ASSESSMENT | PLANNING | MANAGEMENT

Survey Report

Western Sydney Parklands Bungarribee Precinct Project
Cumberland Land Snail Survey
(Project No. 087-013)

Report prepared for:
Landcom

June 2008

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Document Tracking

Item	Detail	Signature
Project Name	Doonside Cumberland Land Snail Survey	
Project Number	087-013	
Prepared by	DM	
Prepared by	MA	
Approved by	MC	
Status	Final	
Version Number	1	
File location	Z:\G Drive\Groups\Current_Projects\CityProjects\Private Clients\APP\Cumberland Land Snail Surveys\Cumberland Land Snail Surveys\Report\CLS Survey Report Final.doc	
Last saved on	4 June 2008	

Acknowledgements
This document has been prepared by Eco Logical Australia Pty Ltd with support from Landcom and APP.

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1. Introduction

1.1 Background

Targeted *Meridolum corneovirens* (Cumberland land snail) surveys were conducted as a direct response to the recommendations within the Doonside Residential Parcel Ecological Impact Assessment produced by Eco Logical Australia in August 2007. This assessment recommended further ecological investigation prior to project approval under Part 3A of the *Environmental Planning and Assessment Act 1979*. The surveys were conducted across the Doonside Residential Parcel and parts of the Parklands Bungarribee Precinct of the Western Sydney Parklands in August and September 2007.

1.2 Aim of this Report

The aim of this survey is to place currently known Cumberland land snail records within the context of the Doonside Residential Footprint and in the broader context of the parklands, and to determine the significance of impacts from the proposed development.

The report provides background information on *Meridolum corneovirens* distribution and ecology, and details the methods utilised in surveying the study area. It assesses the impacts of development, and discusses and recommends appropriate mitigation measures.

1.3 Study Area

The Doonside Residential Parcel is located adjacent to the Bungarribee Parklands Precinct of Western Sydney Parklands. The precinct will form the main community recreation hub for both active and passive recreation in the northern part of the parklands. Bushland is to be restored through the broad floodplain areas, with current rural landscapes retained on the valley slopes to allow open areas for intensive community use.

The Doonside Residential Parcel is defined by the following landscape features:

- Bungarribee Creek to the South;
- Eastern Creek to the West;
- Doonside Road to the East (which continues on to the Railway Station); and
- Eastern Road to the North.

The Bungarribee Parklands Precinct is defined by the following landscape features:

- Great Western Highway to the South;
- M7 Motorway to the West;
- Eastern Creek to the East; and
- Eastern Road to the North.

Figure 1 illustrates the Concept Plan for development and the development site context.

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Figure 1: Western Sydney Parklands - Bungarribee Precinct Project Concept Plan

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2. Literature Review

2.1 Background

Meridolum corneovirens (Cumberland land snail) is a native species, listed as Endangered under Part 1 – Schedule 1 of the NSW *Threatened Species Conservation Act 1995.* In declaring the species endangered, the NSW Scientific Committee has cited that primary habitat destruction and only small disjunct populations remained as key determinates (NSW Scientific Committee 1997). The final scientific determination is provided in **Appendix A**.

The Cumberland land snail has a typical adult shell diameter ranging between 15-30mm. The colour is generally tan to dark brown with a green or yellow tinge (DEC 2007). The underside of the shell tends to have a glossy appearance and is semi-transparent (NPWS 2000). Plate 1 illustrates a specimen recorded on site.

Plate 1: Cumberland Land Snail recorded on site.

The Cumberland land snail is an obligate feeder on fungi that is associated with the roots of *Eucalyptus tereticornis* – Forest Red Gum, and some ironbarks. The land snail's typical habitat occurs under woody debris, leaf litter, bark accumulations around trees, and sometimes within grass clumps (NPWS 2000). Where possible it will burrow into loose soil (DEC 2007).

2.2 Distribution

Current knowledge suggests that the Cumberland land snail is restricted to the Cumberland Plain and Castlereagh Woodlands of Western Sydney and also along the fringes of River-flat Eucalypt Forest, especially where it meets Cumberland Plain Woodland (DEC 2007).

The Cumberland land snail has a distribution that is restricted to an area that includes Western Sydney between Prospect and Liverpool to the east and the Hawkesbury-Nepean River to the west. Its distribution reaches north to the Windsor and Richmond area and south to Picton (www.amonline.net.au).

