	50596	0.025	50596	0.025	50596
Mormopterus norfolkensis	1	UNE	0.010	189737	0.000	N/A	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Mormopterus norfolkensis	2	UNE	0.010	189737	0.000	N/A	0.000	N/A
Mormopterus norfolkensis	3	LNE	0.010	189737	0.000	N/A	0.000	N/A
Mormopterus norfolkensis	4	LNE	0.010	189737	0.000	N/A	0.000	N/A
Mormopterus norfolkensis	5	LNE	0.010	189737	0.000	N/A	0.000	N/A
Myotis adversus	1	UNE	0.050	48990	0.000	N/A	0.000	N/A
Myotis adversus	2	LNE	0.050	48990	0.000	N/A	0.000	N/A
Nyctimene robinsoni	1	UNE	0.033	60000	0.017	120000	0.003	800000
Nyctimene robinsoni	2	UNE	0.033	60000	0.017	120000	0.003	800000
Nyctinomus australis	1	UNE	0.010	126491	0.004	316228	0.002	1000000
Nyctinomus australis	2	LNE	0.010	126491	0.004	316228	0.002	632456
Nyctophilus bifax	1	UNE	0.067	24495	0.005	326599	0.000	N/A
Nyctophilus bifax	2	UNE	0.067	24495	0.005	326599	0.000	N/A
Pteropus alecto	1	UNE	0.025	92376	0.000	N/A	0.000	N/A
Pteropus poliocephalus	1	UNE	0.100	160000	0.067	240000	0.000	N/A
Pteropus poliocephalus	2	LNE	0.100	240000	0.067	360000	0.000	N/A
Rhinolophus megaphyllus	1	UNE	0.100	12649	0.020	63246	0.005	252982
Rhinolophus megaphyllus	2	UNE	0.100	12649	0.020	63246	0.005	252982
Rhinolophus megaphyllus	3	LNE	0.100	12649	0.020	63246	0.005	252982
Rhinolophus megaphyllus	4	LNE	0.100	12649	0.020	63246	0.005	252982
Rhinolophus megaphyllus	5	LNE	0.020	63246	0.005	252982	0.000	N/A
Rhinolophus megaphyllus	6	LNE	0.020	63246	0.005	252982	0.000	N/A
Scotoeanax rueppellii	1	UNE	0.007	189737	0.005	252982	0.000	N/A
Scotoeanax rueppellii	2	UNE	0.007	189737	0.005	252982	0.000	N/A
Scotoeanax rueppellii	3	LNE	0.007	189737	0.005	252982	0.000	N/A
Scotoeanax rueppellii	4	LNE	0.007	189737	0.005	252982	0.000	N/A
Scotoeanax rueppellii	5	LNE	0.008	151789	0.005	252982	0.000	N/A
Scotorepens balstoni	1	UNE	0.033	37947	0.003	379473	0.000	N/A
Scotorepens balstoni	2	LNE	0.033	37947	0.003	379473	0.000	N/A
Scotorepens greyii	1	UNE	0.013	101193	0.005	252982	0.000	N/A
Scotorepens sp 1	1	UNE	0.020	63246	0.013	94868	0.010	126491
Scotorepens sp 1	2	UNE	0.020	63246	0.013	94868	0.010	126491
Scotorepens sp 1	3	LNE	0.020	63246	0.013	94868	0.010	126491
Syconycteris australis	1	UNE	0.083	42426		N/A	0.000	N/A
Syconycteris australis	2	LNE	0.083	42426		N/A	0.000	N/A
Vespadelus pumilus	1	UNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	2	UNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	3	UNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	4	LNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	5	LNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	6	LNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	7	LNE	1.000	1265	0.500	2530	0.100	12649
Vespadelus pumilus	8	LNE	0.500	2530	0.000	N/A	0.000	N/A
Vespadelus troughtoni	1	UNE	0.025	75895	0.005	379473	0.000	N/A
Vespadelus troughtoni	2	UNE	0.025	75895	0.005	379473	0.000	N/A
Vespadelus troughtoni	3	UNE	0.025	75895	0.005	379473	0.000	N/A
Vespadelus troughtoni	4	UNE	0.025	75895	0.005	379473	0.000	N/A

APPENDIX 7.3 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR DIURNAL BIRD SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Albert's Lyrebird	1	UNE	0.050	13333	0.017	40000	0.003	200000
Barred Cuckoo-shrike	1	UNE	0.025	69282	0.013	138564	0.008	207846
Barred Cuckoo-shrike	2	LNE	0.025	69282	0.013	138564	0.008	207846
Black Bittern	1	UNE	0.022	15926	0.001	318517	0.002	159258
Black Bittern	2	UNE	0.022	15926	0.001	318517	0.002	159258
Black Bittern	3	LNE	0.022	15926	0.001	318517	0.000	N/A
Black Bittern	4	LNE	0.001	318517	0.000	N/A	0.000	N/A
Black-breasted Button-quail	1	UNE	0.001	4242641	0.000	N/A	0.000	N/A
Black-breasted Button-quail	2	UNE	0.001	4242641	0.000	N/A	0.000	N/A
Black-breasted Button-quail	3	LNE	0.001	4242641	0.000	N/A	0.000	N/A
Black-breasted Button-quail	4	LNE	0.001	4242641	0.000	N/A	0.000	N/A
Black-necked Stork	1	UNE	0.001	223607	0.000	670820	0.000	2236068
Black-necked Stork	2	LNE	0.001	223607	0.000	670820	0.000	2236068
Black-necked Stork	3	LNE	0.001	447214	0.000	2236068	0.000	N/A
Brush Bronzewing	1	UNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	2	UNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	3	UNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	4	UNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	5	LNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	6	LNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	7	LNE	0.001	2000000	0.000	N/A	0.000	N/A
Brush Bronzewing	8	LNE	0.001	2000000	0.000	N/A	0.000	N/A
Chestnut-rumped Heathwren	1	UNE	0.010	89443	0.000	N/A	0.000	N/A
Chestnut-rumped Heathwren	2	LNE	0.100	8944	0.000	N/A	0.000	N/A
Double-eyed Fig-parrot	1	UNE	0.005	379473	0.001	1897367	0.000	N/A
Eastern Bristlebird	1	UNE	0.002	866025	0.001	1385641	0.001	1385641
Eastern Bristlebird	2	UNE	0.002	866025	0.001	1385641	0.001	1385641
Forest Kingfisher	1	UNE	0.100	13416	0.033	40249	0.020	67082
Forest Kingfisher	2	LNE	0.100	13416	0.033	40249	0.020	67082
Forest Raven	1	UNE	0.010	53033	0.005	106066	0.000	N/A
Forest Raven	2	UNE	0.010	53033	0.005	106066	0.000	N/A
Forest Raven	3	LNE	0.010	53033	0.005	106066	0.000	N/A
Forest Raven	4	LNE	0.010	53033	0.005	106066	0.000	N/A
Gang-gang Cockatoo	1	LNE	0.050	26833	0.000	N/A	0.000	N/A
Glossy Black-Cockatoo	1	UNE	0.083	10733	0.050	17889	0.005	178885
Glossy Black-Cockatoo	2	UNE	0.083	10733	0.050	17889	0.005	178885
Glossy Black-Cockatoo	3	LNE	0.083	10733	0.050	17889	0.005	178885
Glossy Black-Cockatoo	4	LNE	0.083	10733	0.050	17889	0.005	178885
Glossy Black-Cockatoo	5	LNE	0.033	26833	0.000	N/A	0.000	N/A
Grey-crowned Babbler	1	UNE	0.050	10328	0.010	51640	0.001	516398
Grey-crowned Babbler	2	UNE	0.000	N/A	0.000	N/A	0.000	N/A
Grey-crowned Babbler	3	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Grey-crowned Babbler	4	LNE	0.050	10328	0.010	51640	0.001	516398
Hooded Robin	1	UNE	0.010	89443	0.000	N/A	0.000	N/A
Hooded Robin	2	LNE	0.010	89443	0.000	N/A	0.000	N/A
Little Bronze-Cuckoo	1	UNE	0.005	200000	0.003	400000		N/A
Little Bronze-Cuckoo	2	LNE	0.005	200000	0.003	400000		N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Little Shrike-thrush	1	UNE	0.100	13416	0.033	40249	0.000	N/A
Mangrove Honeyeater	1	UNE	0.200	6708	0.200	6708	0.020	67082
Mangrove Honeyeater	2	LNE	0.200	6708	0.200	6708	0.020	67082
Mangrove Honeyeater	3	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Musk Lorikeet	1	UNE	0.005	461880	0.000	N/A	0.000	N/A
Musk Lorikeet	2	LNE	0.005	461880	0.000	N/A	0.000	N/A
Olive Whistler	1	UNE	0.125	9238	0.075	15396	0.013	92376
Olive Whistler	2	UNE	0.125	9238	0.075	15396	0.013	92376
Olive Whistler	3	LNE	0.125	9238	0.075	15396	0.013	92376
Olive Whistler	4	LNE	0.125	9238	0.075	15396	0.013	92376
Olive Whistler	5	LNE	0.125	9238	0.075	15396	0.013	92376
Osprey	1	UNE	0.000	1581139	0.000	N/A	0.000	N/A
Osprey	2	LNE	0.000	1581139	0.000	N/A	0.000	N/A
Pacific Baza	1	UNE	0.001	1431084	0.000	2146625	0.000	4293251
Pacific Baza	2	LNE	0.001	1431084	0.000	2146625	0.000	4293251
Pacific Baza	S of	LNE	0.000	2146625	0.000	4293251	0.000	N/A
Painted Honeyeater	1	UNE	0.000	N/A	0.000	N/A	0.000	N/A
Painted Honeyeater	2	LNE	0.002	1060660	0.000	N/A	0.000	N/A
Painted Honeyeater	3	LNE	0.002	1060660	0.000	N/A	0.000	N/A
Painted Honeyeater	4	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Painted Honeyeater	5	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Pale-yellow Robin	1	UNE	0.333	1732	0.200	2236	0.050	30984
Pale-yellow Robin	2	UNE	0.333	1732	0.200	2236	0.050	30984
Pale-yellow Robin	3	UNE	0.333	1732	0.200	2236	0.050	30984
Pale-yellow Robin	4	LNE	0.333	1732	0.200	2236	0.050	30984
Pale-yellow Robin	5	LNE	0.333	1732	0.200	2236	0.050	1886
Pale-yellow Robin	6	LNE	0.333	1732	0.200	2236	0.050	1886
Paradise Riflebird	1	UNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	2	UNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	3	UNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	4	LNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	5	LNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	6	LNE	0.033	28460	0.025	37947	0.000	N/A
Paradise Riflebird	7	LNE	0.033	28460	0.025	37947	0.000	N/A
Red Goshawk	1	UNE	0.000	2886751	0.000	N/A	0.000	N/A
Red-tailed Black-Cockatoo	1	UNE	0.002	603738	0.000	N/A	0.000	N/A
Red-tailed Black-Cockatoo	2	LNE	0.002	603738	0.000	N/A	0.000	N/A
Regent Honeyeater	1	UNE	0.001	1732051	0.001	1732051	0.001	1732051
Regent Honeyeater	2	LNE	0.001	1732051	0.001	1732051	0.001	1732051
Regent Honeyeater	3	LNE	0.001	1732051	0.001	1732051	0.001	1732051
Rose-crowned Fruit-dove	1	UNE	0.167	13856	0.083	27713	0.042	55426
Rose-crowned Fruit-dove	2	LNE	0.167	13856	0.083	27713	0.042	55426
Rose-crowned Fruit-dove	3	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Rufous Scrub-bird	1	UNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	2	UNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	3	UNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	4	UNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	5	LNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	6	LNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	7	LNE	0.060	19245	0.010	115470	0.003	346410
Rufous Scrub-bird	8	LNE	0.060	19245	0.010	115470	0.003	346410
Square-tailed Kite	1	UNE	0.000	5773503	0.000	N/A	0.000	N/A
Square-tailed Kite	2	LNE	0.000	5773503	0.000	N/A	0.000	N/A
Superb Fruit-dove	1	UNE	0.006	415692	0.003	831384	0.001	1662769
Superb Lyrebird (edwardsii?)	1	UNE	0.005	113389	0.000	N/A	0.000	N/A
Swift Parrot	1	UNE	0.001	1897367	0.000	N/A	0.000	N/A
Swift Parrot	2	UNE	0.001	1897367	0.000	N/A	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Swift Parrot	3	UNE	0.001	1897367	0.000	N/A	0.000	N/A
Swift Parrot	4	LNE	0.001	1897367	0.000	N/A	0.000	N/A
Swift Parrot	5	LNE	0.001	1897367	0.000	N/A	0.000	N/A
Turquoise Parrot	1	UNE	0.001	9237604	0.000	N/A	0.000	N/A
Turquoise Parrot	2	UNE	0.001	9237604	0.000	N/A	0.000	N/A
Turquoise Parrot	3	LNE	0.001	9237604	0.000	N/A	0.000	N/A
Turquoise Parrot	4	LNE	0.001	9237604	0.000	N/A	0.000	N/A
White-eared Monarch	1	UNE	0.050	23094	0.000	N/A	0.000	N/A
Wompoo Fruit-dove	1	UNE	0.100	23094	0.033	69282	0.010	230940
Wompoo Fruit-dove	2	LNE	0.100	23094	0.033	69282	0.010	230940
Wompoo Fruit-dove	3	LNE	0.033	69282	0.000	N/A	0.000	N/A
Yellow-tufted Honeyeater	1	UNE	0.100	17321	0.033	51962	0.017	103923
Yellow-tufted Honeyeater	2	LNE	0.100	17321	0.033	51962	0.017	103923
Yellow-tufted Honeyeater	3	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Yellow-tufted Honeyeater	4	LNE	0.017	103923	0.000	N/A	0.000	N/A

APPENDIX 7.4 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR FROG SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Assa darlingtoni	1	UNE	1.000	1414	1.000	1414	0.000	N/A
Assa darlingtoni	2	UNE	1.000	1414	1.000	1414	0.000	N/A
Assa darlingtoni	3	UNE	1.000	1414	1.000	1414	0.000	N/A
Assa darlingtoni	4	UNE	1.000	1414	1.000	1414	0.000	N/A
Assa darlingtoni	5	UNE	0.100	14142	0.100	14142	0.100	14142
Assa darlingtoni	6	UNE	0.100	14142	0.100	14142	0.100	14142
Assa darlingtoni	7	UNE/LNE	0.200	7071	0.200	7071	0.200	7071
Assa darlingtoni	8	LNE	0.200	7071	0.200	7071	0.200	7071
Assa darlingtoni	9	LNE	0.200	7071	0.200	7071	0.200	7071
Crinia tinnula	1	UNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	2	UNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	3	UNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	4	LNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	5	LNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	6	LNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	7	LNE	4.000	500	2.000	1000	0.000	N/A
Crinia tinnula	8	LNE	2.000	1000	2.000	1000	0.000	N/A
Heleioporus australiacus	1	LNE	0.050	16330	0.000	N/A	0.000	N/A
Litoria aurea	1	UNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria aurea	2	UNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria aurea	3	LNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria aurea	4	LNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria aurea	5	LNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria aurea	6	LNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria brevipalmata	1	UNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria brevipalmata	2	UNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria brevipalmata	3	UNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria brevipalmata	4	UNE	0.010	115470	0.000	N/A	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Litoria brevipalmata	5	LNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria brevipalmata	6	LNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria brevipalmata	7	LNE	0.010	115470	0.000	N/A	0.000	N/A
Litoria freycineti	1	UNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	2	UNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	3	UNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	4	LNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	5	LNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	6	LNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	7	LNE	1.000	1414	1.000	1414	0.000	N/A
Litoria freycineti	8	LNE	1.000	1414	1.000	1414	0.000	N/A
Litoria jervisiensis	1	UNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	2	UNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	3	LNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	4	LNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	5	LNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	6	LNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria jervisiensis	7	LNE	0.500	2828	0.000	N/A	0.000	N/A
Litoria littlejohni	1	LNE	0.020	57735	0.000	N/A	0.000	N/A
Litoria olongburensis	1	UNE	0.100	20000	0.000	N/A	0.000	N/A
Litoria olongburensis	2	UNE	0.100	20000	0.000	N/A	0.000	N/A
Litoria olongburensis	3	UNE	0.100	20000	0.100	20000	0.100	20000
Litoria piperata	1		1km radius reserve of all habitat around sites from which					
Litoria revelata	1	UNE/LNE	0.500	2828	0.400	3536	0.300	4714
Litoria revelata	2	LNE	0.500	2828	0.400	3536	0.300	4714
Litoria revelata	3	LNE	0.500	2828	0.400	3536	0.300	4714
Litoria revelata	4	LNE	0.500	2828	0.400	3536	0.300	4714
Litoria subglandulosa	1	UNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	2	UNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	3	UNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	4	UNE/LNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	5	UNE/LNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	6	LNE	0.400	2887	0.100	11547	0.000	N/A
Litoria subglandulosa	7	LNE	0.400	2887	0.100	11547	0.000	N/A
Mixophyes balbus	1	UNE	0.150	6667	0.050	20000	0.000	N/A
Mixophyes balbus	2	UNE	0.150	6667	0.000	N/A	0.000	N/A
Mixophyes balbus	3	UNE	0.150	6667	0.000	N/A	0.000	N/A
Mixophyes balbus	4	UNE/LNE	0.150	6667	0.000	N/A	0.000	N/A
Mixophyes balbus	5	LNE	0.150	6667	0.050	20000	0.000	N/A
Mixophyes balbus	6	LNE	0.150	6667	0.050	20000	0.000	N/A
Mixophyes balbus	7	LNE	0.150	6667	0.050	20000	0.000	N/A
Mixophyes balbus	8	LNE	0.150	6667	0.000	N/A	0.000	N/A
Mixophyes balbus	9	LNE	0.150	6667	0.150	6667	0.000	N/A
Mixophyes balbus	10	LNE	0.050	20000	0.000	N/A	0.000	N/A
Mixophyes fleayi	1	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes fleayi	2	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes fleayi	3	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes fleayi	4	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes fleayi	5	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes fleayi	6	UNE	0.020	50000	0.000	N/A	0.000	N/A
Mixophyes iteratus	1	UNE	0.200	4472	0.100	8944	0.000	N/A
Mixophyes iteratus	2	UNE	0.200	4472	0.100	8944	0.000	N/A
Mixophyes iteratus	3	UNE	0.200	4472	0.100	8944	0.000	N/A
Mixophyes iteratus	4	UNE	0.200	4472	0.100	8944	0.000	N/A
Mixophyes iteratus	5	UNE	0.200	4472	0.100	8944	0.000	N/A
Mixophyes iteratus	6	UNE	0.200	4472	0.200	4472	0.000	N/A
Mixophyes iteratus	7	UNE/LNE	0.200	4472	0.100	8944	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Mixophyes iteratus	8	LNE	none available		0.050	17889	0.050	17889
Mixophyes iteratus	9	LNE	none available		0.020	44721	0.020	44721
Mixophyes iteratus	10	LNE	none available		0.020	44721	0.020	44721
Mixophyes iteratus	11	LNE	none available		0.020	44721	0.020	44721
Mixophyes iteratus	12	LNE	0.020	44721	0.000	N/A	0.000	N/A
Philoria kundagungan	1	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria kundagungan	2	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria kundagungan	3	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria kundagungan	4	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria loveridgei	1	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria loveridgei	2	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria loveridgei	3	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria loveridgei	4	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria loveridgei	5	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sp 2 (pughi)	1	UNE	0.200	7071	0.200	7071	0.000	N/A
Philoria sp 2 (pughi)	2	UNE	0.100	14142	0.100	14142	0.000	N/A
Philoria sp 2 (pughi)	3	UNE	0.100	14142	0.100	14142	0.000	N/A
Philoria sp 2 (pughi)	4	UNE	0.100	14142	0.100	14142	0.000	N/A
Philoria sp 2 (pughi)	5	UNE	0.100	14142	0.100	14142	0.000	N/A
Philoria sp 3 (richmondensis)	1	UNE	0.050	28284	0.000	N/A	0.000	N/A
Philoria sp 3 (richmondensis)	2	UNE	0.050	28284	0.050	28284	0.000	N/A
Philoria sp 3 (richmondensis)	3	UNE	0.050	28284	0.000	N/A	0.000	N/A
Philoria sp 3 (richmondensis)	4	UNE	0.050	28284	0.050	28284	0.000	N/A
Philoria sphagnicolus	1	UNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	2	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	3	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	4	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	5	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	6	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	7	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	8	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	9	LNE	0.100	14142	0.100	14142	0.000	N/A
Philoria sphagnicolus	10	LNE	0.100	14142	0.000	N/A	0.000	N/A
Philoria sphagnicolus	11	LNE	0.100	14142	0.000	N/A	0.000	N/A
Pseudophryne bibronii	1	UNE	0.020	70711	0.020	70711	0.000	N/A
Pseudophryne bibronii	2	UNE/LNE	0.020	70711	0.020	70711	0.000	N/A
Pseudophryne bibronii	3	LNE	0.020	70711	0.020	70711	0.000	N/A
Pseudophryne bibronii	4	LNE	0.050	28284	0.050	28284	0.000	N/A
Pseudophryne bibronii	5	LNE	0.050	28284	0.050	28284	0.000	N/A
Pseudophryne bibronii	6	LNE	0.050	28284	0.050	28284	0.000	N/A
Pseudophryne bibronii	7	LNE	0.050	28284	0.050	28284	0.000	N/A