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The NSW National Parks and Wildlife Service Atlas of NSW Wildlife currently lists over 641 locations where the Cumberland land snail has been recorded. These locations occur within the Sydney Metropolitan Catchment and Hawkesbury-Nepean Catchment. **Figure 2** shows the known locations of Cumberland land snails within Western Sydney. Most of these known locations are scattered throughout the region and are often small and isolated (DEC 2007).

2.3 Representation in conservation reserves

The snail has been recorded at Scheyville National Park, Agnes Banks Nature Reserve, Castlereagh Nature Reserve, Windsor Downs Nature Reserve and the northern tip of Gulguer Nature Reserve (Bents Basin). Given the distribution and morphological diversity apparent with the Cumberland land snail, the current reserve system does not represent an adequate coverage of the species morphological and genetic diversity particularly in the southern and south-eastern parts of its range.

However, a number of sites occur on lands owned by public authorities including Prospect Reservoir, the Holsworthy and Orchard Hills defence facilities and Noorumba (Campbelltown LGA) and Nurragingy (Blacktown LGA) Reserves, which, under appropriate management conditions, could provide a suitable level of protection.

The new Cumberland land snail records within the Western Sydney Parklands – Bungarribee Precinct, which will be managed under a trust administered by the Department of Planning, will increase representation in protected areas.

2.4 Population Dynamics

Due to the snail's limited mobility, there is an issue in defining what constitutes a distinct population in Western Sydney. Within the present remnant disjunct populations, several morphotypes exist, suggesting that there might be considerable genetic differences between extant populations (NSW Scientific Committee 1997).

A study conducted by Stephanie Clark and Barry Richardson, titled 'Spatial analysis of genetic variation as a rapid assessment tool in the conservation management of narrow-range endemics,' was published in by CSIRO in 2002. The study presented the findings and analysis of 152 individuals representing 17 populations of Cumberland land snail. It found that a mean habitat radius for a Cumberland land snail was approximately 350m. This represents the extent of the genetic neighbourhood for the species (Clark & Richardson 2002). The abstract for this paper is provided in **Appendix B**.

Clarke and Richardson (2002) also found that there was no evidence of increasing divergence between populations of distances greater than 100m and that significant movement of individuals within a single generation is limited to approximately 350m. The study recommended that the critical gap size for the Cumberland land snail was also approximately 350m (Clark & Richardson 2002). Further work by Clarke suggests that the snails on the border of populations illustrate the greatest genetic diversity.

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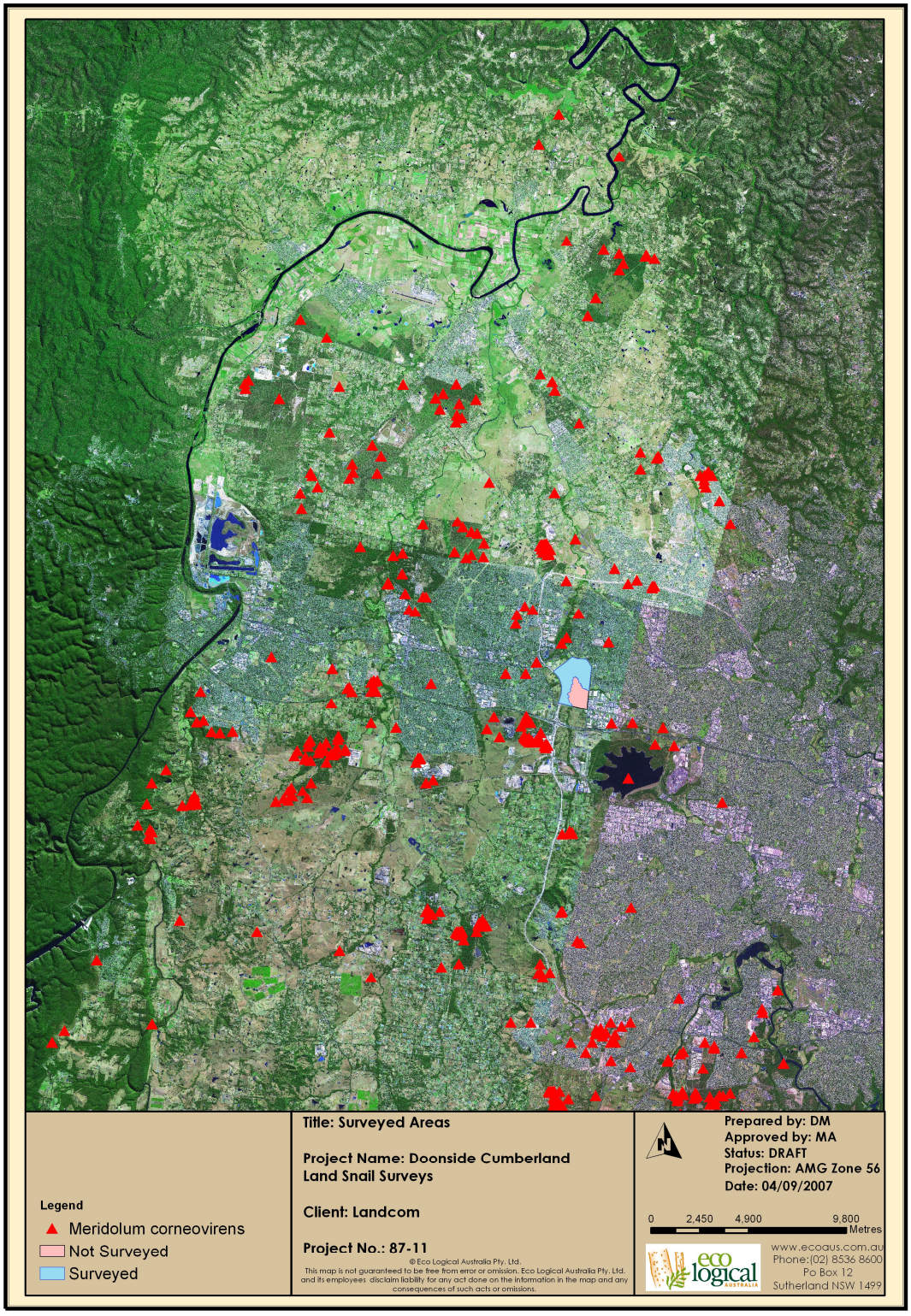
Figure 2: Cumberland land snail locations within Western Sydney.