APPENDIX 7.5 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR TERRESTRIAL MAMMAL SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Rufous Bettong	1	UNE	0.005	565685	0.004	707107	0.002	1414214
Rufous Bettong	2	UNE	0.005	565685	0.004	707107	0.002	1414214
Rufous Bettong	3	LNE	0.000	N/A	0.000	N/A	0.002	1414214
Rufous Bettong	4	LNE	0.000	N/A	0.000	N/A	0.002	1414214
Rufous Bettong	5	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Red-legged Pademelon	1	UNE	0.010	282843	0.002	1414214	0.000	N/A
Red-legged Pademelon	2	UNE	0.008	353553	0.002	1414214	0.000	N/A
Red-legged Pademelon	3	UNE	0.008	353553	0.002	1414214	0.000	N/A
Red-legged Pademelon	4	LNE	0.008	353553	0.002	1414214	0.000	N/A
Red-legged Pademelon	5	LNE	0.008	353553	0.002	1414214	0.000	N/A
Red-legged Pademelon	6	LNE	0.005	565685	0.005	565685	0.000	N/A
Red-legged Pademelon	7	LNE	0.005	565685	0.005	565685	0.000	N/A
Red-legged Pademelon	8	LNE	0.000	N/A	0.000	N/A	0.000	N/A
Brush-tailed Rock-wallaby	1	UNE	0.020	115470	0.003	692820	0.000	N/A
Brush-tailed Rock-wallaby	2	UNE	0.020	115470	0.003	692820	0.000	N/A
Brush-tailed Rock-wallaby	3	LNE	0.020	115470	0.003	692820	0.000	N/A
Brush-tailed Rock-wallaby	4	LNE	0.013	173205	0.002	1039230	0.000	N/A
Brush-tailed Rock-wallaby	5	LNE	0.013	173205	0.002	1039230	0.000	N/A
Black-striped Wallaby	1	UNE	0.143	16166	0.050	46188	0.000	N/A
Long-nosed Potoroo	1	UNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	2	UNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	3	UNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	4	LNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	5	LNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	6	LNE	0.013	212132	0.008	353553	0.006	494975
Long-nosed Potoroo	7	LNE	0.007	424264	0.000	N/A	0.000	N/A
Parma Wallaby	1	UNE	0.010	141421	0.007	395980	0.002	1414214
Parma Wallaby	2	UNE	0.013	212132	0.010	282843	0.003	1131371
Parma Wallaby	3	LNE	0.013	212132	0.010	282843	0.003	1131371
Parma Wallaby	4	LNE	0.013	300000	0.010	282843	0.003	1131371
Parma Wallaby	5	LNE	0.013	212132	0.010	282843	0.003	1131371
Parma Wallaby	6	LNE	0.013	212132	0.010	282843	0.003	1131371
Parma Wallaby	7	LNE	0.013	212132	0.010	282843	0.000	N/A
Whiptail Wallaby	1	UNE	0.083	27713	0.036	64663	0.008	277128
Whiptail Wallaby	2	LNE	0.083	69282	0.036	64663	0.008	277128
Tiger Quoll	1	UNE	0.002	519615	0.001	1272792	0.000	4242641
Tiger Quoll	2	UNE	0.002	900000	0.001	1272792	0.000	4242641
Tiger Quoll	3	LNE	0.002	636396	0.001	1272792	0.001	2121320
Tiger Quoll	4	LNE	0.002	212132	0.001	1272792	0.001	2121320
Common Wombat	1	UNE	0.010	230940	0.010	230940	0.000	N/A
Common Wombat	2	LNE	0.025	92376	0.000	N/A	0.000	N/A
Common Wombat	3	LNE	0.025	92376	0.000	N/A	0.000	N/A
Common Wombat	4	LNE	0.020	115470	0.000	N/A	0.000	N/A
Hastings River Mouse	1	UNE	0.333	12728	0.017	254558	0.002	2121320
Hastings River Mouse	2	UNE	0.167	25456	0.010	424264	0.002	2545584
Hastings River Mouse	3	UNE	0.167	25456	0.010	424264	0.002	2545584
Hastings River Mouse	4	UNE	0.167	25456	0.010	424264	0.002	2545584
Hastings River Mouse	5	UNE	0.333	12728	0.017	254558	0.002	2121320
Hastings River Mouse	6	UNE	0.000	N/A	0.005	848528	0.001	4242641

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Hastings River Mouse	7	LNE	0.000	N/A	0.005	848528	0.001	4242641
Hastings River Mouse	8	LNE	0.333	12728	0.017	254558	0.002	2121320
Hastings River Mouse	9	LNE	0.167	25456	0.010	424264	0.002	2545584
Hastings River Mouse	10	LNE	0.167	25456	0.010	424264	0.002	2545584
Brush-tailed Phascogale	1	UNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	2	UNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	3	UNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	4	LNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	5	LNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	6	LNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	7	LNE	0.004	500000	0.002	1000000	0.001	1700000
Brush-tailed Phascogale	8	LNE	0.002	1000000	0.001	1700000	0.000	N/A
Dingo	1	UNE	0.001	534522	0.001	1069045	0.000	2138090
Dingo	2	LNE	0.001	534522	0.001	1069045	0.000	2138090
Dingo	3	LNE	0.001	1069045	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	1	UNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	2	UNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	3	LNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	4	LNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	5	LNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	6	LNE	0.100	56569	0.000	N/A	0.000	N/A
Eastern Chestnut Mouse	7	LNE	0.100	56569	0.000	N/A	0.000	N/A
Broad-toothed Rat	1	UNE	0.200	0	0.050	56569	0.000	N/A
Common Planigale	1	UNE	1.000	2000	0.500	4000	0.050	40000
Common Planigale	2	UNE	1.000	2000	0.500	4000	0.050	40000
Common Planigale	3	UNE	1.000	2000	0.500	4000	0.050	40000
Common Planigale	4	LNE	1.000	2000	0.500	4000	0.050	40000
Common Planigale	5	LNE	1.000	2000	0.500	4000	0.050	40000
Common Planigale	6	LNE	1.000	2000	0.500	4000	0.050	40000
Pale Field-rat	1	UNE	0.500	16000	0.200	40000	0.050	160000
Pale Field-rat	2	UNE	0.500	16000	0.200	40000	0.050	160000
Pale Field-rat	3	UNE	0.500	16000	0.200	40000	0.050	160000
Grassland Melomys	1	UNE	1.000	4243	0.667	6364	0.000	N/A
Grassland Melomys	2	UNE	1.000	4243	0.667	6364	0.000	N/A
Grassland Melomys	3	UNE	0.500	8485	0.333	12728	0.000	N/A
Grassland Melomys	4	UNE	0.500	8485	0.333	12728	0.000	N/A
New Holland Mouse	1	UNE	0.100	60000	0.050	120000	0.020	300000
New Holland Mouse	2	UNE	0.050	120000	0.050	120000	0.020	300000
New Holland Mouse	3	UNE	0.050	120000	0.050	120000	0.020	300000
New Holland Mouse	4	LNE	0.050	120000	0.050	120000	0.020	300000
New Holland Mouse	5	LNE	0.100	60000	0.050	120000	0.020	300000
New Holland Mouse	6	LNE	0.050	120000	0.000	N/A	0.000	N/A
Dusky Antechinus	1	UNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	2	UNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	3	UNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	4	UNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	5	LNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	6	LNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	7	LNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	8	LNE	0.100	20000	0.033	60000	0.000	N/A
Dusky Antechinus	9	LNE	0.033	60000	0.000	N/A	0.000	N/A

APPENDIX 7.6 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR NOCTURNAL BIRD SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Marbled Frogmouth	1	UNE	0.050	17889	0.000	N/A	0.000	N/A
Marbled Frogmouth	2	UNE	0.050	17889	0.000	N/A	0.000	N/A
Marbled Frogmouth	3	UNE	0.050	17889	0.000	N/A	0.000	N/A
Marbled Frogmouth	4	UNE	0.050	17889	0.000	N/A	0.000	N/A
Marbled Frogmouth	5	UNE	0.050	17889	0.000	N/A	0.000	N/A
Bush Stone-curlew	1	UNE	0.005	400000	0.003	800000	0.000	N/A
Bush Stone-curlew	2	LNE	0.005	400000	0.003	800000	0.000	N/A
Powerful Owl	1	UNE	0.001	377964	0.001	755929	0.000	2.E+09
Powerful Owl	2	LNE	0.001	377964	0.001	755929	0.000	2.E+09
Sooty Owl	1	UNE	0.001	273861	0.001	364236	0.000	N/A
Sooty Owl	2	LNE	0.001	273861	0.001	364236	0.000	N/A
Sooty Owl	3	LNE	0.001	364236	0.001	730297	0.000	N/A
Masked Owl	1	UNE	0.001	734847	0.001	1224745	0.000	3.E+09
Masked Owl	2	LNE	0.001	734847	0.001	1224745	0.000	3.E+09
Barking Owl	1	UNE	0.002	402492	0.001	1341641	0.000	N/A
Barking Owl	2	LNE	0.002	402492	0.001	1341641	0.000	N/A

APPENDIX 7.7 THE DENSITY AND TARGETS CALCULATED IN EACH HABITAT QUALITY AND SPECIES EQUITY TARGET AREA (SETA) FOR REPTILE SPECIES

N/A indicates that the target was not calculated since the density of the species in that habitat quality was either zero or the habitat quality was not present in that SETA.

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Acanthophis antarcticus	buffer of 2km radius around validated records post 1970 accurate to 1km							
Austrelaps ramsayi	1	UNE	0.050	8944	0.010	44721	0.000	N/A
Austrelaps ramsayi	2	UNE	0.050	8944	0.010	44721	0.000	N/A
Austrelaps ramsayi	3	UNE/LNE	0.050	8944	0.010	44721	0.000	N/A
Austrelaps ramsayi	4	LNE	0.050	8944	0.010	44721	0.000	N/A
Austrelaps ramsayi	5	LNE	0.050	8944	0.010	44721	0.000	N/A
Austrelaps ramsayi	6	LNE	0.050	8944	0.010	44721	0.000	N/A
Cacophis harriettae	1	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	2	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	3	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	4	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	5	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	6	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	7	UNE	0.020	25000	0.020	25000	0.020	25000
Cacophis harriettae	8	UNE	0.020	25000	0.020	25000	0.020	25000

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Cautula zia	1	UNE	2.000	1000	0.500	4000	0.100	20000
Cautula zia	2	UNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	3	UNE	2.000	1000	0.500	4000	0.100	20000
Cautula zia	4	UNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	5	UNE	2.000	1000	0.500	4000	0.100	20000
Cautula zia	6	UNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	7	LNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	8	LNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	9	LNE	2.000	1000	0.500	4000	0.000	N/A
Cautula zia	10	LNE	2.000	1000	0.500	4000	0.100	20000
Coeranoscincus reticulatus	1	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	2	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	3	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	4	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	5	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	6	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	7	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	8	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	9	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	10	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	11	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	12	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	13	UNE	0.050	20000	0.000	N/A	0.000	N/A
Coeranoscincus reticulatus	14	UNE	0.050	20000	0.050	20000	0.050	20000
Coeranoscincus reticulatus	15	UNE	0.050	20000	0.050	20000	0.050	20000
Ctenotus eurydice	1	UNE	1.500	1089	1.500	1089	1.500	1089
Ctenotus eurydice	2	UNE	1.500	1089	1.500	1089	1.500	1089
Ctenotus eurydice	3	UNE	1.500	1089	1.500	1089	1.500	1089
Ctenotus eurydice	4	UNE	1.500	1089	1.500	1089	1.500	1089
Drysdalia coronoides	1	UNE	0.100	5000	0.050	10000	0.000	N/A
Drysdalia coronoides	2	UNE	0.100	5000	0.050	10000	0.000	N/A
Drysdalia coronoides	3	UNE	0.100	5000	0.050	10000	0.000	N/A
Drysdalia coronoides	4	LNE	0.100	5000	0.050	10000	0.000	N/A
Drysdalia coronoides	5	LNE	0.100	5000	0.050	10000	0.000	N/A
Drysdalia coronoides	6	LNE	0.100	5000	0.050	10000	0.000	N/A
Elseya georgesi	1	LNE	0.010	213201	0.000	N/A	0.000	N/A
Elseya purvisi	1	LNE	0.010	213201	0.000	N/A	0.000	N/A
Elseya sp2 (Gwydir & Namoi	1	LNE	0.010	213201	0.000	N/A	0.000	N/A
Emydura sp (Bellingen River)	1	LNE	0.050	29848	0.000	N/A	0.000	N/A
Emydura sp1	1	UNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	2	UNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	3	UNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	4	UNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	5	UNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	6	LNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	7	LNE	0.500	2985	0.000	N/A	0.000	N/A
Emydura sp1	8	LNE	0.500	2985	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	1	UNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	2	UNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	3	UNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	4	LNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	5	LNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	6	LNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus kosciuskoi	7	LNE	0.200	7071	0.000	N/A	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Eulamprus kosciuskoi	8	LNE	0.200	7071	0.000	N/A	0.000	N/A
Eulamprus murrayi	1	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	2	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	3	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	4	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	5	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	6	UNE	1.000	1414	1.000	1414	1.000	1414
Eulamprus murrayi	7	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	8	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	9	UNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	10	UNE/LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	11	UNE	1.000	1414	1.000	1414	1.000	1414
Eulamprus murrayi	12	LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	13	LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	14	LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	15	LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	16	LNE	1.000	1414	1.000	1414	1.000	1414
Eulamprus murrayi	17	LNE	1.000	1414	0.000	N/A	0.000	N/A
Eulamprus murrayi	18	LNE	1.000	1414	1.000	1414	1.000	1414
Eulamprus murrayi	19	LNE	1.000	1414	1.000	1414	1.000	1414
Eulamprus tenuis	1	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	2	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	3	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	4	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	5	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	6	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	7	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	8	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	9	UNE/LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	10	UNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	11	LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	12	LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	13	LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	14	LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tenuis	15	LNE	0.100	14142	0.020	70711	0.001	1414214
Eulamprus tryoni	1	UNE	0.100	14142	0.000	N/A	0.000	N/A
Eulamprus tryoni	2	UNE	0.100	14142	0.000	N/A	0.000	N/A
Hoplocephalus bitorquatus	1	Take all HQ1 within 10km radius of known sites						
Hoplocephalus bungaroides	1	LNE	0.010	44721	0.000	N/A	0.000	N/A
Hoplocephalus bungaroides	2	LNE	0.010	44721	0.000	N/A	0.000	N/A
Hoplocephalus stephensii	1	UNE	0.020	22361	0.000	N/A	0.000	N/A
Hoplocephalus stephensii	2	UNE	0.020	22361	0.000	N/A	0.000	N/A
Hoplocephalus stephensii	3	UNE	0.020	22361	0.000	N/A	0.000	N/A
Hoplocephalus stephensii	4	UNE	0.020	22361	0.000	N/A	0.000	N/A
Hoplocephalus stephensii	5	UNE	0.010	44721	0.005	89443	0.005	89443
Hoplocephalus stephensii	6	UNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	7	UNE	0.010	44721	0.005	89443	0.005	89443
Hoplocephalus stephensii	8	UNE	0.010	44721	0.005	89443	0.005	89443
Hoplocephalus stephensii	9	UNE	0.020	22361	0.010	44721	0.000	N/A
Hoplocephalus stephensii	10	LNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	11	LNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	12	LNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	13	LNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	14	LNE	0.010	44721	0.005	89443	0.005	89443
Hoplocephalus stephensii	15	LNE	0.010	44721	0.005	89443	0.005	89443

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Hoplocephalus stephensii	16	LNE	0.010	44721	0.005	89443	0.000	N/A
Hoplocephalus stephensii	17	LNE	0.020	22361	0.010	44721	0.000	N/A
Hoplocephalus stephensii	18	LNE	0.010	44721	0.005	89443	0.000	N/A
Hypsilurus spinipes	1	UNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	2	UNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	3	UNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	4	UNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	5	UNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	6	UNE/LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	7	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	8	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	9	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	10	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	11	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	12	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	13	LNE	0.100	8944	0.100	8944	0.050	17889
Hypsilurus spinipes	14	LNE	0.010	89443	0.000	N/A	0.000	N/A
Lampropholis caligula	1	LNE	0.100	20000	0.050	40000	0.000	N/A
Lampropholis caligula	2	LNE	0.100	20000	0.050	40000	0.000	N/A
Lampropholis caligula	3	LNE	0.100	20000	0.050	40000	0.000	N/A
Lampropholis caligula	4	LNE	0.100	20000	0.050	40000	0.000	N/A
Lampropholis caligula	5	LNE	0.100	20000	0.050	40000	0.000	N/A
Lampropholis elongata	1	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	2	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	3	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	4	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	5	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	6	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	7	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	8	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	9	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	10	LNE	0.100	20000	0.000	N/A	0.000	N/A
Lampropholis elongata	11	LNE	0.100	20000	0.000	N/A	0.000	N/A
Ophioscincus truncatus	1	UNE	0.250	6532	0.063	26128	0.000	N/A
Ophioscincus truncatus	2	UNE	0.250	6532	0.063	26128	0.000	N/A
Ophioscincus truncatus	3	UNE	0.250	6532	0.063	26128	0.000	N/A
Ophioscincus truncatus	4	UNE	0.250	6532	0.063	26128	0.000	N/A
Ophioscincus truncatus	5	UNE	0.250	6532	0.063	26128	0.000	N/A
Ophioscincus truncatus	6	UNE/LNE	0.100	16330	0.100	16330	0.100	16330
Ophioscincus truncatus	7	UNE	0.100	16330	0.100	16330	0.100	16330
Ophioscincus truncatus	8	LNE	0.100	16330	0.000	N/A	0.000	N/A
Ophioscincus truncatus	9	LNE	0.100	16330	0.000	N/A	0.000	N/A
Saltuarius swaini	1	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	2	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	3	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	4	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	5	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	6	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	7	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	8	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	9	UNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	10	UNE/LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	11	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	12	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	13	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	14	LNE	0.050	17889	0.025	35777	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Saltuarius swaini	15	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	16	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius swaini	17	LNE	0.050	17889	0.025	35777	0.000	N/A
Saltuarius wyberba	1	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	2	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	3	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	4	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	5	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	6	UNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	7	UNE/LNE	0.010	89443	0.000	N/A	0.000	N/A
Saltuarius wyberba	8	LNE	0.010	89443	0.000	N/A	0.000	N/A
Saproscincus challengeri	1	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	2	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	3	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	4	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	5	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	6	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	7	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	8	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	9	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	10	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus challengeri	11	UNE	2.500	800	0.500	4000	0.250	8000
Saproscincus galli	1	UNE	0.150	13333	0.020	100000	0.000	N/A
Saproscincus galli	2	UNE	0.150	13333	0.020	100000	0.000	N/A
Saproscincus galli	3	UNE	0.150	13333	0.020	100000	0.000	N/A
Saproscincus galli	4	UNE	0.150	13333	0.020	100000	0.000	N/A
Saproscincus galli	5	UNE	0.150	13333	0.020	100000	0.000	N/A
Saproscincus galli	6	UNE	0.100	20000	0.020	100000	0.000	N/A
Saproscincus galli	7	UNE	0.100	20000	0.020	100000	0.000	N/A
Saproscincus galli	8	UNE	0.100	20000	0.020	100000	0.010	200000
Saproscincus galli	9	UNE	0.100	20000	0.020	100000	0.000	N/A
Saproscincus galli	10	UNE/LNE	0.100	20000	0.020	100000	0.000	N/A
Saproscincus galli	11	LNE	0.100	20000	0.050	40000	0.000	N/A
Saproscincus galli	12	LNE	0.100	20000	0.050	40000	0.010	200000
Saproscincus galli	13	LNE	0.100	20000	0.050	40000	0.000	N/A
Saproscincus galli	14	LNE	0.100	20000	0.050	40000	0.000	N/A
Saproscincus galli	15	LNE	0.100	20000	0.050	40000	0.000	N/A
Saproscincus galli	16	LNE	0.100	20000	0.050	40000	0.000	N/A
Saproscincus oriarus "Nth Coast	1	UNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	2	UNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	3	UNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	4	LNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	5	LNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	6	LNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus oriarus "Nth Coast	7	LNE	0.100	20000	0.000	N/A	0.000	N/A
Saproscincus rosei	1	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	2	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	3	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	4	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	5	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	6	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	7	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	8	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	9	UNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	10	LNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	11	LNE	1.500	1333	0.500	4000	0.000	N/A
Saproscincus rosei	12	LNE	2.500	800	0.500	4000	0.000	N/A

Species	SETA	Region	HQ1 Density (no./ha)	HQ1 Target (ha)	HQ2 Density (no./ha)	HQ2 Target (ha)	HQ3 Density (no./ha)	HQ3 Target (ha)
Saproscincus rosei	13	LNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	14	LNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	15	LNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	16	LNE	1.500	1333	0.500	4000	0.000	N/A
Saproscincus rosei	17	LNE	2.500	800	0.500	4000	0.000	N/A
Saproscincus rosei	18	LNE	1.500	1333	0.500	4000	0.000	N/A
Tropidechis carinatus	1	UNE	0.200	2236	0.200	2236	0.200	2236
Tropidechis carinatus	2	UNE	0.200	2236	0.200	2236	0.200	2236
Tropidechis carinatus	3	UNE	0.200	2236	0.200	2236	0.200	2236
Tropidechis carinatus	4	UNE/LNE	0.020	22361	0.020	22361	0.020	22361
Tropidechis carinatus	5	LNE	0.020	22361	0.020	22361	0.020	22361
Tropidechis carinatus	6	LNE	0.020	22361	0.020	22361	0.020	22361
Tropidechis carinatus	7	LNE	0.020	22361	0.020	22361	0.020	22361
Tropidechis carinatus	8	LNE	0.020	22361	0.020	22361	0.020	22361
Tropidechis carinatus	9	LNE	0.020	22361	0.020	22361	0.020	22361
Tympanocryptis diemensis	1	LNE	0.050	32660	0.000	N/A	0.000	N/A
Tympanocryptis diemensis	2	LNE	0.050	32660	0.000	N/A	0.000	N/A
Underwoodisaurus sphyrurus	1	UNE	0.050	20000	0.010	100000	0.000	N/A
Underwoodisaurus sphyrurus	2	UNE	0.050	20000	0.010	100000	0.000	N/A
Underwoodisaurus sphyrurus	3	UNE/LNE	0.050	20000	0.010	100000	0.000	N/A
Underwoodisaurus sphyrurus	4	LNE	0.050	20000	0.010	100000	0.000	N/A
Varanus rosenbergi	1	LNE	0.002	188982	0.000	N/A	0.000	N/A

APPENDIX 8

APPENDIX 8.1 THE GROUPS (SEE SECTION 3.1.5) ARBOREAL SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional Comments
Eastern Pygmy Possum	UNE	1,2	No Change	
Eastern Pygmy Possum	LNE	1,3	No Change	
Greater Glider	UNE	none	No Change	
Greater Glider	LNE	none	No Change	
Koala	UNE	2,3,4	No Change	
Koala	LNE	2,3,4,	No Change	
Squirrel Glider	UNE	none	No Change	
Squirrel Glider	LNE	none	No Change	
Yellow-bellied Glider	UNE	none	No Change	
Yellow-bellied Glider	LNE	none	No Change	

APPENDIX 8.2 THE GROUPS (SEE SECTION 3.1.5) BAT SPECIES WERE PLACED IN AND AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Taregt Recommendation	Additional Comments
Chalinolobus dwyeri	UNE	1	No Change	
Chalinolobus dwyeri	LNE	1	No Change	
Chalinolobus nigrogriseus	UNE	1	No Change	
Falsistrellus	UNE	1	No Change	

Species	Region	Groups	Taregt Recommendation	Additional Comments
tasmaniensis				
Falsistrellus tasmaniensis	LNE	1	No Change	
Kerivoula papuensis	UNE	none	No Change	
Kerivoula papuensis	LNE	none	No Change	
Miniopterus australis	UNE	1	See notes	Protection of maternal caves are an absolute priority
Miniopterus australis	LNE	1	See notes	Protection of maternal caves are an absolute priority
Miniopterus schreibersii	UNE	none	See notes	
Miniopterus schreibersii	LNE	none	See notes	
Mormopterus norfolkensis	UNE	none	No Change	
Mormopterus norfolkensis	LNE	none	No Change	
Myotis adversus	UNE	none	No Change	Needs stream protection
Myotis adversus	LNE	none	No Change	Needs stream protection
Nyctimene robinsoni	UNE	1	No Change	
Nyctinomus australis	UNE	none	No Change	
Nyctinomus australis	LNE	none	No Change	
Nyctophilus bifax	UNE	1	No Change	
Pteropus alecto	UNE	none	See notes	
Pteropus poliocephalus	UNE	none	See notes	
Pteropus poliocephalus	LNE	none	See notes	
Rhinolophus megaphyllus	UNE	none	No Change	
Rhinolophus megaphyllus	LNE	none	No Change	
Scotoeanax rueppellii	UNE	none	No Change	
Scotoeanax rueppellii	LNE	none	No Change	
Scotorepens balstoni	UNE	1	No Change	
Scotorepens	LNE	1	No Change	

Species	Region	Groups	Taregt Recommendation	Additional Comments
balstoni				
Scotorepens greyii	UNE	1	No Change	
Scotorepens sp 1	UNE	1	No Change	
Scotorepens sp 1	LNE	1	No Change	
Syconycteris australis	UNE	1	No Change	
Syconycteris australis	LNE	1	No Change	
Vespadelus pumilus	UNE	none	No Change	
Vespadelus pumilus	LNE	none	No Change	
Vespadelus troughtoni	UNE	none	No Change	

APPENDIX 8.3 THE GROUPS (SEE SECTION 3.1.5) DIURNAL BIRD SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional Comments
Albert's Lyrebird	UNE	5	reserve all modelled habitat.	Sensitive to lantana invasion after disturbance
Barred Cuckoo-shrike	UNE	1,3	reserve all modelled habitat in SETAs 1 and 2a	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Barred Cuckoo-shrike	LNE	1,3	reserve all modelled habitat in SETAs 1 and 2a	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Black Bittern	UNE	1,4,5	reserve all HQ1 and HQ2.	Need to manage riparian areas on freehold and private land.. Travelling stock routes are important.
Black Bittern	LNE	1,4,5	reserve all HQ1 and HQ2.	Need to manage riparian areas on freehold and private land.. Travelling stock routes are important.
Black-breasted Button-quail	UNE	1,2,4	reserve all HQ1 and HQ2 in SETA 1. LNE may be out of its range. Conduct targeted surveys in modelled habitat of SETAs 2,3 and 4 before making management	processes in addition habitat perturbation are affecting this species ie predation. Would benefit from reservation in areas with low predation. Would benefit from reservation on all crown tenures and private land since clearing a threat

Species	Region	Groups	Target Recommendation	Additional Comments
			decisions here.	
Black-necked Stork	UNE	1,4	reserve all HQ1 and HQ2	Population operates across the continent therefore scale of target application too small. Should conserve all wetlands
Black-necked Stork	LNE	1,4	reserve all HQ1 and HQ3	Population operates across the continent therefore scale of target application too small. Should conserve all wetlands
Brush Bronzewing	UNE	1,2,4	reserve all HQ1	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Brush Bronzewing	LNE	1,2,4	reserve all HQ2	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Chestnut-rumped Heathwren	UNE	1,2	reserve all HQ1	Prefers habitat 10yrs after fire. Highly susceptible to disturbance by burning and grazing on private and public land.
Chestnut-rumped Heathwren	LNE	2	No Change	Prefers habitat 10yrs after fire. Highly susceptible to disturbance by burning and grazing on private and public land.
Double-eyed Fig-parrot	UNE	1,2	reserve all HQ1 and HQ2.	would benefit from reservation on all crown land tenures since clearing is a threat
Eastern Bristlebird	UNE	1,2	reserve all modelled habitat.	species may not be getting enough infrequent hot fire in habitat which is being replaced by rainforest
Forest Kingfisher	UNE	1	all modelled habitat constitutes one SETA and will get 50% of a target	would benefit from reservation on all crown land tenures since clearing is a threat
Forest Kingfisher	LNE	1	all modelled habitat constitutes one SETA and will get 50% of a target	would benefit from reservation on all crown land tenures since clearing is a threat
Forest Raven	UNE	5	For coastal Species Only, reserve all modelled habitat in SETA 3 and all habitat in Bongill Bongill NP	Sensitive to fragmentation
Forest Raven	LNE	5	For coastal Species Only, reserve all modelled habitat in SETA 3 and all habitat in Bongill Bongill NP	Sensitive to fragmentation
Gang-gang Cockatoo	LNE	1	Part of a SETA that extends into Victoria. Will get	.

Species	Region	Groups	Target Recommendation	Additional Comments
			30% of a target	
Glossy Black-Cockatoo	UNE	none	No Change	In far north UNE nest trees are limiting resource not feed trees. We should provide a habitat corridor between eastern and western populations in UNE. With this there is no need for separate SETAs.
Glossy Black-Cockatoo	LNE	none	No Change	
Grey-crowned Babbler	UNE	4	No Change	Occurs mainly on private land and is affected by land management practices here. Would benefit from reservation on all crown land tenures and private land since it is threatened by clearing.
Grey-crowned Babbler	LNE	4	No Change	Occurs mainly on private land and is affected by land management practices here. Would benefit from reservation on all crown land tenures and private land since it is threatened by clearing.
Hooded Robin	UNE	4	reserve all modelled habitat	Urgent need to manage grazing and fire. This problem also exists on public and may therefore need reservation to deal with this.
Hooded Robin	LNE	4	reserve all modelled habitat	Urgent need to manage grazing and fire. This problem also exists on public and may therefore need reservation to deal with this.
Little Bronze-Cuckoo	UNE	1,3,4,	No Change	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Little Bronze-Cuckoo	LNE	1,3,4	No Change	Would benefit from reservation on all crown land tenures and private land since clearing is a threat
Little Shrike-thrush	UNE	1,2	No Change	Popn. In UNE considered to be genetically distinct to Qld popn.
Mangrove Honeyeater	UNE	1,5	reserve all modelled habitat in SETAs 1 and 2	would benefit from reservation on all crown land tenures since clearing is a threat
Mangrove Honeyeater	LNE	1,5	reserve all modelled habitat in SETAs 1 and 2	would benefit from reservation on all crown land tenures since clearing is a threat
Musk Lorikeet	UNE	3,4	reserve all HQ1 and HQ2	Need to protect all winter flowering eucalypts
Musk Lorikeet	LNE	3,4	reserve all HQ1 and HQ3	Need to protect all winter flowering eucalypts
Olive Whistler	UNE	2,5	reserve all modelled habitat	Rare and limited distribution. The 5 populations identified show evidence of differentiation.
Olive Whistler	LNE	2,5	reserve all	Rare and limited distribution. The 5

Species	Region	Groups	Target Recommendation	Additional Comments
			modelled habitat	populations identified show evidence of differentiation.
Osprey	UNE	5	reserve all modelled habitat	Needs to be protected on private land. Info should be passed on to relevant govt. agencies to ensure it comes to the attention of Clearing Committees. Would benefit from reservation of all crown land tenures and public land.
Osprey	LNE	5	reserve all modelled habitat	Needs to be protected on private land. Info should be passed on to relevant govt. agencies to ensure it comes to the attention of Clearing Committees. Would benefit from reservation of all crown land tenures and public land.
Pacific Baza	UNE	none	No Change	
Pacific Baza	LNE	none	No Change	
Painted Honeyeater	UNE	1,3	reserve all modelled habitat in SETAs 2 and 3	Threatened by clearing in the wheat/sheep belt. Need to reserve crownlands and travelling stock routes with yellowbox. Must manage private land with yellowbox
Painted Honeyeater	LNE	1,3	reserve all modelled habitat in SETAs 2 and 4	
Pale-yellow Robin	UNE	none	No Change	
Pale-yellow Robin	LNE	none	No Change	
Paradise Riflebird	UNE	none	No Change	
Paradise Riflebird	LNE	none	No Change	
Red Goshawk	UNE	1,4	reserve all HQ1	Need regulation to prevent clearing of habitat on private land
Red-tailed Black-Cockatoo	UNE	1,2,4	No Change	Loss of habitat on private land is the main threat, overall target on public land could be reduced if appropriate management was put in place on private land to protect habitat
Red-tailed Black-Cockatoo	LNE	1,2,4	No Change	Loss of habitat on private land is the main threat, overall target on public land could be reduced if appropriate management was put in place on private land to protect habitat
Regent Honeyeater	UNE	1,2,3,4	Reserve all modelled habitat in SETAs 1a, 2a, 2c and 3	Acquire all focal nesting areas on privateland. Target freehold land dominated by winter flowering eucs. This species needs all suitable crown land protected. Travelling stock routes are very important
Regent Honeyeater	LNE	1,2,3,4	Reserve all modelled habitat in SETAs 1a, 2a, 2c	Acquire all focal nesting areas on private land. Target freehold land dominated by winter flowering eucs.

Species	Region	Groups	Target Recommendation	Additional Comments
			and 3	This species needs all suitable crown land protected. Travelling stock routes are very important
Rose-crowned Fruit-dove	UNE	none	No Change	
Rose-crowned Fruit-dove	LNE	none	No Change	
Rufous Scrub-bird	UNE	2	reserve all HQ1 and HQ2.	Rainforest encroachment may destroy habitat, needs appropriate fire regimes. If none then reservation may disadvantage species
Rufous Scrub-bird	LNE	2	reserve all HQ1 and HQ2.	Rainforest encroachment may destroy habitat, needs appropriate fire regimes. If none then reservation may disadvantage species
Square-tailed Kite	UNE	4	reserve all HQ1	Clearing is the major issue for this species. Would benefit from reservation on all crown land tenures and public land.
Square-tailed Kite	LNE	4	reserve all HQ1	Clearing is the major issue for this species. Would benefit from reservation on all crown land tenures and public land.
Superb Fruit-dove	UNE	1	Reserve all HQ1	.
Superb Lyrebird (edwardsii?)	UNE	1,4	reserve all HQ1 and HQ2	Need to protect this species from burning, grazing, clearing and introduced predators. Would benefit from reservation on all crown land tenures and private land.
Swift Parrot	UNE	1,2,3,4	reserve all modelled habitat in SETAs 1,3 and 5	would benefit from reservation on all crown land tenures since clearing is a threat
Swift Parrot	LNE	1,2,3,4	reserve all modelled habitat in SETAs 1,3 and 6	would benefit from reservation on all crown land tenures since clearing is a threat
Turquoise Parrot	UNE	2,4,	reserve all HQ1 in SETAs 2 and 4	Need to protect this species from burning, grazing, clearing and introduced predators. Would benefit from reservation on all crown land tenures and private land.
Turquoise Parrot	LNE	2,4	reserve all HQ1 in SETAs 2 and 5	Need to protect this species from burning, grazing, clearing and introduced predators. Would benefit from reservation on all crown land tenures and private land.
White-eared Monarch	UNE	1,4	No Change	Probably genetically distinct from Qld popn.
Wompoo Fruit-dove	UNE	none	No Change	would benefit from reservation on all crown land tenures since clearing is a

Species	Region	Groups	Target Recommendation	Additional Comments
				threat
Wompoo Fruit-dove	LNE	none	No Change	would benefit from reservation on all crown land tenures since clearing is a threat
Yellow-tufted Honeyeater	UNE	none	No Change	Inland and coastal sub-species have been recognised for this species. This is not indicated by the model.
Yellow-tufted Honeyeater	LNE	none	No Change	Inland and coastal sub-species have been recognised for this species. This is not indicated by the model.

APPENDIX 8.4 THE GROUPS (SEE SECTION 3.1.5) FROG SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional Comments
Assa darlingtoni	UNE	5	reserve all modelled habitat in SETAs 5-9	applies to southern population only, therefore only SETAs 5-9
Assa darlingtoni	LNE	5	reserve all modelled habitat in SETAs 5-9	applies to southern population only, therefore only SETAs 5-9
Crinia tinnula	UNE	none	No Change	
Crinia tinnula	LNE	none	No Change	
Heleioporus australiacus	LNE	none	No Change	
Litoria aurea	UNE	none	No Change	Needs Threatened Species management
Litoria aurea	LNE	none	No Change	Needs Threatened Species management
Litoria boorolongensis	UNE	6	No Target	Since it is probably extinct will leave out of process.
Litoria boorolongensis	LNE	6	No Target	Since it is probably extinct will leave out of process.
Litoria brevipalmata	UNE	2	reserve all modelled habitat	.
Litoria brevipalmata	LNE	2	reserve all modelled habitat	.
Litoria freycineti	UNE	none	No Change	
Litoria freycineti	LNE	none	No Change	
Litoria jervisiensis	UNE	none	No Change	

Species	Region	Groups	Target Recommendation	Additional Comments
Litoria jervisiensis	LNE	none	No Change	
Litoria littlejohni	LNE	none	No Change	
Litoria olongburensis	UNE	none	No Change	
Litoria piperata	UNE	4	reserve all habitat within a 1km radius of type locations and Curramore location	.
Litoria piperata	LNE	4	reserve all habitat within a 1km radius of type locations and Curramore location	.
Litoria revelata	UNE	none	No Change	
Litoria revelata	LNE	none	No Change	
Litoria subglandulosa	UNE	none	No Change	
Litoria subglandulosa	LNE	none	No Change	
Mixophyes balbus	UNE	none	No Change	
Mixophyes balbus	LNE	none	No Change	
Mixophyes fleayi	UNE	none	No Change	
Mixophyes iteratus	UNE	2	No Change	
Mixophyes iteratus	LNE	none	No Change	
Philoria kundagungan	UNE	5	reserve all modelled habitat	.
Philoria loveridgei	UNE	none	No Change	
Philoria sp 2 (pughi)	UNE	none	No Change	
Philoria sp 3 (richmondensis)	UNE	5	reserve all modelled habitat	.
Philoria sp 3 (richmondensis)	UNE	5	reserve all modelled habitat	.
Philoria sphagnicolus	LNE	none	No Change	
Pseudophryne bibronii	UNE	4	No Change	
Pseudophryne	LNE	4	No Change	

Species	Region	Groups	Target Recommendation	Additional Comments
bibronii				

APPENDIX 8.5 THE GROUPS (SEE SECTION 3.1.5) NOCTURNAL BIRD SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional Comments
Barking Owl	UNE	none	No Change	
Barking Owl	LNE	none	No Change	
Bush Stone-curlew	UNE	2	No Change	Needs predator control and reservation of freehold land. Travelling stock routes are important.
Bush Stone-curlew	LNE	2	No Change	Needs predator control and reservation of freehold land. Travelling stock routes are important.
Marbled Frogmouth	UNE	1,5	reserve all modelled habitat	.
Masked Owl	UNE	none	No Change	
Masked Owl	LNE	none	No Change	
Powerful Owl	UNE	none	No Change	
Powerful Owl	LNE	none	No Change	
Sooty Owl	UNE	none	No Change	
Sooty Owl	LNE	none	No Change	

APPENDIX 8.6 THE GROUPS (SEE SECTION 3.1.5) REPTILE SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional Comments
Acanthophis antarcticus	UNE	none	No Change	Grazing and burning greatest threat. Many records on private land.
Acanthophis antarcticus	LNE	none	No Change	Grazing and burning greatest threat. Many records on private land.
Austrelaps ramsayi	UNE	4	No Change	Habitat primarily on freehold land where it is probably in serious trouble. Would therefore benefit from reservation on public land.
Austrelaps	LNE	4	No Change	Habitat primarily on freehold land where it is probably in serious trouble.

Species	Region	Groups	Target Recommendation	Additional Comments
ramsayi				Would therefore benefit from reservation on public land.
Cacophis harriettae	UNE	4	all modelled habitat within a 5km radius of known records	.
Cautula zia	UNE	none	No Change	
Cautula zia	LNE	none	No Change	
Coeranoscincus reticulatus	UNE	2	reserve all HQ1	.
Ctenotus eurydice	UNE	none	No Change	
Drysdalia coronoides	UNE	none	No Change	
Drysdalia coronoides	LNE	none	No Change	
Elseya georgesi	LNE	4	reserve all modelled habitat within known range	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Elseya purvisi	LNE	4	reserve all modelled habitat within known range. Needs 2-5km of river below junction reserved to connect habitat	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Elseya sp2 (Gwydir & Namoi Rivers)	LNE	4	reserve all modelled habitat within known range	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Emydura sp (Bellingen River)	LNE	4	reserve all modelled habitat within known range	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Emydura sp1	UNE	4	No Change	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Emydura sp1	LNE	4	No Change	All turtles are a land management issue when on private land. Predation of nests an issue everywhere.
Eulamprus kosciuskoi	UNE	none	No Change	
Eulamprus kosciuskoi	LNE	none	No Change	
Eulamprus murrayi	UNE	none	No Change	
Eulamprus murrayi	LNE	none	No Change	

Species	Region	Groups	Target Recommendation	Additional Comments
Eulamprus tenuis	UNE	none	No Change	
Eulamprus tenuis	LNE	none	No Change	
Hoplocephalus bitorquatus	UNE	2	No Change	
Hoplocephalus bitorquatus	LNE	2	reserve all HQ1	.
Hoplocephalus bungaroides	LNE	none	reserve all HQ2	.
Hoplocephalus stephensii	UNE	none	No Change	A major conservation issue. Species is difficult to deal with since it has a very patchy but widespread distribution.
Hoplocephalus stephensii	LNE	none	No Change	A major conservation issue. Species is difficult to deal with since it has a very patchy but widespread distribution.
Hypsilurus spinipes	UNE	none	No Change	
Hypsilurus spinipes	LNE	none	No Change	
L. caligula	LNE	5	reserve all modelled habitat	.
Lampropholis elongata	LNE	5	reserve all modelled habitat	.
Ophioscincus truncatus	UNE	none	No Change	
Ophioscincus truncatus	LNE	none	No Change	
Saltuarius swaini	UNE	none	No Change	
Saltuarius swaini	LNE	none	No Change	
Saltuarius wyberba	UNE	5	reserve all modelled habitat	.
Saltuarius wyberba	LNE	5	reserve all modelled habitat	.
Saproscincus challengeri	UNE	none	No Change	
Saproscincus galli	UNE	none	No Change	
Saproscincus galli	LNE	none	No Change	
Saproscincus oriarus "North Coast sp"	UNE	none	No Change	
Saproscincus oriarus "North Coast sp"	LNE	none	No Change	
Saproscincus rosei	UNE	none	No Change	

Species	Region	Groups	Target Recommendation	Additional Comments
Saproscincus rosei	LNE	none	No Change	
Tropidechis carinatus	UNE	none	No Change	
Tropidechis carinatus	LNE	none	No Change	
Tympanocryptis diemensis	LNE	none	No Change	
Underwoodisaurus sphyrurus	UNE	none	No Change	
Underwoodisaurus sphyrurus	LNE	none	No Change	
Varanus rosenbergi	LNE	none	No Change	

APPENDIX 8.7 THE GROUPS (SEE SECTION 3.1.5) TERRESTRIAL MAMMAL SPECIES WERE PLACED IN AND THE RESULTING RECOMMENDATIONS MADE REGARDING THEIR TARGETS

Species	Region	Groups	Target Recommendation	Additional comments
Black-striped Wallaby	UNE	1,2	No Change	
Broad-toothed Rat	UNE	1,2,4	No Change	
Brush-tailed Phascogale	UNE	1,4	reserve all HQ1 and HQ2	Need predator control in all HQ1 and HQ2. Also need to apply a 500m buffer to all known populations on both public and private land.
Brush-tailed Phascogale	LNE	1,4	reserve all HQ1 and HQ2	Need predator control in all HQ1 and HQ2. Also need to apply a 500m buffer to all known populations on both public and private land.
Brush-tailed Rock-wallaby	UNE	1,4	reserve all HQ1 and HQ2 and known colonies	Needs predator control
Brush-tailed Rock-wallaby	LNE	1,4	reserve all HQ1 and HQ2 and known colonies	Needs predator control
Common Planigale	UNE	1	No Change	Species does not like intensive landuse
Common Planigale	LNE	1	No Change	Species does not like intensive landuse
Common Wombat	UNE	1,2	No Change	