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These findings are directly relevant to establishing the genetic extent of the population at Bungarribee, the viability of this population and in determining ecological restoration plans for the parklands.

2.5 Threatening Processes

There are several key threatening processes that have been declared by DECC for the Cumberland land snail. These include:

- the clearing and degradation of Cumberland Plain remnants;
- high frequency fire resulting in loss of vegetation structure and composition;
- removal and reduction of groundcover including leaf litter, woody debris, and bark accumulations; and
- modification of habitat through weed invasion (NPWS 2000).

High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition" is also a key threatening process listed under the *TSC Act*. This process is relevant to this species and currently occurring on site through repeated arson attacks.

2.6 Legal Precedents

Proposals that may have potential impacts on the Cumberland land snail are typically subject to Part 5A of the *Environmental Planning and Assessment Act1979* (or seven part test). This test considers the likely significant impact from the proposal on the threatened species and their habitat. Although this project will be assessed under Part 3A of the EP&A Act, which does not require a significance assessment, there is case law that provides precedents regarding Cumberland land snail and significant impact assessment.

In *BT Goldsmith Planning Services Pty Ltd v Blacktown City Council* (2003) NSWLEC 240, the NSW Land and Environment Court found that Cumberland land snails could be translocated to a nearby reserve in order to satisfy Part 5A of the *Environmental Planning and Assessment Act 1979*. Conversely in *Australand Holdings Limited v Liverpool City Council* (2007) NSWLEC 229, the NSW Land and Environmental Court found that Cumberland land snail could **not** be translocated into a residual lot. This decision was based on concerns that the size and isolation of the resident snail population could result in inbreeding which would disadvantage the long term survival of the species at the location.

In interpreting these judgments it would appear the court is upholding the notable case of *Drummoyne Municipal Council v Roads and Traffic Authority of NSW of NSW* (1989) 67 LGRA 155 at p163), in which significance is interpreted in the context and upon the facts of the each individual case.

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3. Methods

3.1 Data Audit

An audit of digital data was undertaken to assist in locating potential habitat for the Cumberland land snail. This included vegetation mapping and Atlas records. Vegetation communities within the study area were reviewed (NSW NPWS, 2002) along with aerial photography of the study area (LPI, 1998 approx.) prior to field survey. Data from the NSW National Parks and Wildlife Service Atlas of NSW Wildlife was reviewed, identifying the regional distribution of Cumberland land snails.

3.2 Field Survey

Targeted field surveys were conducted over a period of 7 days, from the 22nd August to 3rd September. The area surveyed is shown in **Figure 3**. The surveys were undertaken by Daniel Magdi, Simon Tweed, Enhua Lee, Penny Colyer, and Alastair Patton of Eco Logical Australia Pty Ltd (ELA). Approximately 105 person hours were utilised in completing the survey.