Species	Region	Groups	Target Recommendation	Additional comments
Common Wombat	LNE	1,2	No Change	
Dingo	UNE	none	No Change	
Dingo	LNE	none	No Change	
Dusky Antechinus	UNE	1	No Change	
Dusky Antechinus	LNE	1	No Change	
Eastern Chestnut Mouse	UNE	1,2	reserve all modelled habitat	.
Eastern Chestnut Mouse	LNE	1,2	No Change	
Grassland Melomys	UNE	1	No Change	Urbanisation will fragment populations
Hastings River Mouse	LNE	2	No Change	
Hastings River Mouse+	UNE	2	No Change	
Long-nosed Potoroo	UNE	2	reserve all modelled habitat	Densities very low due to predation, therefore needs predator control.
Long-nosed Potoroo	LNE	2	reserve all modelled habitat	Densities very low due to predation, therefore needs predator control.
New Holland Mouse	UNE	none	No Change	
New Holland Mouse	LNE	none	No Change	
Pale Field-rat	UNE	1	No Change	
Parma Wallaby	UNE	2	reserve all HQ1 and HQ2	.
Parma Wallaby	LNE	2	reserve all HQ1 and HQ2	.
Red-legged Pademelon	UNE	1,2	reserve all HQ1 and HQ2	Very susceptible to dogs, with appropriate management and dog control densities would increase.
Red-legged Pademelon	LNE	1,2	reserve all HQ1 and HQ2	Very susceptible to dogs, with appropriate management and dog control densities would increase.
Rufous Bettong	UNE	2	No Change	
Rufous Bettong	LNE	2	No Change	
Tiger Quoll	UNE	none	No Change	
Tiger Quoll	LNE	none	No Change	
Whiptail Wallaby	UNE	1	No Change	
Whiptail Wallaby	LNE	1	No Change	

APPENDIX 9

APPENDIX 9.1 THE REASONS GIVEN FOR DEFINING EACH OF THE SPECIES EQUITY TARGET AREAS (SETAS) FOR EACH SPECIES

Arboreal Mammals

Species	SETA ID No.	Region	Reason
Koala	1	UNE	1/2- the Clarence river valley.
Koala	2	UNE	May be a break along Deane fault line within SETA. Need to maintain connectivity.
Koala	3	LNE	3 and 4 are separated by the Macleay River, clearing and gorge habitat
Koala	4	LNE	4and 5/6 are separated by the Manning River as well as clearing and gorge habitat
Koala	5	LNE	5 and 6 are separated by the Karuah river
Koala	6	LNE	5 and 6 are separated by the Karuah river
Koala	7	LNE	7 is separated from the 5/6 populations by the Hunter Valley
Squirrel Glider	1	UNE	1 and 2/3. Clarence river a barrier also clearing esp at the mouth of river
Squirrel Glider	2	UNE	Between 2 and 3 is due to clearing
Squirrel Glider	3	UNE	Between 2 and 3 is due to clearing
Squirrel Glider	4	LNE	4/5- Macleay river and associated clearing esp at mouth of the river
Squirrel Glider	5	LNE	5/6 - Hastings River and associated clearing esp at mouth of river
Squirrel Glider	6	LNE	6/7- Manning River and associated clearing esp at mouth of river
Squirrel Glider	7	LNE	7/8- The Hunter and associated clearing esp at mouth of river
Squirrel Glider	8	LNE	
Yellow-bellied Glider	1	UNE	Surrounded by private land that has or will be cleared. Distant from public land.
Yellow-bellied Glider	2	UNE	Surrounded by private land that has or will be cleared. Distant from public land.
Yellow-bellied Glider	3	UNE	Low quality habitat.
Yellow-bellied Glider	4	LNE	4/5- clearing between mid to low elev + unsuitable gorges at high elev

Species	SETA ID No.	Region	Reason
Yellow-bellied Glider	5	LNE	Surrounded by substantially cleared or large tracts of private land
Yellow-bellied Glider	6	LNE	Surrounded by substantially cleared or large tracts of private land
Yellow-bellied Glider	7	LNE	Surrounded by substantially cleared or large tracts of private land
Yellow-bellied Glider	8	LNE	South of Hunter. Hunter Valley substantially cleared
Greater Glider	1	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	2	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	3	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	4	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	5	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	6	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	7	UNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	8	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	9	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	10	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	11	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	12	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	13	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	14	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	15	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	16	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Greater Glider	17	LNE	Surrounded by cleared or large tracts of private land. Species is poor disperser
Eastern Pygmy Possum	1	UNE	1/2-3 -low elev dry forest or clearing. A cool temperate species in region
Eastern Pygmy Possum	2	UNE	1/2-3 -low elev dry forest or clearing. A cool temperate species in region

Species	SETA ID No.	Region	Reason
Eastern Pygmy Possum	3	UNE	1/2-3 -low elev dry forest or clearing. A cool temperate species in region
Eastern Pygmy Possum	4	LNE	4/5 -low elevation dry forest or clearing and Macleay River
Eastern Pygmy Possum	5	LNE	5/6-7 - Manning River and associated clearing
Eastern Pygmy Possum	6	LNE	6/7 due to clearing
Eastern Pygmy Possum	7	LNE	6-7/8 - Hunter river and clearing
Eastern Pygmy Possum	8	LNE	6-7/8 - Hunter river and clearing

Bats

Species	SETA ID No.	Region	Reason
Nyctimene robinsoni	1	UNE	Mosaic of dry and cleared corridor gap between two SETAs
Nyctimene robinsoni	2	UNE	
Pteropus alecto	1	UNE	
Syconycteris australis	1	UNE	
Syconycteris australis	2	LNE	
Pteropus poliocephalus	1	UNE	
Pteropus poliocephalus	2	LNE	
Kerivoula papuensis	1	UNE	Divided upper region into two on basis of >10km gap
Kerivoula papuensis	2	UNE	see above
Kerivoula papuensis	3	LNE	
Kerivoula papuensis	4	LNE	Manning has much dry and semi-dry rainforest in lower and upper reaches, so needn't be further divided
Kerivoula papuensis	5	LNE	Separated by cleared land barrier >10km
Kerivoula papuensis	6	LNE	Large gap dry habitat. No records found even though potential habitat
Kerivoula papuensis	7	LNE	Large gap
Chalinolobus nigrogriseus	1	UNE	
Myotis adversus	1	UNE	
Myotis adversus	2	LNE	
Vespadelus troughtoni	1	UNE	Cliff dependent animal. Major gaps between areas of cliffs. Evidence very localised
Vespadelus troughtoni	2	UNE	Cliff dependent animal. Major gaps between areas of cliffs. Evidence very localised
Vespadelus troughtoni	3	UNE	Cliff dependent animal. Major gaps between areas of cliffs. Evidence very localised
Vespadelus troughtoni	4	UNE	Cliff dependent animal. Major gaps between areas of cliffs.

Species	SETA ID No.	Region	Reason
			Evidence very localised
Miniopterus australis	1	UNE	Movements, distribution of records etc suggests a separate population than that further south
Miniopterus australis	2	UNE	
Miniopterus australis	3	LNE	Suspect break in breeding location. Relates to location of maternity colonies, distance, location of records and predicted habitat.
Miniopterus australis	4	LNE	
Chalinolobus dwyeri	1	UNE	Large gap >30km with no cliffs available.
Chalinolobus dwyeri	2	UNE	Experts consider gaps too large
Chalinolobus dwyeri	3	UNE	Experts consider gaps too large
Chalinolobus dwyeri	4	UNE	Experts consider gaps too large
Chalinolobus dwyeri	5	LNE	Experts consider gaps too large
Chalinolobus dwyeri	6	LNE	Experts consider gaps too large
Chalinolobus dwyeri	7	LNE	Experts consider gaps too large
Chalinolobus dwyeri	8	LNE	50km gap to nearest modelled habitat
Vespadelus pumilus	1	UNE	1-2 substantially cleared with treed habitat unsuitable (dry)
Vespadelus pumilus	2	UNE	1-2-3 substantially cleared with section of unsuitable hab, predom tablelands complex
Vespadelus pumilus	3	UNE	2-3-4 statutary boundary
Vespadelus pumilus	4	LNE	4-5 predom cleared with section of dry forest
Vespadelus pumilus	5	LNE	5-6-7 as for 4-5.
Vespadelus pumilus	6	LNE	6-7 predominantly cleared
Vespadelus pumilus	7	LNE	6-7-8 Hunter valley. Mixture of cleared and dry
Vespadelus pumilus	8	LNE	
Rhinolophus megaphyllus	1	UNE	Likely to be diff taxa to north
Rhinolophus megaphyllus	2	UNE	
Rhinolophus megaphyllus	3	LNE	3/4 - McLeay Barrier
Rhinolophus megaphyllus	4	LNE	4/5- Buckets way
Rhinolophus megaphyllus	5	LNE	5/6-Hunter River barrier
Rhinolophus megaphyllus	6	LNE	
Nyctophilus bifax	1	UNE	Richmond River valley is cleared and dry
Nyctophilus bifax	2	UNE	
Falsistrellus tasmaniensis	1	UNE	Clarence valley poses large barrier.

Species	SETA ID No.	Region	Reason
Falsistrellus tasmaniensis	2	UNE	see above
Falsistrellus tasmaniensis	3	LNE	Large gap between upper LNE and Hunter
Falsistrellus tasmaniensis	4	LNE	Large gap, small pockets hab modelled in between probably false
Falsistrellus tasmaniensis	5	LNE	see above
Scotoeanax rueppellii	1	UNE	Wide gaps cleared and unsuitable habitat
Scotoeanax rueppellii	2	UNE	Wide gaps cleared and unsuitable habitat
Scotoeanax rueppellii	3	LNE	Wide gaps cleared and unsuitable habitat
Scotoeanax rueppellii	4	LNE	Wide gaps cleared and unsuitable habitat
Scotoeanax rueppellii	5	LNE	Wide gaps cleared and unsuitable habitat
Miniopterus schreibersii	1	UNE	
Miniopterus schreibersii	2	LNE	See comments. Bats south of Hunter migrate to Bungonia. North of Hunter bats need to meet entire target to north
Miniopterus schreibersii	3	LNE	
Scotorepens balstoni	1	UNE	2 isolated areas in which bat occurs - one SETA for each
Scotorepens balstoni	2	LNE	
Scotorepens greyii	1	UNE	
Mormopterus norfolkensis	1	UNE	Divided into upper and lower based on sizable gap in model prediction of habitat
Mormopterus norfolkensis	2	UNE	
Mormopterus norfolkensis	3	LNE	Big gap - debate as to whether should be subSETA in 4
Mormopterus norfolkensis	4	LNE	
Mormopterus norfolkensis	5	LNE	
Nyctinomus australis	1	UNE	No barriers within each region
Nyctinomus australis	2	LNE	
Scotorepens sp 1	1	UNE	Wide barrier of unsuitable habitat at Clarence R.
Scotorepens sp 1	2	UNE	Wide barrier of unsuitable habitat at Clarence R.
Scotorepens sp 1	3	LNE	Wide barrier of unsuitable habitat at Clarence R.

Diurnal Birds

Species	SETA ID No.	Region	Reason
Albert's Lyrebird	1	UNE	

Species	SETA ID No.	Region	Reason
Barred Cuckoo-shrike	1	UNE	partial SETA
Barred Cuckoo-shrike	2	LNE	partial SETA
Black-breasted Button-quail	1	UNE	Clarence river valley
Black-breasted Button-quail	2	UNE	partial SETA
Black-breasted Button-quail	3	LNE	3/4 - clearing and inappropriate habitat
Black-breasted Button-quail	4	LNE	3/4 - clearing and inappropriate habitat
Black-necked Stork	1	UNE	share target with 2 and 3
Black-necked Stork	2	LNE	share target with 1 and 3
Black-necked Stork	3	LNE	share target with 1 and 2
Black Bittern	1	UNE	clearing and a break in records
Black Bittern	2	UNE	partial SETA
Black Bittern	3	LNE	partial SETA
Black Bittern	4	LNE	Hunter Valley and clearing
Brush Bronzewing	1	UNE	1/2-3 -Clarence river- lack of habitat and clearing
Brush Bronzewing	2	UNE	2/3 - inappropriate habitat
Brush Bronzewing	3	UNE	3/4 - inappropriate habitat
Brush Bronzewing	4	UNE	3/4 - inappropriate habitat
Brush Bronzewing	5	LNE	5/7- inappropriate habitat, change in elevation
Brush Bronzewing	6	LNE	5/6 - change in elevation and clearing and inappropriate habitat
Brush Bronzewing	7	LNE	6/7 - change in elevation and clearing and inappropriate habitat
Brush Bronzewing	8	LNE	Hunter Valley
Chestnut-rumped Heathwren	1	UNE	
Chestnut-rumped Heathwren	2	LNE	
Double-eyed Fig-parrot	1	UNE	
Eastern Bristlebird	1	UNE	Totally isolated from Whian by inappropriate habitat
Eastern Bristlebird	2	UNE	Point location at Whian
Forest Kingfisher	1	UNE	a partial SETA and will get 50% of a target with SETA 2
Forest Kingfisher	2	LNE	a partial SETA and will get 50% of a target with SETA 1
Forest Raven	1	UNE	2/3 from 1 and 4 delineates a distinct new species
Forest Raven	2	UNE	2/3 from 1 and 4 delineates a distinct new species
Forest Raven	3	LNE	2/3 from 1 and 4 delineates a distinct new species
Forest Raven	4	LNE	2/3 from 1 and 4 delineates a distinct new species
Gang-gang Cockatoo	1	LNE	half a SETA

Species	SETA ID No.	Region	Reason
Glossy Black-Cockatoo	1	UNE	1/2 - Clarence river valley and associated clearing
Glossy Black-Cockatoo	2	UNE	1/2 - Clarence river valley and associated clearing
Glossy Black-Cockatoo	3	LNE	3/4 -clearing
Glossy Black-Cockatoo	4	LNE	3/4 -clearing
Glossy Black-Cockatoo	5	LNE	4/5 -Hunter Valley and associated clearing
Grey-crowned Babbler	1	UNE	unsui+D27table habitat and high elevation
Grey-crowned Babbler	2	UNE	no target
Grey-crowned Babbler	3	LNE	no target
Grey-crowned Babbler	4	LNE	unsuitable habitat and high elevation
Hooded Robin	1	UNE	
Hooded Robin	2	LNE	
Little Bronze-Cuckoo	1	UNE	this gets 95% of the target
Little Bronze-Cuckoo	2	LNE	this gets 5% of the target
Little Shrike-thrush	1	UNE	
Mangrove Honeyeater	1	UNE	partial SETA
Mangrove Honeyeater	2	LNE	partial SETA
Mangrove Honeyeater	3	LNE	exclude
Musk Lorikeet	1	UNE	share target with 2
Musk Lorikeet	2	LNE	share target with 1
Olive Whistler	1	UNE	geographically isolated
Olive Whistler	2	UNE	geographically isolated
Olive Whistler	3	LNE	geographically isolated
Olive Whistler	4	LNE	geographically isolated
Olive Whistler	5	LNE	geographically isolated
Osprey	1	UNE	partial SETA
Osprey	2	LNE	partial SETA
Pacific Baza	1	UNE	partial SETA
Pacific Baza	2	LNE	partial SETA
Pale-yellow Robin	1	UNE	1/2-3 - Clarence River valley
Pale-yellow Robin	2	UNE	2/3- Mann river gorge
Pale-yellow Robin	3	UNE	share with 4
Pale-yellow Robin	4	LNE	share with 3
Pale-yellow Robin	5	LNE	4/5-Macleay river
Pale-yellow Robin	6	LNE	5/6- cleared land
Painted Honeyeater	1	UNE	no value
Painted Honeyeater	2	LNE	2/4 -marginal habitat, occurs as a vagrant
Painted Honeyeater	3	LNE	3/4-5- marginal habitat, occurs as a vagrant

Species	SETA ID No.	Region	Reason
Painted Honeyeater	4	LNE	no value
Painted Honeyeater	5	LNE	no value
Paradise Riflebird	1	UNE	1/2- Clarence river valley and clearing and lack of habitat
Paradise Riflebird	2	UNE	2/3-Mann river gorge and inappropriate habitat
Paradise Riflebird	3	UNE	partial SETA
Paradise Riflebird	4	LNE	4/5- Macleay river and unsuitable habitat
Paradise Riflebird	5	LNE	5/6- Barnard River gorge and clearing
Paradise Riflebird	6	LNE	7/6-5-clearing and unsuitable habitat
Paradise Riflebird	7	LNE	7/6-5-clearing and unsuitable habitat
Red-tailed Black-Cockatoo	1	UNE	Only 1 SETA between the two regions
Red-tailed Black-Cockatoo	2	LNE	Only 1 SETA between the two regions
Red Goshawk	1	UNE	
Regent Honeyeater	1	UNE	
Regent Honeyeater	2	LNE	
Regent Honeyeater	3	LNE	
Rose-crowned Fruit-dove	1	UNE	partial SETA
Rose-crowned Fruit-dove	2	LNE	partial SETA
Rose-crowned Fruit-dove	3	LNE	exclude
Rufous Scrub-bird	1	UNE	1/2 - Clearing and zero modelled habitat and dry rainshadow areas
Rufous Scrub-bird	2	UNE	2/3-Inappropriate habitat
Rufous Scrub-bird	3	UNE	3/4- climatic isolate
Rufous Scrub-bird	4	UNE	3/4- climatic isolate
Rufous Scrub-bird	5	LNE	5/6-
Rufous Scrub-bird	6	LNE	6/8-climatic isolate
Rufous Scrub-bird	7	LNE	7/8 -climatic isolate
Rufous Scrub-bird	8	LNE	6/8-climatic isolate
Square-tailed Kite	1	UNE	partial SETA
Square-tailed Kite	2	LNE	partial SETA
Superb Fruit-dove	1	UNE	partial SETA
Superb Lyrebird (edwardsii?)	1	UNE	
Swift Parrot	1	UNE	share with 3 and 5
Swift Parrot	2	UNE	zero target
Swift Parrot	3	UNE	share with 1 and 5
Swift Parrot	4	LNE	zero target
Swift Parrot	5	LNE	share with 3 and 1

Species	SETA ID No.	Region	Reason
Turquoise Parrot	1	UNE	zero target
Turquoise Parrot	2	UNE	
Turquoise Parrot	3	LNE	zero target
Turquoise Parrot	4	LNE	
White-eared Monarch	1	UNE	
Wompoo Fruit-dove	1	UNE	
Wompoo Fruit-dove	2	LNE	
Wompoo Fruit-dove	3	LNE	Hunter Valley and associated clearing
Yellow-tufted Honeyeater	1	UNE	share with 2
Yellow-tufted Honeyeater	2	LNE	share with 1
Yellow-tufted Honeyeater	3	LNE	no target
Yellow-tufted Honeyeater	4	LNE	SETA 3 is barrier - unsuitable habitat

Frogs

Species	SETA ID No.	Region	Reason
Assa darlingtoni	1	UNE	Focus SETAs on known locations
Assa darlingtoni	2	UNE	Focus SETAs on known locations
Assa darlingtoni	3	UNE	Focus SETAs on known locations
Assa darlingtoni	4	UNE	Focus SETAs on known locations
Assa darlingtoni	5	UNE	Focus SETAs on known locations
Assa darlingtoni	6	UNE	Focus SETAs on known locations
Assa darlingtoni	7	UNE/ LNE	Focus SETAs on known locations
Assa darlingtoni	8	LNE	Focus SETAs on known locations
Assa darlingtoni	9	LNE	Focus SETAs on known locations
Crinia tinnula	1	UNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	2	UNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	3	UNE	Identified major rivers as breaks in populations and barriers to movement

Species	SETA ID No.	Region	Reason
Crinia tinnula	4	LNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	5	LNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	6	LNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	7	LNE	Identified major rivers as breaks in populations and barriers to movement
Crinia tinnula	8	LNE	Identified major rivers as breaks in populations and barriers to movement
Heleioporus australiacus	1	LNE	No major breaks in range
Litoria aurea	1	UNE	Focus SETAs on known locations
Litoria aurea	2	UNE	Focus SETAs on known locations
Litoria aurea	3	LNE	Focus SETAs on known locations
Litoria aurea	4	LNE	Focus SETAs on known locations
Litoria aurea	5	LNE	Focus SETAs on known locations
Litoria aurea	6	LNE	Focus SETAs on known locations
Litoria brevipalmata	1	UNE	Focus SETAs on known locations
Litoria brevipalmata	2	UNE	Focus SETAs on known locations
Litoria brevipalmata	3	UNE	Focus SETAs on known locations
Litoria brevipalmata	4	UNE	Focus SETAs on known locations
Litoria brevipalmata	5	LNE	Focus SETAs on known locations
Litoria brevipalmata	6	LNE	Focus SETAs on known locations
Litoria brevipalmata	7	LNE	Focus SETAs on known locations
Litoria freycineti	1	UNE	Major rivers form boundaries
Litoria freycineti	2	UNE	Major rivers form boundaries
Litoria freycineti	3	UNE	Major rivers form boundaries
Litoria freycineti	4	LNE	Major rivers form boundaries
Litoria freycineti	5	LNE	Major rivers form boundaries
Litoria freycineti	6	LNE	Major rivers form boundaries
Litoria freycineti	7	LNE	Major rivers form boundaries
Litoria freycineti	8	LNE	Major rivers form boundaries
Litoria jervisiensis	1	UNE	Major rivers form boundaries
Litoria jervisiensis	2	UNE	Major rivers form boundaries
Litoria jervisiensis	3	LNE	Major rivers form boundaries
Litoria jervisiensis	4	LNE	Major rivers form boundaries
Litoria jervisiensis	5	LNE	Major rivers form boundaries
Litoria jervisiensis	6	LNE	Major rivers form boundaries

Species	SETA ID No.	Region	Reason
Litoria jervisiensis	7	LNE	Major rivers form boundaries
Litoria littlejohni	1	LNE	
Litoria olongburensis	1	UNE	
Litoria olongburensis	2	UNE	
Litoria olongburensis	3	UNE	
Litoria piperata	2	LNE	Focus on known populations
Litoria piperata		UNE/ LNE	Focus on known populations
Litoria revelata	1	UNE/ LNE	
Litoria revelata	2	LNE	
Litoria revelata	3	LNE	
Litoria revelata	4	LNE	
Litoria subglandulosa	1	UNE	substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	2	UNE	substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	3	UNE	substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	4	UNE/ LNE	substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	5	UNE/ LNE	substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	6	LNE	probably separate species; substantial clearings and warmer, low elevation dry forest
Litoria subglandulosa	7	LNE	probably separate species; substantial clearings and warmer, low elevation dry forest
Mixophyes balbus	1	UNE	large, cleared areas of land considered barriers.
Mixophyes balbus	2	UNE	large, cleared areas of land considered barriers.
Mixophyes balbus	3	UNE	large, cleared areas of land considered barriers.
Mixophyes balbus	4	UNE/ LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	5	LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	6	LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	7	LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	8	LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	9	LNE	large, cleared areas of land considered barriers.
Mixophyes balbus	10	LNE	large, cleared areas of land considered barriers.
Mixophyes fleayi	1	UNE	
Mixophyes fleayi	2	UNE	
Mixophyes fleayi	3	UNE	
Mixophyes fleayi	4	UNE	

Species	SETA ID No.	Region	Reason
Mixophyes fleayi	5	UNE	
Mixophyes fleayi	6	UNE	
Mixophyes iteratus	1	UNE	
Mixophyes iteratus	2	UNE	
Mixophyes iteratus	3	UNE	
Mixophyes iteratus	4	UNE	
Mixophyes iteratus	5	UNE	
Mixophyes iteratus	6	UNE	
Mixophyes iteratus	7	UNE/ LNE	
Mixophyes iteratus	8	LNE	
Mixophyes iteratus	9	LNE	
Mixophyes iteratus	10	LNE	
Mixophyes iteratus	11	LNE	
Mixophyes iteratus	12	LNE	
Philoria kundagungan	1	UNE	Focus on known populations
Philoria kundagungan	2	UNE	Focus on known populations
Philoria kundagungan	3	UNE	Focus on known populations
Philoria kundagungan	4	UNE	Excluding southern modelled hab.
Philoria loveridgei	1	UNE	Unsuitable hab separates SETAs - much modelled hab is unsuitable.
Philoria loveridgei	2	UNE	Unsuitable hab separates SETAs - much modelled hab is unsuitable.
Philoria loveridgei	3	UNE	Unsuitable hab separates SETAs - much modelled hab is unsuitable.
Philoria loveridgei	4	UNE	Unsuitable hab separates SETAs - much modelled hab is unsuitable.
Philoria loveridgei	5	UNE	Unsuitable hab separates SETAs - much modelled hab is unsuitable.
Philoria sp 2 (pughi)	1	UNE	
Philoria sp 2 (pughi)	2	UNE	
Philoria sp 2 (pughi)	3	UNE	
Philoria sp 2 (pughi)	4	UNE	
Philoria sp 2 (pughi)	5	UNE	
Philoria sp 3 (richmondensis)	1	UNE	
Philoria sp 3 (richmondensis)	2	UNE	
Philoria sp 3 (richmondensis)	3	UNE	

Species	SETA ID No.	Region	Reason
Philoria sp 3 (richmondensis)	4	UNE	
Philoria sphagnicolus	1	UNE	
Philoria sphagnicolus	2	LNE	
Philoria sphagnicolus	3	LNE	
Philoria sphagnicolus	4	LNE	
Philoria sphagnicolus	5	LNE	
Philoria sphagnicolus	6	LNE	
Philoria sphagnicolus	7	LNE	
Philoria sphagnicolus	8	LNE	
Philoria sphagnicolus	9	LNE	
Philoria sphagnicolus	10	LNE	
Philoria sphagnicolus	11	LNE	
Pseudophryne bibronii	1	UNE	
Pseudophryne bibronii	2	UNE /LNE	
Pseudophryne bibronii	3	LNE	
Pseudophryne bibronii	4	LNE	
Pseudophryne bibronii	5	LNE	
Pseudophryne bibronii	6	LNE	
Pseudophryne bibronii	7	LNE	

Nocturnal Birds

Species	SETA ID No.	Region	Reason
Marbled Frogmouth	1	UNE	Whian Whian considered separate from other areas.
Marbled Frogmouth	2	UNE	Focus on known locations
Marbled Frogmouth	3	UNE	Focus on known locations
Marbled Frogmouth	4	UNE	Focus on known locations
Marbled Frogmouth	5	UNE	Focus on known locations
Bush Stone-curlew	1	UNE	
Bush Stone-curlew	1	LNE	
Powerful Owl	1	UNE	
Powerful Owl	2	LNE	
Sooty Owl	1	UNE	

Species	SETA ID No.	Region	Reason
Sooty Owl	2	LNE	
Sooty Owl	3	LNE	Substantial range gap between Sthn and Hunter. Different models used
Masked Owl	1	UNE	
Masked Owl	2	LNE	
Barking Owl	1	UNE	
Barking Owl	2	LNE	

Reptiles

Species	SETA ID No.	Region	Reason
Acanthophis antarcticus	1	UNE/ LNE	
Austrelaps ramsayi	1	UNE	Stretches of substantially cleared habitat and lower elevation
Austrelaps ramsayi	2	UNE	Stretches of substantially cleared habitat and lower elevation
Austrelaps ramsayi	3	UNE/ LNE	Stretches of substantially cleared habitat and lower elevation
Austrelaps ramsayi	4	LNE	Stretches of substantially cleared habitat and lower elevation
Austrelaps ramsayi	5	LNE	Stretches of substantially cleared habitat and lower elevation
Austrelaps ramsayi	6	LNE	Stretches of substantially cleared habitat and lower elevation
Cacophis harriettae	1	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	2	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	3	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	4	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	5	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	6	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	7	UNE	SETAs at clusters of known records around core habitat
Cacophis harriettae	8	UNE	SETAs at clusters of known records around core habitat
Cautula zia	1	UNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	2	UNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	3	UNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	4	UNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	5	UNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	6	UNE	Relictual species. Low elevation and dry or cleared areas a barrier

Species	SETA ID No.	Region	Reason
Cautula zia	7	LNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	8	LNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	9	LNE	Relictual species. Low elevation and dry or cleared areas a barrier
Cautula zia	10	LNE	Relictual species. Low elevation and dry or cleared areas a barrier
Coeranoscincus reticulatus	1	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	2	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	3	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	4	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	5	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	6	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	7	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	8	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	9	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	10	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	11	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	12	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	13	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	14	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Coeranoscincus reticulatus	15	UNE	Clearing, dry areas and unsuitable habitat used to define SETA boundaries
Ctenotus eurydice	1	UNE	Unsuitable habitat between SETAs (not granitic)
Ctenotus eurydice	2	UNE	Unsuitable habitat between SETAs (not granitic)
Ctenotus eurydice	3	UNE	Unsuitable habitat between SETAs (not granitic)
Ctenotus eurydice	4	UNE	Unsuitable habitat between SETAs (not granitic)
Drysdalia coronoides	1	UNE	Separated by unsuitable land (cleared and warm)
Drysdalia coronoides	2	UNE	Separated by unsuitable land (cleared and warm)

Species	SETA ID No.	Region	Reason
Drysdalia coronoides	3	UNE	Separated by unsuitable land (cleared and warm)
Drysdalia coronoides	4	LNE	Separated by unsuitable land (cleared and warm)
Drysdalia coronoides	5	LNE	Separated by unsuitable land (cleared and warm)
Drysdalia coronoides	6	LNE	Separated by unsuitable land (cleared and warm)
Elseya georgesi	1	LNE	Only lives in one catchment - Bellinger R
Elseya purvisi	1	LNE	Upper reaches of Manning only
Elseya sp2 (Gwydir & Namoi Rivers)	1	LNE	Only in Gwydir and Namoi rivers
Emydura sp (Bellingen River)	1	LNE	Only lives in one catchment - Bellinger R
Emydura sp1	1	UNE	Major catchment boundaries
Emydura sp1	2	UNE	Major catchment boundaries
Emydura sp1	3	UNE	Major catchment boundaries
Emydura sp1	4	UNE	Major catchment boundaries
Emydura sp1	5	UNE	Major catchment boundaries
Emydura sp1	6	LNE	Major catchment boundaries
Emydura sp1	7	LNE	Major catchment boundaries
Emydura sp1	8	LNE	Major catchment boundaries
Eulamprus kosciuskoi	1	UNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	2	UNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	3	UNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	4	LNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	5	LNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	6	LNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	7	LNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus kosciuskoi	8	LNE	SETA boundaries where areas of cleared land or unsuitable habitat
Eulamprus murrayi	1	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	2	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	3	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	4	UNE	Cleared area or major patches of unsuitable habitat are barriers

Species	SETA ID No.	Region	Reason
Eulamprus murrayi	5	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	6	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	7	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	8	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	9	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	10	UNE/ LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	11	UNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	12	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	13	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	14	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	15	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	16	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	17	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	18	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus murrayi	19	LNE	Cleared area or major patches of unsuitable habitat are barriers
Eulamprus tenuis	1	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	2	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	3	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	4	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	5	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	6	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	7	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	8	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	9	UNE/ LNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	10	UNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	11	LNE	Breaks where cleared or predominantly dry forest areas.

Species	SETA ID No.	Region	Reason
Eulamprus tenuis	12	LNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	13	LNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	14	LNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tenuis	15	LNE	Breaks where cleared or predominantly dry forest areas.
Eulamprus tryoni	1	UNE	
Eulamprus tryoni	2	UNE	
Hoplocephalus bitorquatus	1	UNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	2	UNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	3	UNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	4	UNE/ LNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	5	LNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	6	LNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bitorquatus	7	LNE	Extensive area of modelled non-habitat a barrier
Hoplocephalus bungaroides	1	LNE	
Hoplocephalus bungaroides	2	LNE	
Hoplocephalus stephensii	1	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	2	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	3	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	4	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	5	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	6	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	7	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	8	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	9	UNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus	10	LNE	Clearing or unsuitable habitat between SETAs

Species	SETA ID No.	Region	Reason
stephensii			
Hoplocephalus stephensii	11	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	12	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	13	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	14	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	15	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	16	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	17	LNE	Clearing or unsuitable habitat between SETAs
Hoplocephalus stephensii	18	LNE	Clearing or unsuitable habitat between SETAs
Hypsilurus spinipes	1	UNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	2	UNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	3	UNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	4	UNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	5	UNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	6	UNE/ LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	7	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	8	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	9	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	10	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	11	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	12	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	13	LNE	Clearing or substantial patch of dry forest
Hypsilurus spinipes	14	LNE	Clearing or substantial patch of dry forest
Lampropholis caligula	1	LNE	cleared vegetation and disjunctions in distribution
Lampropholis caligula	2	LNE	cleared vegetation and disjunctions in distribution
Lampropholis caligula	3	LNE	cleared vegetation and disjunctions in distribution
Lampropholis caligula	4	LNE	cleared vegetation and disjunctions in distribution
Lampropholis caligula	5	LNE	cleared vegetation and disjunctions in distribution
Lampropholis elongata	1	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	2	LNE	Very restricted distribution - SETAs allocated where breaks

Species	SETA ID No.	Region	Reason
			in modelled hab
Lampropholis elongata	3	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	4	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	5	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	6	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	7	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	8	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	9	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	10	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Lampropholis elongata	11	LNE	Very restricted distribution - SETAs allocated where breaks in modelled hab
Ophioscincus truncatus	1	UNE	Cleared land barriers
Ophioscincus truncatus	2	UNE	Cleared land barriers
Ophioscincus truncatus	3	UNE	Cleared land barriers
Ophioscincus truncatus	4	UNE	Cleared land barriers
Ophioscincus truncatus	5	UNE	Cleared land barriers
Ophioscincus truncatus	6	UNE/ LNE	Cleared land barriers
Ophioscincus truncatus	7	UNE	Cleared land barriers
Ophioscincus truncatus	8	LNE	Cleared land barriers
Ophioscincus truncatus	9	LNE	Cleared land barriers
Saltuarius swaini	1	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	2	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	3	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	4	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	5	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	6	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	7	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	8	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	9	UNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	10	UNE/ LNE	major habitat breaks (dry forest or clearing)

Species	SETA ID No.	Region	Reason
Saltuarius swaini	11	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	12	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	13	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	14	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	15	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	16	LNE	major habitat breaks (dry forest or clearing)
Saltuarius swaini	17	LNE	major habitat breaks (dry forest or clearing)
Saltuarius wyberba	1	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	2	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	3	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	4	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	5	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	6	UNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	7	LNE	Cleared areas or breaks in granite substrate
Saltuarius wyberba	8	LNE	Cleared areas or breaks in granite substrate
Saproscincus challengeri	1	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	2	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	3	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	4	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	5	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	6	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	7	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	8	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	9	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	10	UNE	Cleared or dry forest a barrier
Saproscincus challengeri	11	UNE	Cleared or dry forest a barrier
Saproscincus galli	1	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	2	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	3	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	4	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	5	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	6	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	7	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	8	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	9	UNE	Large rivers and cleared areas a barrier
Saproscincus galli	10	UNE/ LNE	Large rivers and cleared areas a barrier

Species	SETA ID No.	Region	Reason
Saproscincus galli	11	LNE	Large rivers and cleared areas a barrier
Saproscincus galli	12	LNE	Large rivers and cleared areas a barrier
Saproscincus galli	13	LNE	Large rivers and cleared areas a barrier
Saproscincus galli	14	LNE	Large rivers and cleared areas a barrier
Saproscincus galli	15	LNE	Large rivers and cleared areas a barrier
Saproscincus galli	16	LNE	Large rivers and cleared areas a barrier
Saproscincus oriarus "North Coast sp"	1	UNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	2	UNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	3	UNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	4	LNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	5	LNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	6	LNE	Major rivers were used to define SETA boundaries
Saproscincus oriarus "North Coast sp"	7	LNE	Major rivers were used to define SETA boundaries
Saproscincus rosei	1	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	2	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	3	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	4	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	5	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	6	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	7	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	8	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	9	UNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	10	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	11	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	12	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries

Species	SETA ID No.	Region	Reason
Saproscincus rosei	13	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	14	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	15	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	16	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	17	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Saproscincus rosei	18	LNE	Lowland habitat, cleared areas and dry forest define SETA boundaries
Tropidechis carinatus	1	UNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	2	UNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	3	UNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	4	UNE/ LNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	5	LNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	6	LNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	7	LNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	8	LNE	Boundaries based on clearing and known disjunctions in distribution
Tropidechis carinatus	9	LNE	Boundaries based on clearing and known disjunctions in distribution
Tympanocryptis diemensis	1	LNE	Large area of cleared land between SETAs
Tympanocryptis diemensis	2	LNE	Large area of cleared land between SETAs
Underwoodisaurus sphyrurus	1	UNE	Major disjunctions of major blocks of HQ1 - predominantly cleared land
Underwoodisaurus sphyrurus	2	UNE	Major disjunctions of major blocks of HQ1 - predominantly cleared land
Underwoodisaurus sphyrurus	3	UNE LNE	Major disjunctions of major blocks of HQ1 - predominantly cleared land
Underwoodisaurus sphyrurus	4	LNE	Major disjunctions of major blocks of HQ1 - predominantly cleared land
Varanus rosenbergi	1	LNE	

Terrestrial Mammal

Species	SETA ID No.	Region	Reason
Black-striped Wallaby	1	UNE	
Broad-toothed Rat	1	LNE	
Brush-tailed Phascogale	1	UNE	1/2 Clarence River and associated clearing
Brush-tailed Phascogale	2	UNE	1/2 Clarence River and associated clearing
Brush-tailed Phascogale	3	UNE	3 and 1/2 due to the rate of clearing occuring on private land
Brush-tailed Phascogale	4	LNE	coastal clearing and urbanisation and majoe estuaries
Brush-tailed Phascogale	5	LNE	coastal clearing and urbanisation and majoe estuaries
Brush-tailed Phascogale	6	LNE	coastal clearing and urbanisation and majoe estuaries
Brush-tailed Phascogale	7	LNE	coastal clearing and urbanisation and majoe estuaries
Brush-tailed Phascogale	8	LNE	coastal clearing and urbanisation and majoe estuaries
Brush-tailed Rock-wallaby	1	UNE	1/2 - breaks in contiguous cliffline habitat, supported by records and model
Brush-tailed Rock-wallaby	2	UNE	1/2 - breaks in contiguous cliffline habitat, supported by records and model
Brush-tailed Rock-wallaby	3	LNE	1/2 - breaks in contiguous cliffline habitat, supported by records and model
Brush-tailed Rock-wallaby	4	LNE	1/2 - breaks in contiguous cliffline habitat, supported by records and model
Brush-tailed Rock-wallaby	5	LNE	1/2 - breaks in contiguous cliffline habitat, supported by records and model
Common Planigale	1	UNE	1/2 -Richmond Valley due to clearing for agriculture
Common Planigale	2	UNE	2/3 - Clarence Valley due to clearing for agriculture
Common Planigale	3	UNE	2/3 - Clarence Valley due to clearing for agriculture
Common Planigale	4	LNE	4/5 - river valleys and clearing, intensive land use, poor disperser
Common Planigale	5	LNE	5/6 - river valleys, clearing, intensive land use, short dispersal distances
Common Planigale	6	LNE	5/6 - river valleys, clearing, intensive land use, short dispersal distances
Common Wombat	1	UNE	
Common Wombat	2	LNE	the 2/3 barrier is due to habitat clearing and unsuitable habitat
Common Wombat	3	LNE	the 2/3 barrier is due to habitat clearing and unsuitable habitat
Common Wombat	4	LNE	The hunter Valley and associated clearing
Dingo	1	UNE	
Dingo	2	LNE	
Dingo	3	LNE	Hunter river and associated clearing and horticulture
Dusky Antechinus	1	UNE	Isolated by unsuiatble habitat
Dusky Antechinus	2	UNE	exclude from consideration
Dusky Antechinus	3	UNE	Isolated by unsuiatble habitat

Species	SETA ID No.	Region	Reason
Dusky Antechinus	4	UNE	a partial SETA linking with 5 in LNE
Dusky Antechinus	5	LNE	a partial SETA linking with 4 in UNE
Dusky Antechinus	6	LNE	5/6 - Macleay river and associated clearing
Dusky Antechinus	7	LNE	6 and 7/8 -Manning and associated clearing
Dusky Antechinus	8	LNE	7/8 Clearing on freehold land
Dusky Antechinus	9	LNE	Hunter valley and associated clearing
Eastern Chestnut Mouse	1	UNE	1/2 - Clarence River Valley -clearing and unsuitable habitat
Eastern Chestnut Mouse	2	UNE	1/2 - Clarence River Valley -clearing and unsuitable habitat
Eastern Chestnut Mouse	3	LNE	3/4 - Macleay River and clearing
Eastern Chestnut Mouse	4	LNE	3/4 - Macleay River and clearing
Eastern Chestnut Mouse	5	LNE	4/5 -Hastings river and clearing
Eastern Chestnut Mouse	6	LNE	5/6 - Manning River and clearing
Eastern Chestnut Mouse	7	LNE	6/7 Hunter river and clearing
Grassland Melomys	1	UNE	1/2 Brunswick estuary and urban development
Grassland Melomys	2	UNE	2/3 Richmond estuary and urban development
Grassland Melomys	3	UNE	4/3 Clarence and urban development
Grassland Melomys	4	UNE	4/3 Clarence and urban development
Hastings River Mouse	1	UNE	1+ 2/3- gorges, river valleys with unsuitable climate and landuse + clearing
Hastings River Mouse	2	UNE	1+ 2/3- gorges, river valleys with unsuitable climate and landuse + clearing
Hastings River Mouse	3	UNE	1+ 2/3- gorges, river valleys with unsuitable climate and landuse + clearing
Hastings River Mouse	4	UNE	1+ 2/3- gorges, river valleys with unsuitable climate and landuse + clearing
Hastings River Mouse	5	UNE	Genetically isolated from 3 and 1 and 8. Unsuitable habitat + landuse
Hastings River Mouse	6	UNE	Matrix around others. Separated by deep dry gorges etc
Hastings River Mouse	7	LNE	Matrix around others. Separated by deep dry gorges etc
Hastings River Mouse	8	LNE	Deep gorges of unsuitable habitat, clearing and inappropriate landuse
Hastings River Mouse	9	LNE	Clearing and inappropriate land-use and areas of unsuiatable habitat
Hastings River Mouse	10	LNE	Clearing, inappropriate land-use + areas of unsuiatable habitat. Dry gorges
Long-nosed Potoroo	1	UNE	1nd 2/3 - Clarence valley and inappropriate habitat and intensive landuse
Long-nosed Potoroo	2	UNE	2/3 -gorge and inapproporiate habitat
Long-nosed Potoroo	3	UNE	
Long-nosed Potoroo	4	LNE	4/5 - Clearing and inappropriate habitat

Species	SETA ID No.	Region	Reason
Long-nosed Potoroo	5	LNE	5/6 -gorge inappropriate habita and clearing
Long-nosed Potoroo	6	LNE	Hunter river and intensive landuse
Long-nosed Potoroo	7	LNE	
New Holland Mouse	1	UNE	Clarence River valley, unsuiatble substrate and soils
New Holland Mouse	2	UNE	2/3 -Isolated by clearing and unsuitable substrate and soils
New Holland Mouse	3	UNE	1/3 -Clarence River valley, unsuiatble substrate and soils
New Holland Mouse	4	LNE	4/5 -Clearing and inappropriate habitat
New Holland Mouse	5	LNE	5/6- Hunter and clearing
New Holland Mouse	6	LNE	5/6- Hunter and clearing
Pale Field-rat	1	UNE	1 -2/3 -Clarence River, intensive landuse, clearing + poor soils fro burrowing
Pale Field-rat	2	UNE	2/3 -Inappropriate habitat and clearing
Pale Field-rat	3	UNE	2/3 -Inappropriate habitat and clearing
Parma Wallaby	1	UNE	Clarence River valley, clearing and unsuitable habitat
Parma Wallaby	2	UNE	Clarence River valley, clearing and unsuitable habitat
Parma Wallaby	3	LNE	Macleay River, clearing and unsuitable habitat
Parma Wallaby	4	LNE	4 and 5/6 - Manning river, clearing and unsuitable habitat
Parma Wallaby	5	LNE	4 and 5/6 - Manning river, clearing and unsuitable habitat
Parma Wallaby	6	LNE	4 and 5/6 - Manning river, clearing and unsuitable habitat
Parma Wallaby	7	LNE	5/6 and 7 - Hunter Valley, clearing and unsuitable habitat
Red-legged Pademelon	1	UNE	Clarence River valley, clearing and unsuitable habitat
Red-legged Pademelon	2	UNE	Mann River and unsuitable habitat
Red-legged Pademelon	3	UNE	See parma wallaby
Red-legged Pademelon	4	LNE	See parma wallaby
Red-legged Pademelon	5	LNE	See parma wallaby
Red-legged Pademelon	6	LNE	See parma wallaby
Red-legged Pademelon	7	LNE	See parma wallaby
Red-legged Pademelon	8	LNE	See parma wallaby
Rufous Bettong	1	UNE	The Clarence river and associated clearing
Rufous Bettong	2	UNE	The Clarence river and associated clearing
Rufous Bettong	3	LNE	3/4 -Discontinuity of records indicates a major range gap for the species
Rufous Bettong	4	LNE	3/4 -Discontinuity of records indicates a major range gap for the species
Rufous Bettong	5	LNE	Hunter valley is an apparent range gap.
Tiger Quoll	1	UNE	1/2 - The Clarence river valley and associated clearing
Tiger Quoll	2	UNE	1/2 - The Clarence river valley and associated clearing
Tiger Quoll	3	LNE	3/4 -The Hunter river and associated clearing.