The weather conditions during the targeted field surveys are outlined in **Table 1**.

Table 1 Weather conditions during field surveys

Date	Min Temp (°C)	Max Temp (°C)	Rainfall (mm)
22nd August 2007	9.5	15.1	1.6
23rd August 2007	8.3	17.2	1.1
24th August 2007	8.4	18.2	2
29th August 2007	9.6	21.9	0
30th August 2007	14.8	27.2	0
31st August 2007	14.8	26.5	0
3rd September 2007	11.8	21.2	0

Weather observations were taken from Prospect (www.bom.gov.au)

The survey was targeted at potential habitat, primarily within native vegetation, at the base of *Eucalyptus tereticornis* (Forest Red Gum), and under woody debris. The survey covered an area of approximately 57 ha of native vegetation, including Alluvial Woodland and Shale Plains Woodland within the study area.

Survey methods included:

- Active searches of litter and bark accumulations at the base of *Eucalyptus tereticornis*;
- Active digging of loose soil at the base of *Eucalyptus tereticornis*;
- Active searches under woody debris, rocks and other surface materials (ie: carpet, cement, tin); and
- Limited active searches at the base of *Eucalyptus amplifolia* and *Eucalyptus moluccana.*

The presence of empty shells was treated as a positive identification for the presence of living individuals.

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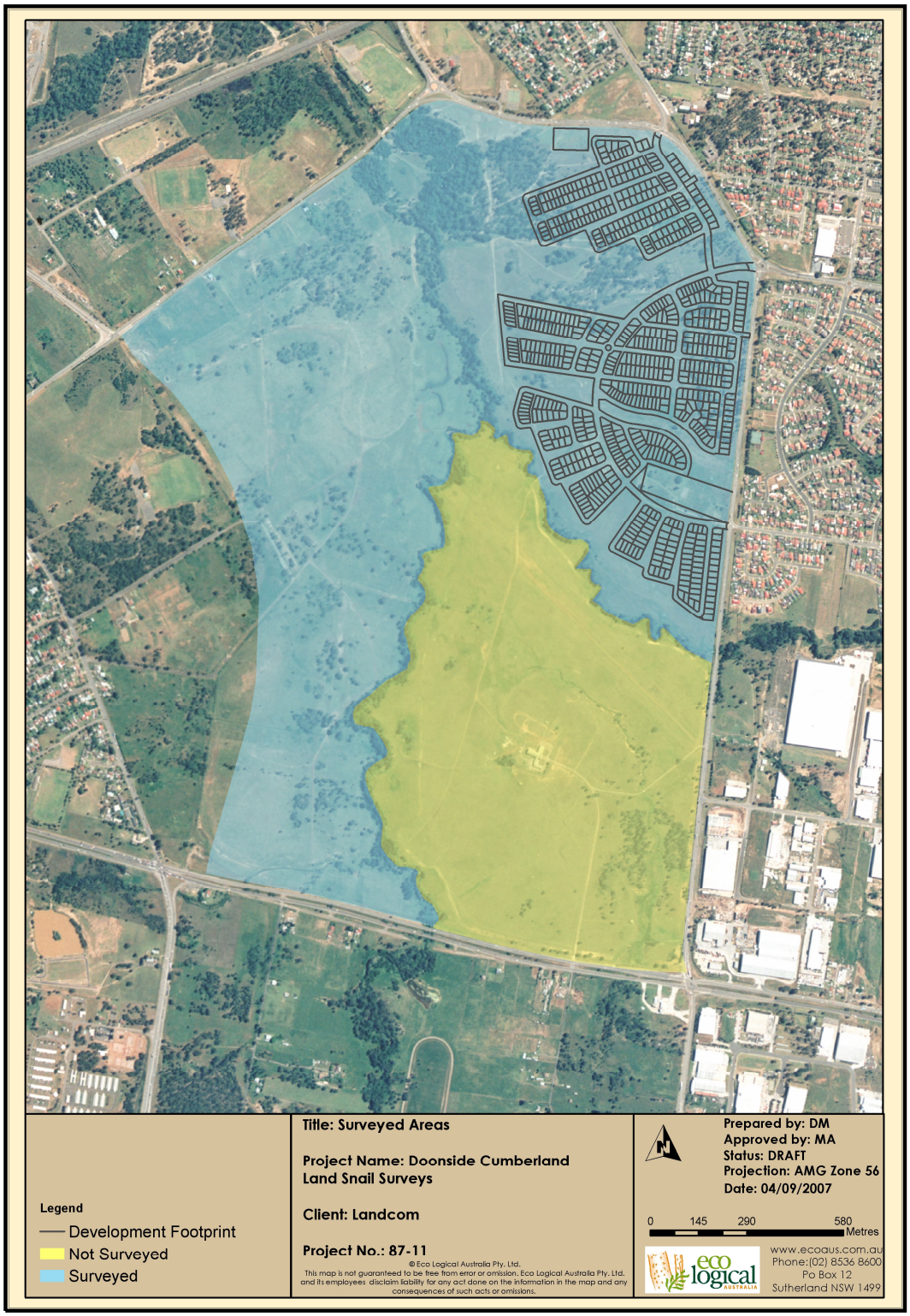
Figure 3: Area Surveyed