Species	SETA ID No.	Region	Reason
Tiger Quoll	4	LNE	3/4 -Hunter river and associated clearing.
Whiptail Wallaby	1	UNE	
Whiptail Wallaby	2	LNE	Will be allocated 0.25 of a target

APPENDIX 10

APPENDIX 10.1 PRIORITY FLORA TAXA IN NORTHEAST NSW

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Acacia acrionastes	UNE	C-1	R-1	100%	Not listed	TSC - E		3RC-
Acacia adunca	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Acacia bakeri	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Acacia brunioides subsp. brunioides	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Acacia brunioides subsp. granitica	UNE	C-2	R-3	60%	Not listed	Not listed		3RC
Acacia bulgaensis	LNE	C-2	R-4	20%	Not listed	Not listed		2RC-
Acacia bynoeana	LNE	C-1	R-2	100%	ESP - V	TSC - V		3VC-
Acacia cangaiensis	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Acacia chrysotricha	LNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E	2R
Acacia courtii	LNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2V
Acacia dangarensis	LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	2RC-t
Acacia eborensis ms.	LNE	C-2	R-3	60%	Not listed	Not listed		2KCi
Acacia farnesiana	LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Acacia flocktoniae	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VC-
Acacia floydii	UNE	C-2	R-4	20%	Not listed	Not listed		2RC-
Acacia fulva	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RC-
Acacia ingramii	LNE	C-2	R-4	20%	Not listed	Not listed		2RCa
Acacia jonesii	LNE	C-2	R-1	100%	Not listed	Not listed		3RCa
Acacia juncifolia subsp. serpentinicola	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Acacia latisepala	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Acacia leucoclada subsp. argentifolia	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Acacia linearifolia	LNE	C-1	R-4	60%	ESP - X	Not listed		Not listed
Acacia macnuttiana	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2VCi
Acacia matthewii	LNE	C-2	R-4	20%	Not listed	Not listed		3RC-
Acacia orites - Demon NR metapopulation unit	UNE	C-2	R-5	10%	Not listed	Not listed		2RC-
Acacia orites - Northeast metapopulation unit	UNE	C-2	R-5	Areal Target	Not listed	Not listed		Not listed
Acacia podalyriifolia	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Acacia pubescens	LNE	C-1	R-1	100%	ESP - V	TSC - V		2VCa
Acacia pubifolia	UNE	C-1	R-1	100%	ESP - V	TSC - E		2VC-
Acacia pycnostachya	UNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	2V
Acacia ruppii	UNE	C-1	R-3	Areal Target	ESP - V	TSC - E	TSC - V	2E

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Acacia williamsiana J. T. Hunter ms.	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Acalypha eremorum	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Acianthus amplexicaulis	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Acianthus apprimus	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		2R
Acianthus exiguus	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Acomis acoma	UNE/LNE	C-1	R-3	Areal Target	Not listed	Not listed	TSC - V	3RC-
Acronychia baeuerlenii	UNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Acronychia littoralis	UNE/LNE	C-1	R-1	100%	ESP - E	TSC - E		3ECi
Adenochilus nortonii	LNE	C-2	R-2	80%	Not listed	Not listed		Formerly 3RC-
Adenostemma lavenia	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Aldrovanda vesiculosa	UNE/LNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Alectryon diversifolius	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Alexfloydia repens	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	2K
Allocasuarina defungens	UNE/LNE	C-1	R-3	Areal Target	ESP - E	TSC - E	TSC - V	2E
Allocasuarina ophiolitica	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	2K
Allocasuarina rupicola	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Allocasuarina simulans	LNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	2VCa
Alloxylon pinnatum - Northern metapopulation unit	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E?	3RCa
Alloxylon pinnatum - Southern metapopulation unit	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RCa
Almaleea cambagei	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2V
Almaleea paludosa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Amorphospermum antilogum	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Amorphospermum whitei - Northern Metapopulation Unit	UNE	C-2	R-1	Areal Target	ESP - V	TSC - V		3RCa
Amorphospermum whitei - Southern Metapopulation Unit	UNE/LNE	C-2	R-3	60%	ESP - V	TSC - V	Delist	3RCa
Amphibromus pithogastrus	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3K
Amphibromus sinuatus	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Amyema conspicuum	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Amyema gaudichaudii	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V or E?	Not listed
Amyema scandens	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Angiopteris evecta	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Angophora exul	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2R-
Angophora inopina	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2R
Angophora robur	UNE	C-2	R-3	Areal Target	ESP - V	TSC - V	Delist	2RC-
Apatophyllum constablei	LNE	C-1	R-1	100%	ESP - E	TSC - E		2EC-
Aponogeton elongatus	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Archidendron muellerianum	UNE	C-2	R-2	80%	Not listed	Not listed		3RCa

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Ardisia bakeri	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V	2RC-
Argophyllum nullumense	UNE	C-2	R-3	60%	Not listed	Not listed		3RCa
Aristolochia deltantha var. laheyana	UNE	C-2	R-2	80%	Not listed	Not listed		2RC-+
Aristolochia praevenosa	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Artanema fimbriatum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Arthraxon hispidus	UNE	C-1	R-1	100%	ESP - E	TSC - V	TSC - E	3VC-+
Arthropteris palisotii	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Asperula asthenes	LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3VC-
Asperula charophyton	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V or E?	3RCa
Asplenium aethiopicum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Asplenium harmanii	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Asplenium trichomanes subsp. quadrivalens	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Asterolasia elegans	LNE	C-1	R-2	100%	Not listed	TSC - E		2ECa
Astrotricha cordata	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - E?	Not listed
Astrotricha sp. nov. (Mt Boss)	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Atriplex semibaccata	UNE/LNE	C-2	R-5	10%	Not listed	Not listed		Not listed
Austromyrtus fragrantissima	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		3EC-
Austromyrtus sp. B	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Babingtonia odontocalyx	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Babingtonia prominens	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Babingtonia silvestris	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Backhousia anisata	UNE/LNE	C-2	R-1	Areal Target	Not listed	Not listed		2RCa
Baeckea sp. Pyramids (Babingtonia granitica??)	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	Not listed
Baloghia marmorata	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Belvisia mucronata	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Bertya brownii	LNE	C-2	R-4	20%	Not listed	Not listed		2RC-
Bertya ingramii	LNE	C-1	R-1	100%	ESP - V	TSC - E		2VCit
Bertya rosmarinifolia	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Bertya sp. A Cobar-Coolabah	UNE	C-1	R-2	100%	Not listed	TSC - V		2V
Blechnum ambiguum	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Blechnum fluviatile	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Blumea lacera	UNE	C-1	R-1	100%	Not listed	TSC - X		Not listed
Blumea mollis	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Boronia chartacea	UNE/LNE	C-2	R-3	Areal Target	Not listed	Not listed		3R
Boronia fraseri	LNE	C-2	R-4	20%	Not listed	Not listed		2RCa
Boronia granitica	UNE/LNE	C-1	R-2	Areal Target	ESP - E	TSC - E	TSC - V	3VC-
Boronia repanda	UNE	C-1	R-1	100%	ESP - E	TSC - E		2E
Boronia rubiginosa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Boronia serrulata	LNE	C-2	R-4	20%	Not listed	Not listed		2RC-

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Boronia sp. aff. bipinnata Torrington	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Boronia sp. aff. Bolivia Hill	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Boronia sp. aff. microphylla Torrington	UNE	C-2	R-3	60%	Not listed	Not listed	TSC - V?	Not listed
Boronia umbellata	UNE	C-1	R-3	Areal Target	Not listed	TSC - V		2VC-
Bosistoa floydii	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		2RCi
Bosistoa selwynii	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VCi
Bosistoa transversa	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Bossiaea rupicola	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Bothriochloa biloba	UNE/LNE	C-1	R-2	100%	ESP - V	TSC - V		3V
Brachycome ascendens	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RC-
Brachycome dissectifolia	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Brachycome heterodonta var. A	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Brachycome radicans	UNE/LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Brasenia schreberi	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RC-+
Brunoniella spiciflora	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Buchnera gracilis	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V or E?	Not listed
Bulbine vagans	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Bulbophyllum argyropus	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	3RCi+
Bulbophyllum globuliforme	UNE	C-1	R-1	100%	ESP - V	TSC - V		3VC-
Bulbophyllum lamingtonense (B. caldericola)	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Bulbophyllum weinthalii	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	3RCi
Bulbostylis pyriformis	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Cadellia pentastylis	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3RCa
Caesalpinia bonduc	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Caesia alpina	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Caesia parviflora var. minor	UNE/LNE	C-1	R-3	80%	Not listed	TSC - E		Not listed
Caladenia arenaria - Bald Rock - prob. C. atroclavia	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Caladenia filamentosa var. filamentosa	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Caladenia quadrifaria	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Caladenia tesselata	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Caladenia testacea	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Callistemon acuminatus	UNE/LNE	C-2	R-3	Areal Target	Not listed	Not listed		3RC-
Callistemon flavovirens	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Callistemon shiressii	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Callitris baileyi	UNE	C-1	R-1	100%	Not listed	TSC - E		3RC-
Callitris monticola	UNE	C-2	R-2	80%	Not listed	Not listed		3RC-

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Callitris oblonga	UNE/LNE	C-1	R-2	Areal Target	ESP - V	TSC - V		3VCa
Calocephalus citreus	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V or E?	Not listed
Calophanoides hygrophiloides	UNE	C-1	R-3	Areal Target	Not listed	TSC - E	TSC - V	Not listed
Cardamine gunnii	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Cardamine lilacina	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Carex bichenoviana	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Carex capillacea	LNE	C-2	R-1	100%	Not listed	Not listed		3RC-+
Carex chlorantha	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Carex echinata	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Carex lophocarpa	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Carex tereticaulis	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Cassia brewsteri var. marksiana	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2RCi
Cassinia aureonitens	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Cassinia sp. D	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Cassytha racemosa var. muelleri	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Cenchrus sp. A	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Centranthera cochinchinensis	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Chamaesyce macgillivrayi	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Chenopodium erosum	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Chiloglottis anaticeps	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2KC-
Chiloglottis palachila	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Chiloglottis platyptera	UNE/LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	2KC-
Chiloglottis sp. aff. formicifera (Bald Rock)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Chiloglottis sp. aff. sphyrnoides (Barrington Tops)	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Chiloglottis sphyrnoides	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3KC-
Chionogentias barringtonensis	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Choricarpia subargentea	UNE	C-1	R-1	100%	ESP - V	TSC - E		3RC-
Christella hispidula	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Chrysopogon fallax	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Chrysopogon sylvaticus	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Cladium procerum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Clematis fawcettii	UNE	C-1	R-3	Areal Target	ESP - V	TSC - V		3VC-
Cleome viscosa	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Conospermum burgessiorum	UNE	C-2	R-3	60%	Not listed	Not listed		3RCa
Conospermum ellipticum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Coprosma nitida	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Corchorus cunninghamii	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		3E

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Cordyline congesta	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Corokia whiteana - Coastal Sands metapopulation unit	UNE	C-1	R-1	100%	ESP - V	TSC - V		2VCi
Corokia whiteana - Metasediments metapopulation unit	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V		2VCi
Corokia whiteana - Rhyolite metapopulation unit	UNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2VCi
Correa lawrenciana var. macrocalyx	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Corybas fordhamii	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Corybas sp. aff. dilatatus (Barrington Tops)	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Corybas undulatus	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	3KC-
Corynocarpus rupestris subsp. arborescens	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	3RC-
Corynocarpus rupestris subsp. rupestris	UNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	2VC-t
Crepidomanes walleri	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Crotalaria medicaginea	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Cryptandra buxifolia	LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Cryptandra lanosiflora	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RCa
Cryptandra propinqua	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Cryptocarya dorrigoensis	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Cryptocarya floydii	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RCi
Cryptocarya foetida	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V		3VCi
Cryptocarya williwilliana	LNE	C-2	R-3	60%	Not listed	Not listed		2RCi
Cryptostylis hunteriana	UNE/LNE	C-1	R-1	100%	ESP - V	TSC - V		3VC-
Cupaniopsis newmanii	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Cupaniopsis serrata	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Cyathea cunninghamii	UNE/LNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Cymbidium canaliculatum	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Cynanchum elegans	UNE/LNE	C-1	R-2	Areal Target	ESP - E	TSC - E		3ECi
Cyperus aquatilis	UNE	C-1	R-2	100%	Not listed	TSC - E		Not listed
Cyperus dietrichiae var. brevibracteatus	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Cyperus nutans subsp. eleusinoides	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Cyperus odoratus	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Cyperus platystylis	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Cyperus rupicola	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Cyperus scaber	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Cyperus sculptus	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Cyperus subulatus	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Cyperus vaginatus	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed

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Cyphanthera albicans subsp. albicans	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Dactyloctenium radulans	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Damasonium minus	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Dampiera lanceolata	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Danthonia carphoides	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Daphnandra tenuipes	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Darwinia biflora	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VCa
Darwinia glaucophylla	LNE	C-2	R-3	60%	Not listed	Not listed		2RCi
Darwinia peduncularis	LNE	C-2	R-3	60%	Not listed	Not listed		3RCi
Darwinia procera	LNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Davidsonia pruriens var. jerseyana	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2ECi
Davidsonia sp. A	UNE	C-1	R-1	100%	ESP - E	TSC - E		2ECi
Dendrobium dolichophyllum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Dendrobium melaleucaphilum	UNE/LNE	C-1	R-3	80%	Not listed	Not listed		Not listed
Dendrocnide moroides	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Denhamia moorei	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Denhamia pittosporoides subsp. pittosporoides	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Derwentia arenaria	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Desmodium acanthocladum	UNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2VC-
Desmodium gangeticum	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Desmodium heterocarpon var. heterocarpon	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Deyeuxia carinata	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Dichanthium setosum	UNE/LNE	C-1	R-2	100%	ESP - V	TSC - V		3VC-
Dichanthium tenue	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Dichrocephala integrifolia	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Digitaria divaricatissima	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Digitaria leucostachya	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Dillwynia sp. A	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-t
Dillwynia tenuifolia	LNE	C-1	R-1	100%	Not listed	Not listed		2RCa
Diospyros mabacea	UNE	C-1	R-1	100%	ESP - E	TSC - E		2ECi
Diospyros major var. ebenus	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Diploglottis campbellii	UNE	C-1	R-1	100%	ESP - E	TSC - E		2E
Dipodium atropurpureum	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Dipodium pulchellum	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Discaria pubescens	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RCa

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Diuris dendrobioides	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Diuris disposita	LNE	C-1	R-1	100%	Not listed	TSC - E		2K
Diuris flavescens	LNE	C-1	R-1	100%	Not listed	TSC - E		2K
Diuris pedunculata	UNE/LNE	C-1	R-1	100%	Not listed	TSC - E		2E
Diuris praecox	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VC-
Diuris secundiflora ?=D. tricolor	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Diuris sp. aff. ochroma (New England)	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Diuris venosa	LNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2VC-
Dodonaea lanceolata var. subsessilifolia	LNE	C-1	R-4	60%	Not listed	Not listed		Not listed
Dodonaea rhombifolia	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		3RCa
Dodonaea serratifolia	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		2RC-
Dodonaea sinuolata subsp. sinuolata	LNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Dodonaea stenophylla	UNE	C-1	R-1	100%	Not listed	TSC - X	TSC - E	Not listed
Doodia maxima	UNE	C-2	R-5	10%	Not listed	Not listed		Not listed
Doryanthes excelsa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Doryanthes palmeri	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Drynaria rigidula	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Dryopoa dives	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Elaeocarpus eumundi	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Elaeocarpus sp. Minyon	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Elaeocarpus williamsianus	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2ECi
Eleocharis dulcis	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Eleocharis tetraquetra	UNE	C-1	R-1	100%	Not listed	TSC - X	TSC - E	Not listed
Elyonurus citreus	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Endiandra floydii	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2E
Endiandra globosa	UNE	C-2	R-4	20%	Not listed	Not listed		2RC-
Endiandra hayesii	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V		3VC-
Endiandra introrsa	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RCa
Endiandra muelleri subsp. bracteata	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Epacris coriacea	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Epacris muelleri	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Epacris petrophila	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Epacris purpurascens var. purpurascens	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V or E?	2KC-
Epipogeum roseum	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Eremophila deserti	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Eriostemon difformis subsp. smithianus	LNE	C-2	R-1	Areal Target	Not listed	Not listed	TSC - V	Not listed
Eriostemon ericifolius	LNE	C-1	R-2	100%	ESP - V	TSC - V		3RC-
Eriostemon myoporoides subsp. conduplicatus	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Eriostemon obovalis	LNE	C-2	R-3	60%	Not listed	Not listed		3RCa

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Erythroxylum australe	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Eucalyptus aenea	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Eucalyptus ancophila	UNE/LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	2K
Eucalyptus approximans	LNE	C-1	R-2	100%	Not listed	TSC - E		2RC-
Eucalyptus bensonii	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-t
Eucalyptus bicostata	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Eucalyptus caleyi subsp. ovendenii	UNE	C-1	R-2	100%	Not listed	TSC - V		2V
Eucalyptus camfieldii	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VCi
Eucalyptus camphora subsp. relicta	UNE	C-1	R-2	Areal Target	Not listed	TSC - E		3VC-
Eucalyptus conjuncta	LNE	C-2	R-3	60%	Not listed	Not listed		2K
Eucalyptus dissita	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	2RC-
Eucalyptus dunnii	UNE	C-2	R-3	60%	Not listed	Not listed		3RCa
Eucalyptus elliptica	UNE/LNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E or V?	3KC-
Eucalyptus fergusonii subsp. dorsiventralis	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Eucalyptus fergusonii subsp. fergusonii	LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	3KC-
Eucalyptus fracta	LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V	2R
Eucalyptus glaucina - Northern metapopulation unit	UNE	C-1	R-3	Areal Target	ESP - V	TSC - V		3VCa
Eucalyptus glaucina - Southern metapopulation unit	LNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VCa
Eucalyptus hypostomatica	LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Eucalyptus largeana	LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	3R
Eucalyptus luehmanniana	LNE	C-2	R-4	20%	Not listed	Not listed		2RCa
Eucalyptus magnificata	UNE/LNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E	3K
Eucalyptus malacoxylon	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3R
Eucalyptus mckieana	UNE/LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	2V
Eucalyptus michaeliana	LNE	C-2	R-4	20%	Not listed	Not listed		3RCa
Eucalyptus nicholii	UNE/LNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3V
Eucalyptus ophitica	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	2K
Eucalyptus oresbia ms	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Eucalyptus pachycalyx subsp. banyabba	UNE	C-1	R-1	100%	Not listed	TSC - E		2VCi
Eucalyptus paniculata subsp. matutina	LNE	C-1	R-3	80%	Not listed	Not listed	TSC - V?	2K
Eucalyptus parramattensis subsp. decadens	LNE	C-1	R-2	100%	ESP - V	TSC - V		2V
Eucalyptus psammitica	UNE	C-2	R-3	60%	Not listed	Not listed		3K
Eucalyptus pumila	LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	2VCi
Eucalyptus rubida subsp. barbigerorum	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3V
Eucalyptus rudderi	LNE	C-2	R-1	Areal Target	Not listed	Not listed	TSC - V?	3RC-
Eucalyptus rummeryi	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Eucalyptus scias subsp. apoda	UNE	C-2	R-3	Areal Target	Not listed	Not listed		3K
Eucalyptus scoparia	UNE	C-1	R-1	100%	ESP - V	Not listed	TSC - V	Not listed
Eucalyptus scopulorum	UNE	C-2	R-2	80%	Not listed	Not listed		2R
Eucalyptus serpentinicola	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	2R

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Eucalyptus sp. aff. cypellocarpa (Hillgrove)	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Eucalyptus sp. aff. cypellocarpa (Long Point)	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Eucalyptus subcaerulea	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Eucalyptus tessellaris	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Eucalyptus tetrapleura	UNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2VCa
Eucalyptus youmanii	UNE/LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2R
Euphorbia psammogeton	UNE	C-1	R-2	100%	Not listed	TSC - E		Not listed
Euphrasia arguta	LNE	C-1	R-1	100%	ESP - X	TSC - X		3X
Euphrasia bella	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	2VCit
Euphrasia ciliolata	LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	2KC-
Euphrasia collina subsp. muelleri	LNE	C-1	R-1	100%	ESP - E	TSC - E		2EC-
Euphrasia collina subsp. paludosa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Euphrasia orthocheila subsp. peraspera	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3RC-
Euphrasia ramulosa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Euphrasia ruptura (E. sp. Tamworth)	LNE	C-1	R-1	100%	ESP - X	TSC - X		Not listed
Evolvulus alsinoides	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Exocarpos latifolius	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Festuca muelleri	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Fimbristylis bisumbellata	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Fimbristylis polytrichoides	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Floydia praealta	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Fontainea australis	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VCi
Fontainea oraria	UNE	C-1	R-1	100%	ESP - E	TSC - E		2E
Freycinetia excelsa	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Galium curvihirtum	LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Gaultheria viridicarpa subsp. merinoensis	UNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	2VCit
Gaultheria viridicarpa subsp. viridicarpa	LNE	C-1	R-2	100%	Not listed	TSC - V		2VCit
Geijera paniculata	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Genoplesium acuminatum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Genoplesium baueri	LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Genoplesium sp. aff. sigmoideum (Gib. Range)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Gentiana wissmannii	UNE/LNE	C-1	R-1	Areal Target	Not listed	TSC - V	TSC - E	2VC-
Geodorum densiflorum	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Gingidia harveyana	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Gingidia montana	LNE	C-1	R-1	100%	Not listed	TSC - E		2VCit+
Glossostigma diandrum	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Glossostigma elatinoides	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Glyceria latispicea	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed

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Gompholobium foliolosum	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Gompholobium sp. B	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Gonocarpus longifolius	LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Gonocormus saxifragoides	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Goodenia macbarronii	UNE/LNE	C-1	R-1	100%	ESP - V	TSC - V		3VC-
Grammitis stenophylla	UNE	C-2	R-2	80%	Not listed	TSC - E	Delist	Not listed
Gratiola pubescens	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Grevillea acanthifolia subsp. stenomera	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Grevillea acerata	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-t
Grevillea banyabba	UNE	C-1	R-2	Areal Target	Not listed	TSC - V		2VC-
Grevillea beadleana	UNE	C-1	R-1	100%	ESP - E	TSC - E		3ECi
Grevillea evansiana	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VC-
Grevillea granulifera - Curricabark metapopulation unit	LNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - V	3KCA
Grevillea granulifera - Wollomombi metapopulation unit	LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	3KCA
Grevillea guthrieana - Booral metapopulation unit	LNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Grevillea guthrieana - Carrai metapopulation unit	LNE	C-1	R-3	Areal Target	Not listed	TSC - E	Delist	Not listed
Grevillea hilliana	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Grevillea johnsonii	LNE	C-2	R-4	20%	Not listed	Not listed		2RCi
Grevillea longifolia	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Grevillea masonii	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2E
Grevillea mollis	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2VCit
Grevillea montana	LNE	C-2	R-4	20%	Not listed	Not listed		2KC-
Grevillea obtusiflora subsp. fecunda	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2V
Grevillea obtusiflora subsp. obtusiflora	LNE	C-1	R-1	100%	Not listed	TSC - E		2E
Grevillea oldei	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Grevillea parviflora subsp. parviflora (previously Grevillea linearifolia form D)	LNE	C-1	R-2	100%	Not listed	TSC - V		Not listed
Grevillea quadricauda	UNE	C-1	R-2	Areal Target	Not listed	TSC - V		3VC-
Grevillea rhizomatosa	UNE	C-1	R-1	Areal Target	Not listed	TSC - V	TSC - E	2VC-t
Grevillea scortechinii subsp. sarmentosa	UNE	C-1	R-3	Areal Target	ESP - V	TSC - V		2VC-
Grevillea shiressii	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VCit
Grewia latifolia	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Gynura drymophila var. drymophila (and var. glabrifolia)	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Hakea fraseri	LNE	C-1	R-3	Areal Target	Not listed	TSC - V		2VC-
Hakea macrorrhyncha	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Hakea ochroptera	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		2K
Hakea sp. aff. trineura	LNE	C-1	R-2	Areal Target	ESP - V	TSC - V		Not listed
Haloragis exalata subsp. exalata	LNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	3VCa
Haloragis exalata subsp. velutina	LNE	C-1	R-3	80%	Not listed	TSC - V		3VC-
Haloragis serra	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Hedyotis galioides	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed

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Helichrysum boormanii	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Helichrysum sp.1 Mt Merino	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	2RC-
Helichrysum sp.2 Point Lookout	LNE	C-2	R-2	80%	Not listed	Not listed		2RC-
Hemisteptia lyrata	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3K
Hibbertia acuminata	UNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Hibbertia elata	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3RC-
Hibbertia hermanniifolia	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RCa
Hibbertia hexandra - Northern metapopulation unit	UNE	C-1	R-3	Areal Target	Not listed	TSC - E	TSC - V	3RC-
Hibbertia hexandra - Southern metapopulation unit	LNE	C-1	R-2	Areal Target	Not listed	TSC - E	TSC - V	3RC-
Hibbertia marginata	UNE	C-2	R-3	Areal Target	Not listed	TSC - V	Delist	Not listed
Hibbertia procumbens	LNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Hicksbeachia pinnatifolia - Northern metapopulation unit	UNE	C-1	R-2	Areal Target	ESP - V	TSC - V		3RC-
Hicksbeachia pinnatifolia - Southern metapopulation unit	LNE	C-1	R-1	Areal Target	ESP - V	TSC - V		3RC-
Homopholis proluta	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Homoranthus biflorus	UNE	C-2	R-2	80%	Not listed	Not listed		2RCat
Homoranthus cernuus	LNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Homoranthus croftianus ms. (JTH)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Homoranthus darwinioides	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	3VCa
Homoranthus floydii	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	2RC-t
Homoranthus lunatus	UNE	C-1	R-1	Areal Target	Not listed	TSC - V	TSC - E	2VCit
Homoranthus prolixus	UNE	C-2	R-2	80%	Not listed	TSC - V		Not listed
Hovea longipes	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Hydrocharis dubia	UNE	C-1	R-1	100%	ESP - V	Not listed	TSC - E	Not listed
Hygrophila angustifolia	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Hypoestes floribunda var. pubescens	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Hypolepis elegans	UNE	C-1	R-1	100%	Not listed	TSC - E		3KC-+
Hypserpa decumbens	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Indigofera baileyi	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3R
Indigofera linifolia	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Isoetes muelleri	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Isoetopsis graminifolia	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Isoglossa eranthemoides	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2E
Isolepis gaudichaudiana	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Isotropis foliosa	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	3KC-
Jacksonia sp. nov. Bald Knob / Little Plain (JBW)	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Kennedia retrorsa	LNE	C-2	R-2	80%	Not listed	Not listed		2VCa
Keraudrenia corollata var. denticulata	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Knoxia sumatrensis	UNE	C-1	R-1	100%	Not listed	TSC - X		Not listed
Korthalsella breviarticulata	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed

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Kunzea bracteolata	UNE	C-2	R-4	20%	Not listed	Not listed		3RC-
Kunzea rupestris	LNE	C-1	R-1	100%	ESP - E	TSC - E		2VCa
Kunzea sp A	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Lasiopetalum joyceae	LNE	C-2	R-2	80%	Not listed	Not listed		2RC-
Lasiopetalum longistamineum	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VC-
Lastreopsis silvestris	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RCa
Lepiderema pulchella	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RC-
Lepidium fasciculatum	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Lepidium hyssopifolium	UNE/LNE	C-1	R-1	100%	ESP - E	TSC - E		3ECi+
Lepidium peregrinum	UNE/LNE	C-1	R-1	100%	ESP - X	TSC - X		3X
Lepidosperma latens	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Leptopteris fraseri	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Leptorhynchos elongatus	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Leptorhynchos squamatus subsp. A	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Leptospermum deanei	LNE	C-1	R-2	100%	ESP - V	TSC - V		2V
Leptospermum spectabile	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Leptostigma reptans	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Lepturus repens	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Leucopogon cicatricatus	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Leucopogon confertus	UNE	C-1	R-1	100%	Not listed	TSC - E		3E
Leucopogon esquamatus	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Leucopogon pilifer	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Leucopogon recurvisepalus	UNE	C-1	R-3	80%	Not listed	Not listed		3KC-
Leucopogon rodwayi	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Leucopogon sp. aff. appressus (Gibraltar Range NP)	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Leucopogon sp. aff. fraseri	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Leucopogon sp. aff. setiger (Mt Belmore)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E?	Not listed
Leucopogon sp.5 Echo Point Border Ranges	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2RC-
Leucopogon trichostylus	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Lilaeopsis polyantha	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Limosella australis	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Lindernia alsinoides	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - E?	Not listed
Lindsaea brachypoda	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Lindsaea dimorpha	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Lindsaea fraseri	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed

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Lindsaea incisa	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Liparis habenarina	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Liparis simmondsii	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3KC-
Lissanthe sapida	LNE	C-2	R-4	20%	Not listed	Not listed		3RCa
Lobelia membranacea	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Lomandra brevis	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Lomandra fluviatilis	LNE	C-2	R-4	20%	Not listed	Not listed		3RCa
Luzula modesta	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Lycopodium fastigiatum	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Lyperanthus nigricans	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Lysimachia japonica	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Macadamia tetraphylla	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	2VC-
Macrothelypteris torresiana	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Macrozamia concinna	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Macrozamia johnsonii (previously known as M. moorei)	UNE	C-2	R-4	20%	Not listed	TSC - E	Delist	2RC-
Macrozamia pauli-guilielmi subsp. flexuosa	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2K
Macrozamia stenomera	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		2RC-
Marsdenia hemiptera	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Formerly 3RC-
Marsdenia liisae	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Marsdenia longiloba	UNE/LNE	C-1	R-1	100%	ESP - E	TSC - E		3RC-
Mazus pumilio	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Medicosma cunninghamii	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Melaleuca biconvexa	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Melaleuca deanei	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Melaleuca tamariscina subsp. irbyana	UNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E	Not listed
Melaleuca tortifolia	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		2RC-t
Melichrus adpressus	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Melichrus sp A	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2
Melichrus sp. Gibberagee	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Melicope vitiflora	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Microcitrus australasica var. australasica	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Micromelum minutum	UNE	C-1	R-1	100%	Not listed	TSC - X		Not listed
Micromyrtus blakelyi	LNE	C-2	R-3	60%	Not listed	Not listed		2VCi
Micromyrtus striata	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Microseris lanceolata	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Microstegium nudum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Microtrichomanes vitiense	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed

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Millettia australis	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3RC-+
Mimulus gracilis	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Minuria leptophylla	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Mischocarpus lachnocarpus	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Mitrasacme pygmaea	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Momordica balsamina	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Monococcus echinophorus	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Monotaxis macrophylla	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Mucuna gigantea	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Muehlenbeckia costata	UNE/LNE	C-1	R-1	100%	Not listed	TSC - V		3KC-
Muellerina myrtifolia	UNE	C-1	R-1	100%	Not listed	TSC - E		3RC-
Myosotis exarrhena	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Myriophyllum alpinum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Myriophyllum implicatum	UNE	C-1	R-1	100%	ESP - V	TSC - X		3V
Myriophyllum pedunculatum subsp. pedunculatum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Myriophyllum striatum	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Neisosperma poweri	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Neoastelia spectabilis	LNE	C-1	R-3	80%	Not listed	TSC - V		2VCit
Neptunia gracilis	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Nertera granadensis	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Niemeyera chartacea	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Notelaea johnsonii	UNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Nymphaea gigantea	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Nymphoides crenata	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Oberonia complanata	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Oberonia titania	UNE/LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Ochrosia moorei	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2ECi
Olax angulata	UNE	C-1	R-3	80%	Not listed	TSC - V		2VCi
Olearia cordata	LNE	C-1	R-2	100%	ESP - V	TSC - V		2VCi
Olearia erubescens	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Olearia flocktoniae	UNE/LNE	C-1	R-1	100%	ESP - E	TSC - E		2ECi
Olearia gravis	UNE	C-2	R-2	80%	Not listed	Not listed		3KC-
Olearia heterocarpa	UNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Olearia myrsinoides	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Olearia sp. aff. erubescens	LNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E	Not listed
Olearia sp.2 Wollomombi	LNE	C-2	R-1	100%	Not listed	Not listed	TSC - E?	2KC-
Olearia stilwelliae	UNE	C-2	R-3	60%	Not listed	Not listed		3RCa

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Opercularia varia	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Ophioglossum pendulum	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Ophioglossum reticulatum	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Oreobolus distichus	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Oreobolus oxycarpus subsp. oxycarpus	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Oreomyrrhis ciliata	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Orthoceras strictum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Owenia cepiodora	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	2VCi
Ozothamnus adnatus	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		3KC-
Ozothamnus argophyllus	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Ozothamnus whitei	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Panicum paludosum	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Parsonsia dorrigoensis	UNE/LNE	C-2	R-2	Areal Target	Not listed	TSC - V	Delist	2VCi
Parsonsia largiflorens	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - X	3R
Parsonsia lilacina	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - E	3RC-
Parsonsia tenuis	UNE	C-2	R-4	20%	Not listed	Not listed		2RC-t
Paspalidium albovillosum	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Paspalidium breviflorum	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Paspalidium grandispiculatum	UNE	C-2	R-2	Areal Target	ESP - V	Not listed		3VC-
Passiflora cinnabarina	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Patersonia longifolia	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pavetta australiensis	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Peristeranthus hillii	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Persicaria elatior	UNE/LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3V
Persoonia chamaepeuce	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Persoonia hirsuta subsp. evoluta	LNE	C-2	R-2	80%	Not listed	Not listed		3KCi
Persoonia hirsuta subsp. hirsuta	LNE	C-2	R-2	80%	Not listed	Not listed		3KCi
Persoonia katerae	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Persoonia procumbens	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Persoonia rufa	UNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Persoonia volcanica	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Phaius australis	UNE	C-1	R-1	100%	Not listed	TSC - E		3VCa
Phaius tankervilliae	UNE	C-1	R-1	100%	ESP - V	TSC - E		3VC-+
Phebalium ambiens	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	3RC-
Phebalium elatius subsp. elatius	UNE	C-1	R-5	20%	Not listed	Not listed		3K
Phebalium glandulosum subsp. eglandulosum	UNE	C-1	R-1	100%	Not listed	TSC - E		2VCi
Phebalium nottii	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Phebalium squamulosum subsp. ozothamnoides	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed

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Phebalium squamulosum subsp. verrucosum	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Phebalium sympetalum	LNE	C-2	R-2	80%	Not listed	Not listed		2VC-
Phyllanthus microcladus	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Picris evae	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	Not listed
Picris sp. nov.	UNE	C-1	R-5	20%	Not listed	Not listed		Not listed
Pimelea umbratica	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Pimelea venosa	UNE	C-1	R-1	100%	ESP - V	TSC - E		2V
Pisonia aculeata	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pisonia umbellifera	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Pittosporum oreillyanum	UNE	C-2	R-4	20%	Not listed	Not listed		2RCat
Planchonella pohlmaniana	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Plantago cladarophylla	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Plantago palustris	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Platysace clelandii	LNE	C-2	R-4	20%	Not listed	Not listed		2RCa
Plectranthus alloplectus	UNE	C-1	R-1	100%	Not listed	TSC - E		2RC-
Plectranthus nitidus	UNE	C-1	R-2	Areal Target	Not listed	TSC - E	TSC - V	2KCi
Plectranthus sp. 3 Long Gully	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Barrington Tops (Chichester)	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Coramba Rd (Nana Creek)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Dorrigo Mountain	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Kangaroo River	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. New Italy	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Nundle	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	1K
Plectranthus sp. Pinnacle	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Plectranthus sp. Star Ridge (Orara West)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E or V?	Not listed
Pleogyne australis	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Plinthanthesis urvillei	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Plumbago zeylanica	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Pneumatopteris pennigera	UNE	C-2	R-1	100%	Not listed	Not listed		3RCa+
Pneumatopteris sogerensis	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Podolepis hieracioides	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Podolepis monticola	UNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Podolobium aestivum	UNE	C-1	R-3	80%	Not listed	Not listed		3RC-
Polygala linariifolia	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		Not listed
Pomaderris bodalla	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Pomaderris brunnea	LNE	C-1	R-1	100%	ESP - V	TSC - V		2VC-
Pomaderris costata	LNE	C-2	R-2	80%	Not listed	Not listed		3RC-
Pomaderris crassifolia	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		3K
Pomaderris helianthemifolia	LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pomaderris notata (Mt. Warning)	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2RC-t
Pomaderris pauciflora	LNE	C-2	R-3	60%	Not listed	Not listed		3RC-

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Pomaderris precaria	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2VC-
Pomaderris queenslandica	UNE/LNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Pomaderris reperta	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2V
Pomaderris sericea	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Pomaderris subcapitata	UNE/LNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Prasophyllum australe	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Prasophyllum dossenum	UNE/LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3R
Prasophyllum exilis	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	3RC-
Prasophyllum flavum	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Prasophyllum patens	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Prasophyllum rogersii	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Prasophyllum species A	UNE/LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Prasophyllum striatum	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Premna lignum-vitae	UNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Prostanthera askania (Syn. P. sp. Strickland State Forest)	LNE	C-1	R-1	100%	Not listed	TSC - V	TSC - E	Not listed
Prostanthera cryptandroides	LNE	C-2	R-3	60%	Not listed	Not listed		2RC-t
Prostanthera densa	LNE	C-1	R-2	100%	ESP - V	TSC - V		3VC-
Prostanthera discolor	LNE	C-2	R-3	60%	Not listed	Not listed		2VC-
Prostanthera junonis (syn. P. sp. Somersby)	LNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Prostanthera palustris (Syn. P. sp. Bundjalung)	UNE	C-1	R-2	100%	Not listed	TSC - V		2VCit
Prostanthera saxicola var. major	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Prostanthera sp. aff. howelliae (Sherwood Nature Reserve)	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Prostanthera spinosa	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Prostanthera staurophylla	UNE	C-1	R-3	80%	ESP - V	TSC - V		2R
Pseudanthus divaricatissimus	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pseudanthus ovalifolius	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Pseudanthus sp. aff. pimeleoides	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Psilotum complanatum	UNE/LNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Pteris comans	UNE/LNE	C-1	R-2	100%	Not listed	Not listed		Not listed
Pterostylis chaetophora	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Pterostylis cucullata (P. sp. D; P. sp. aff.. cucullata)	LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3VCa
Pterostylis cycnocephala	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pterostylis daintreana	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pterostylis elegans	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Pterostylis gibbosa	LNE	C-1	R-1	100%	ESP - E	TSC - E		2E
Pterostylis laxa	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed

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Pterostylis longipetala	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pterostylis metcalfei	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Pterostylis nigricans	UNE	C-1	R-2	100%	Not listed	TSC - V		3V
Pterostylis russellii	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pterostylis sp. aff. alata	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Pterostylis sp. aff. alveata sens lat. (Mt. Duval and New England escarpment)	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pterostylis sp. aff. cycnocephala	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Pterostylis sp. aff. laxa (Barrington Tops)	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Pterostylis sp. aff. parviflora (Ebor)	LNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	Not listed
Pterostylis sp. aff. revoluta (Northern Tablelands) - syn. Pterostylis sp. B	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pterostylis torquata	UNE/LNE	C-1	R-2	Areal Target	Not listed	Not listed	TSC - V	Not listed
Pterostylis woollsii	UNE/LNE	C-1	R-3	80%	Not listed	Not listed	TSC - V	3RC-
Pultenaea campbellii - Glenn Innes metapopulation unit	UNE/LNE	C-2	R-2	Areal Target	ESP - V	TSC - V	Delist?	3K
Pultenaea campbellii - Walcha metapopulation unit	LNE	C-2	R-2	Areal Target	ESP - V	TSC - V	Delist?	3K
Pultenaea dentata	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pultenaea fasciculata	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Pultenaea sp. aff. flexilis	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Pultenaea species B	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pultenaea species J	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Pultenaea subspicata	LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Quassia sp. Moonee Creek (Quassia sp. B)	UNE	C-1	R-2	Areal Target	ESP - V	TSC - E		2E
Quassia sp.A	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	3RC-
Randia moorei	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		3ECi
Rapanea sp. A	UNE	C-1	R-1	100%	ESP - X	TSC - E		2X
Rhizanthella slateri	LNE	C-1	R-3	80%	Not listed	Not listed	TSC - V	3KC-
Rhodamnia maideniana	UNE	C-2	R-3	60%	Not listed	Not listed		2RC-
Rhodamnia whiteana	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Rhodanthe polyphylla	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Rhynchosia acuminatissima	UNE	C-1	R-1	Areal Target	Not listed	Not listed	TSC - E	Not listed
Rhynchosia minima	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Ricinocarpos speciosus	UNE	C-2	R-3	60%	Not listed	Not listed		3RCi
Rostellularia obtusa	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - X?	Not listed
Rulingia hermanniifolia	LNE	C-2	R-2	80%	Not listed	Not listed		3RCa
Rulingia procumbens	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	Not listed
Rulingia prostrata	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	2ECi
Rulingia salviifolia	UNE	C-2	R-2	80%	Not listed	Not listed		2RC-
Rutidosis heterogama - Coastal metapopulation unit	UNE/LNE	C-1	R-2	100%	ESP - V	TSC - V		2VCa
Rutidosis heterogama - Inland metapopulation unit	UNE	C-1	R-2	100%	ESP - V	TSC - V		2VCa