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3.3 Licence Conditions

Current scientific licences to conduct flora and fauna surveys are held by Eco Logical Australia (ELA). These licences are issued by the NSW NPWS and Department of Primary Industries (DPI) and place an obligation upon Eco Logical Australia to submit all survey and incidental records to the NPWS for inclusion in their databases (primarily the Atlas of NSW Wildlife).

The targeted field surveys for the Cumberland land snail were completed based upon the specific techniques outlined within the Environmental Impact Assessment Guidelines for the Cumberland land snail and in accordance with the above licence conditions.

It is noted that invertebrates would not normally be regarded by Animal Care and Ethics Committee's (ACEC) administered under DPI.

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4. Results

4.1 Distribution

The surveys identified 215 separate positive sites for Cumberland land snail. Within these record sites, 244 shells and 35 live snails were recorded. The concentration of the sites is shown in **Figure 4**, and occurs within the Shale Plains Woodland to the north and west of the proposed Doonside Residential Footprint. There were other isolated positive search results within Alluvial Woodland along Eastern Creek and a tributary.

The surveys identified that there are 19 sites (or 8.8%) within the current development footprint where 17 shells (6.9%) and 4 live snails (11.4%) were recorded. The asset protection zone (APZ) requirements are included within the calculation of impacts from the development footprint.

The bulk of the population exists within the patch of Shale Plains Woodland located immediately outside the development footprint, with 215 shells (88%) and 29 live snails (74%) recorded.

The areas of Alluvial Woodland surveyed within the Bungarribee and Doonside Precincts had scattered locations where the snails were found. These included 12 shells and 2 live snails. Tubulated results are presented within **Table 2**.

Table 2 Survey results.

Location	Positive Searches	Shells	Live Snails
Shale Plains Woodland (Development Footprint)	19	17	4
Shale Plains Woodland	183	215	29
Alluvial Woodland	13	12	2
Total	**215**	**244**	**35**

4.2 Population

The survey identified a viable population within the Shale Plain Woodland adjacent to the Doonside residential development.

Based on the results from the field surveys, there is estimated to be only one population within the Bungarribee Precinct. Given that the relative spatial distribution of the results is centred as illustrated in **Figure 4,** it is believed that this population comprises one genetic community. The spatial extent of the community is approximately 254m (north-south) by 204m (east west). This is well within the mean 350m radius established by Clarke et al (2002).

4.3 Micro Habitat

The majority Cumberland land snail locations were found within litter and bark accumulations at the base of *E.tereticornis.* Other habitats under which the snail was

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recorded included woody debris, rocks, and foreign building material. These habitat results are documented in **Table 3.**

Table 3 Habitat results.

	Sites	Live Snails	Shells
Eucalyptus tereticornis	194	29	216
Eucalyptus amplifolia	1	0	1
Eucalyptus moluccana	5	0	5
Woody Debris	6	2	6
Rock	6	4	13
Other Materials	3	0	3
Total	**215**	**35**	**244**