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Sarcochilus aequalis	UNE/LNE	C-1	R-3	80%	Not listed	Not listed		3RC-
Sarcochilus dilatatus	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3RC-
Sarcochilus fitzgeraldii - Dorrigo metapopulation unit	UNE/LNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Sarcochilus fitzgeraldii - Kunderang metapopulation unit	LNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Sarcochilus fitzgeraldii - Tweed metapopulation unit	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VC-
Sarcochilus hartmannii	UNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3VC-
Sarcochilus weinthalii	UNE	C-1	R-2	100%	ESP - V	TSC - V		3VC-
Sauropus sp. A (S. hirtellus)	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Schizaea rupestris	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Schoenus calostachyus	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - E?	Not listed
Scleria levis	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Scleria rugosa	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Scleria tricuspidata	UNE	C-2	R-1	100%	Not listed	Not listed	TSC - V or E?	Not listed
Selenodesmium elongatum	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Senecio gunnii	UNE/LNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Senecio picridioides	LNE	C-1	R-5	20%	Not listed	Not listed		Not listed
Senna acclinis	UNE/LNE	C-1	R-1	100%	Not listed	TSC - E		3RC-
Senna aciphylla	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Sesbania cannabina var. cannabina	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Setaria australiensis	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Sida cordifolia	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Sida corrugata	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Solanum laciniatum	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Sophora fraseri	UNE	C-1	R-1	Areal Target	Not listed	TSC - V	TSC - E	3VC-
Sophora tomentosa	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Strychnos arborea	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Stuartina hamata	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Stylidium uliginosum	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Styphelia perileuca	UNE	C-1	R-3	80%	Not listed	TSC - V		2VC-
Swainsona fraseri	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Swainsona monticola	UNE/LNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Swainsona parviflora	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	Not listed
Symplocos baeuerlenii	UNE	C-1	R-2	Areal Target	ESP - V	TSC - V		2VC-
Syzygium hodgkinsoniae	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V		3VC-
Syzygium moorei	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	2VCi
Syzygium paniculatum	LNE	C-1	R-1	100%	ESP - V	TSC - V	TSC - E	3VCi

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Taeniophyllum muelleri	UNE/LNE	C-2	R-4	20%	Not listed	Not listed		Not listed
Tarenna cameronii	UNE	C-1	R-1	100%	Not listed	TSC - E		Not listed
Tasmannia glaucifolia - Northern metapopulation unit	LNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3VCi
Tasmannia glaucifolia - Southern metapopulation unit	LNE	C-1	R-1	Areal Target	ESP - V	TSC - V		3VCi
Tasmannia purpurascens	LNE	C-2	R-3	60%	ESP - V	TSC - V	Delist	2VC-t
Telopea aspera	UNE	C-2	R-3	60%	Not listed	Not listed		2RCa
Tephrosia baueri	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	3KC-
Tephrosia brachyodon	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Tephrosia filipes	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Tephrosia rufula	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Tetratheca glandulosa	LNE	C-1	R-3	80%	ESP - V	TSC - V		2VC-
Tetratheca juncea	LNE	C-1	R-3	80%	ESP - V	TSC - V		3VCa
Teucrium sp. A	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Teucrium sp. D	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Thelionema grande	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Thelymitra circumsepta	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Thesium australe	UNE/LNE	C-1	R-3	80%	ESP - V	TSC - V		3VCi+
Thismia rodwayi	LNE	C-1	R-1	100%	Not listed	Not listed	TSC - V	3RC-+
Tinospora smilacina	UNE	C-1	R-2	Areal Target	Not listed	TSC - E		Not listed
Tinospora tinosporoides	UNE	C-1	R-1	Areal Target	ESP - V	TSC - V	TSC - E	3RC-
Trachymene procumbens	UNE/LNE	C-2	R-1	100%	Not listed	Not listed	TSC - V?	Not listed
Trichosanthes subvelutina	UNE	C-1	R-3	80%	Not listed	Not listed	TSC - V	3RC-
Triplarina imbricata	UNE	C-1	R-1	Areal Target	Not listed	TSC - E		2E
Triumfetta rhomboidea	UNE	C-1	R-1	100%	Not listed	Not listed		Not listed
Turraea pubescens	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Tylophora woollsii	UNE/LNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2E
Typhonium eliosurum	LNE	C-1	R-1	100%	Not listed	Not listed		3RC-
Uromyrtus australis	UNE	C-1	R-1	Areal Target	ESP - E	TSC - E		2ECi
Uromyrtus sp. 1 (Lamington)	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - E	2RC-
Utricularia biloba	UNE/LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed
Utricularia caerulea	UNE	C-2	R-3	60%	Not listed	Not listed		Not listed
Utricularia monanthos	LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Velleia montana	UNE/LNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Velleia perfoliata	LNE	C-1	R-3	80%	ESP - V	TSC - V		2VC-
Vetiveria filipes	UNE	C-2	R-2	80%	Not listed	Not listed		Not listed
Vigna luteola	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V	Not listed
Vitex trifolia var. trifolia	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - E	Not listed
Wahlenbergia glabra	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RC-

Taxon	Region	Regional Conservation Status	Reservation Priority Rank	Conservation Target	Cwlth. ESP Act	NSW TSC Act	Proposed changes to TSC Act*	ROTAP category
Wahlenbergia scopulicola	UNE	C-1	R-1	100%	Not listed	TSC - E		2RC-
Wahlenbergia sp. 4 Point Lookout	LNE	C-2	R-2	80%	Not listed	Not listed		2RC-t
Westringia blakeana	UNE	C-2	R-3	Areal Target	Not listed	Not listed		2RCa
Westringia glabra	LNE	C-2	R-2	80%	Not listed	Not listed	TSC - V?	2RC-
Westringia sericea	UNE	C-2	R-3	60%	Not listed	Not listed		3RC-
Xylosma terrae-reginae	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Zannichellia palustris	UNE/LNE	C-1	R-1	100%	Not listed	Not listed		3R+
Zieria adenodonta	UNE	C-1	R-2	100%	Not listed	Not listed	TSC - V	2RC-t
Zieria floydii	UNE	C-1	R-1	100%	Not listed	TSC - E		2RC-t
Zieria fraseri subsp. A	UNE	C-1	R-1	100%	Not listed	Not listed	TSC - E	Not listed
Zieria hindii	UNE	C-2	R-3	Areal Target	Not listed	Not listed		2R
Zieria involucrata	LNE	C-1	R-3	80%	ESP - V	TSC - V		2VCa
Zieria lasiocaulis	LNE	C-1	R-1	Areal Target	Not listed	TSC - E		2V
Zieria prostrata	UNE	C-1	R-2	100%	ESP - E	TSC - E		2E
Zieria smithii (Diggers Headland Form)	UNE	C-1	R-3	80%	Not listed	TSC - E		Not listed
Zornia floribunda	UNE	C-2	R-1	100%	Not listed	Not listed		Not listed
Zornia muriculata	UNE	C-2	R-2	80%	Not listed	Not listed	TSC - V or E?	Not listed

* A “?” indicates the taxon was proposed for listing on the TSC Act, subject to further investigation.

APPENDIX 10.2 AREAL TARGETS FOR FLORA TAXA IN NORTHEAST NSW

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Acacia chrysotricha	184	184	1.00	2.000	2697		5394	mapped
Acacia courtii	580	580	1.00	0.075	3826	nd=5,nu=30, Fire (p=0.15)	658	350
Acacia macnuttiana	42719	13000	0.30	2.000	5313		10625	750
Acacia orites - Northeast metapopulation unit	12700	10000	0.79	1.000	2914		1301	750
Acacia ruppii	29480	26000	0.88	0.067	6377	nd=7,nd=20, Fire (p1=0.01)	3724	750
Acomis acoma	132000	79200	0.60	10.000	12425		124250	750
Allocasuarina defungens	10000	2000	0.20	0.500	775	Roading (L1=0.1,c1=0.01) Clearing (L2=0.1,c2=0.05)	412	0
Almaleea cambagei	280	600	2.14	1.000	10813		10813	0
Amorphospermum whitei - Northern Metapopulation Unit	30883	7500	0.24	25.000	2071		51780	750
Angophora robur	45000	18000	0.40	0.200	609		122	750
Austromyrtus fragrantissima	6098	4000	0.66	8.000	1677		13414	750
Backhousia anisata	13600	7000	0.51	3.000	1487		4460	750
Baloghia marmorata	328	328	1.00	1.000	2697	Weeds (L1=0.02,c1=0.5)	3954	0
Boronia chartacea	44000	22000	0.50	0.400	6377	nd=3,nu=18, Fire (p1=0.05) Weeds (L1=0.1,c1=0.01)	5599	750
Boronia granitica	44500	2700	0.06	0.250	6377	nd=5, Fire (p1=0.05) Browsing (r1=0.75)	2747	750
Boronia umbellata	8500	4000	0.47	0.500	6377		3188	750
Bosistoa selwynii	11300	2800	0.25	1.000	3826		3826	750
Bosistoa transversa	11200	3800	0.34	1.000	3826		3826	750

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Callistemon acuminatus	124388	8000	0.06	2.000	1677		3354	750
Callitris oblonga	30846	5000	0.16	0.333	3826	nd=4,nu=50, Fire (p1=0.1) Roading (L1=0.1,c1=0.01) Weeds (L2=0.1,c2=0.05)	2084	750,mapped
Calophanoides hygrophiloides	15000	3000	0.20	0.100	9263	nd=3, Fire (p1=0.01) Weeds (r1=0.9)	1061	750
Chiloglottis platyptera	5000	5000	1.00	5.000	3826		19131	750
Clematis fawcettii	56144	35000	0.62	0.667	2697	Weeds (L1=0.01,c1=0.5) Grazing (r1=0.9)	2489	750
Corchorus cunninghamii	1160	1160	1.00	0.200	6377	nd=1,nu=20, Fire (p1=0.05) Weeds (L1=0.1,c1=0.5)	4290	750
Corokia whiteana - Metasediments metapopulation unit	12783	1500	0.12	15.000	1677	nd=30, ?? (p1=0.025)	53756	750
Corokia whiteana - Rhyolite metapopulation unit	20989	6000	0.29	0.400	1677	nd=30, ?? (p1=0.02) ?? (L1=0.1,c1=0.1)	1365	750
Cryptocarya foetida	32128	12000	0.37	6.000	1677	nd=15, Fire (p1=0.06) Urban Development (L1=0.01,c1=0.8)	37209	750
Cynanchum elegans	79000	56000	0.71	10.000	1121	Weeds and Recreation (L1=0.1,c1=0.02)	11434	750
Davidsonia pruriens var. jerseyana	14400	10000	0.69	10.000	2484		24840	750
Dendrocnide moroides	2260	2260	1.00	10.000	5055		50555	750
Desmodium acanthocladum	26788	8000	0.30	0.133	5055	Weeds (L1=0.01,c1=1) Grazing (r1=0.25)	4457	750
Diuris venosa	7348	2000	0.27	0.200	6377	nd=7, Ferals (p1=0.06) Weeds (L1=0.1,c1=0.5)	2923	300

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Elaeocarpus sp. Minyon	3400	3400	1.00	25.000	1872		46792	750
Elaeocarpus williamsianus	3100	3100	1.00	50.000	2071	Weeds (L1=0.01,c1=0.75)	147154	750
Endiandra floydii	22692	30000	1.32	10.000	1872		18717	750
Endiandra hayesii	48492	35000	0.72	5.000	1677	Weeds (L1=0.005,c1=0.2) Fire (L2=0.2,c2=0.2)	11095	750
Endiandra muelleri subsp. bracteata	34000	3300	0.10	10.000	1872		18717	750
Eriostemon difformis subsp. smithianus	500	125	0.25	0.500	5055		2528	750
Eucalyptus ancophila	10148	9000	0.89	1.000	609	nd=15, Forestry (p1=0.01) Weeds (L1=0.1,c1=0.1)	676	mapped
Eucalyptus camphora subsp. relicta	80	80	1.00	0.125	609		76	0
Eucalyptus elliptica	64000	16000	0.25	4.000	609	Dieback (L1=0.1,c1=0.5) Roading(L2=0.1,c2=0.01)	4946	750
Eucalyptus fergusonii subsp. fergusonii	68000	18000	0.26	2.000	775	nd=10, Forestry (p1=0.03)	1549	750
Eucalyptus glaucina - Northern metapopulation unit	20700	10350	0.50	1.000	609	Grazing (L1=0.1,c1=0.01) Roading (L2=0.1,c2=0.01)	622	750
Eucalyptus glaucina - Southern metapopulation unit	4600	2300	0.50	2.000	609	Roading and Weeds (L1=0.1,c1=0.2)	1521	mapped
Eucalyptus largeana	100000	50000	0.50	3.000	609	nd=10, Forestry (p1=0.02)	1827	750
Eucalyptus magnificata	11602	4800	0.41	5.000	609		3046	750
Eucalyptus nicholii	36000	14400	0.40	5.000	775	Dieback and Roading (L1=0.1,c1=0.2)	4835	750
Eucalyptus rudderi	2700	2700	1.00	1.000	609	nd=15, Forestry (p1=0.03) Roading (L1=0.1,c1=0.02)	622	750
Eucalyptus scias subsp. apoda	6000	4800	0.80	0.500	609		305	0
Eucalyptus tetrapleura	108000	43200	0.40	2.000	609	Roading*(L1=0.1,c1=0.01)	1218	0

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Euphrasia ciliolata	16000	6400	0.40	0.200	50700	Weeds (L1=0.1,c1=0.5)	20176	750
Floydia praealta	30421	24000	0.79	10.000	2071		20712	750
Fontainea australis	10500	5000	0.48	20.000	3826		76523	750
Geijera paniculata	38000	5000	0.13	6.000	1872		11230	750
Gentiana wissmannii	8000	400	0.05	0.400	108000		43200	750
Grevillea banyabba	21600	13000	0.60	0.200	7781	nd=3, Fire (p1=0.125)	2323	750
Grevillea granulifera - Curricabark metapopulation unit	2568	600	0.23	0.100	6377	nd=4, Fire (p1=0.05)	783	750
Grevillea granulifera - Wollomombi metapopulation unit	12000	10000	0.83	10.000	6377	nd=4, Fire (p1=0.05)	78287	750
Grevillea guthrieana - Booral metapopulation unit	640	640	1.00	0.333	3826	nd=4, Fire (p1=0.1) Roading (L1=0.1,c1=0.1) Grazing (r1=0.95)	2272	750
Grevillea guthrieana - Carrai metapopulation unit	9000	9000	1.00	2.000	3826	nd=4, Fire (p1=0.1)	12277	750
Grevillea masonii	800	400	0.50	1.000	5055		5055	750
Grevillea mollis	44500	2670	0.06	0.100	3826		383	750
Grevillea quadricauda	8178	5000	0.61	0.050	7781	nd=4, Forestry (p1=0.1) Fire (L1=0.1,c1=0.03) Roading (L2=0.1,c2=0.02)	409	0
Grevillea rhizomatosa	4000	4000	1.00	0.667	3826	Trampling (L1=0.1,c1=0.01) Fire (r1=0.95)	2712	750
Grevillea scortechinii subsp. sarmentosa	18000	13500	0.75	1.000	2275	nd=5, Fire (p1=0.05) Roading (L1=0.1,c1=0.01)	2970	750
Hakea fraseri	17500	12000	0.69	6.000	2697		210	750
Hakea sp. aff. trineura	3000	2500	0.83	0.125	1677		16182	mapped
Hibbertia hexandra - Northern metapopulation unit	4000	2400	0.60	0.050	2914	nd=3,nu=40, Fire (p1=0.01)	484	0

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Hibbertia hexandra - Southern metapopulation unit	4000	3200	0.80	0.250	2914	nd=4, Fire (p1=0.04)	858	mapped
Hibbertia marginata	75000	30000	0.40	0.333	1677	nd=4, Fire (p1=0.1)	852	750
Hicksbeachia pinnatifolia - Northern metapopulation unit	50696	39543	0.78	4.000	2071		8285	750
Hicksbeachia pinnatifolia - Southern metapopulation unit	5878	5878	1.00	20.000	2484		49679	750
Homoranthus lunatus	4000	1000	0.25	0.500	2697	nd=5,nu=50, Fire (p1=0.05)	1935	750
Isoglossa eranthemoides	936	936	1.00	0.080	1677		134	0
Lindsaea incisa	720	144	0.20	4.000	1487		5946	750
Macadamia tetraphylla	5600	5600	1.00	5.000	1774		8868	750
Melaleuca tamariscina subsp. irbyana	8000	2200	0.28	1.000	1677	nd=5, Fire (p1=0.1)	2840	750
Melichrus sp A	19000	13500	0.71	4.000	5055	nd=6, Fire (p1=0.1)	38051	750
Monotaxis macrophylla	800	600	0.75	0.050	26874		1344	750
Ochrosia moorei	16800	6000	0.36	20.000	3362		67240	750
Olearia sp. aff. erubescens	1600	1600	1.00	1.500	5055		7583	750
Owenia cepiodora	94248	50000	0.53	15.000	1677		25151	750
Parsonsia dorrigoensis	440000	44000	0.10	1.000	5055	nd=5, Fire (p1=0.02)	5593	mapped
Paspalidium grandispiculatum	17000	11900	0.70	0.050	6377	Spraying for Weeds (L1=0.1,c1=0.01)	322	750
Plectranthus nitidus	1000	600	0.60	0.200	5055	Weeds (r1=0.8) Forestry (r2=0.99)	1264	750
Polygala linariifolia	2320	5000	2.16	1.000	3826		3826	750
Pterostylis torquata	120000	12000	0.10	10.000	693		6929	750
Pultenaea campbellii - Glenn Innes metapopulation unit	72000	14000	0.19	0.200	9263	nd=3, Fire (p1=0.04)	2094	750
Pultenaea campbellii - Walcha metapopulation unit	68093	13600	0.20	0.200	9263	nd=3, Fire (p1=0.04), Forestry (p2=0.07)	2094	750

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Quassia sp. Moonee Creek (Quassia sp. B)	35000	10500	0.30	2.000	2071	Weeds (r1=0.85)	4873	750
Randia moorei	21779	12000	0.55	10.000	2697		26970	750
Rhynchosia acuminatissima	16328	16000	0.98	20.000	2697	nd=5, Fire (p1=0.05) Weeds(r1=0.8)	87137	750
Sarcochilus fitzgeraldii - Dorrigo metapopulation unit	24243	875	0.04	0.500	5055	Weeds (L1=0.05,c1=0.5) Collecting (r1=0.5)	9389	750
Sarcochilus fitzgeraldii - Kunderang metapopulation unit	39138	1600	0.04	1.000	5055		5055	750
Sarcochilus fitzgeraldii - Tweed metapopulation unit	6125	700	0.11	0.200	5055	Weeds (L1=0.01,c1=0.5) Collecting (r1=0.5)	2520	0
Sophora fraseri	340	500	1.47	5.000	6377		31883	0
Symplocos baeuerlenii	11408	22400	1.96	1.000	2697	nd=30, Fire (p1=0.015) Weeds (L1=0.1,c1=0.15)	4989	750
Syzygium hodgkinsoniae	73987	2300	0.03	20.000	1872		37433	750
Syzygium moorei	52311	38000	0.73	15.000	2275	Weeds (L1=0.1,c1=0.6)	84670	750
Tasmannia glaucifolia - Northern metapopulation unit	2054	400	0.19	1.000	2275	nd=5, Fire (p1=0.01)	2393	mapped
Tasmannia glaucifolia - Southern metapopulation unit	20000	2000	0.10	0.500	1872	nd=5,nu=40, Fire (p1=0.07) Weeds (L1=0.1,c1=0.5)	2906	mapped
Tinospora smilacina	118418	8000	0.07	1.000	3025	nd=10, Fire (p1=0.05) Weeds (L1=0.1,c1=0.15) Rainforest Regenerators(r1=0.99) Weeds(r2=0.9)	6664	750
Tinospora tinosporoides	28400	14000	0.49	16.000	3826		61219	750
Triplarina imbricata	5000	1500	0.30	0.400	6377	Weeds (L1=0.1,c1=0.5) Fire (L2=0.1,c2=0.25)	10047	0

Taxon	Total Model Area (ha)	Estimated Potential Habitat (ha)	Cplan Weight	Density (ha/plant)	Adequate F	Major Threats	Conservation Target (ha)	Buffer Size (m)
Tylophora woollsii	6000	4800	0.80	10.000	7781		77815	750
Uromyrtus australis	3720	2500	0.67	1.000	1677	nd=20, Fire (p1=0.02) Weeds (L1=0.01,c1=0.1)	2615	750
Westringia blakeana	700	400	0.57	0.013	9263	nd=2,nu=10, Fire (p1=0.01)	1631	750
Zieria hindii	84	150	1.79	0.033	5055	Weeds (L1=0.1,c1=0.05)	177	0
Zieria lasiocaulis	300	300	1.00	0.143	5055	nd=4,nu=20, Fire (p1=0.01)	5061	750

Species	Disturbance Description	Rank	Comments