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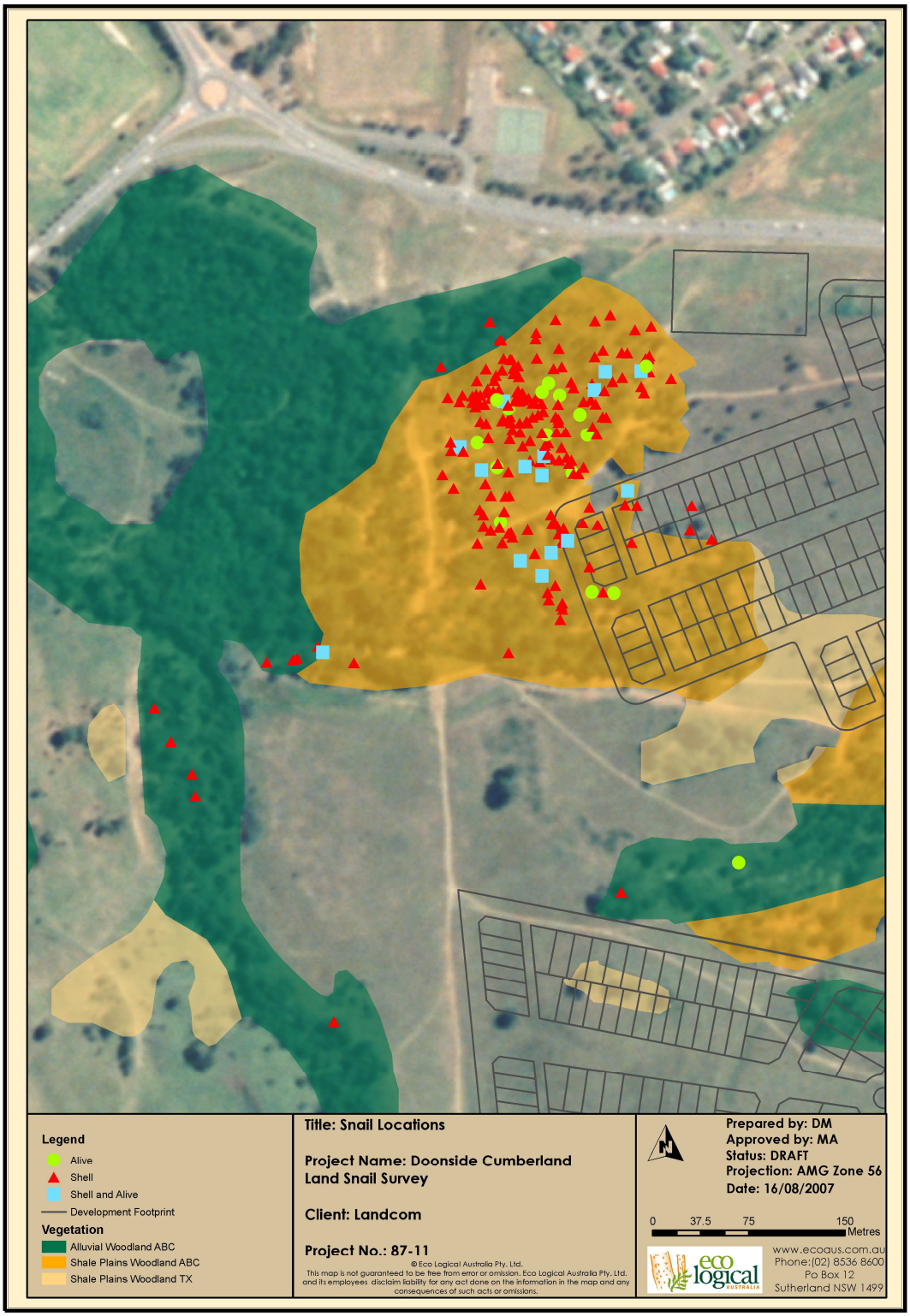
Figure 4: Survey Results.



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4.4 Threats

Several threats to the Cumberland land snail were identified during the field surveys. These threats included:

- Weed invasion (Africa Olive);
- Frequency and intensity of current fire regimes;
- Exposed ground surfaces on Trails and easements; and
- Predation by introduced snails.

Weed invasion by African Olive is currently the major threat to the Cumberland land snail at the Doonside site. African Olive, which is toxic to the snail, dominates the understorey of some large *E.tereticornis* in areas shown in **Figure 5**.

Fire regime is a key threatening process to the Cumberland land snail. There has been recent fire activity within the Doonside Precinct that has affected the amount of habitat available for the snails. This fire activity is shown in **Figure 5**. This fire affected area is devoid of larger logs and woody debris possibly indicating intense fire events.

Trails and easements, shown in **Figure 5**, are located throughout the surveyed area. These tracks and trails may be a potential barrier for Cumberland land snail movement. The bare surfaces present an increased exposure to predators such as birds. Introduced snails were also present within the Bungarribee Precinct, west of Eastern Creek. These snails are carnivorous and may have an impact on the long-term viability of the recorded snail population.

4.5 Discussion

The targeted surveys within the Parklands Bungarribee Precinct and Doonside Residential Parcel resulted in the identification of a single viable population within the Shale Plain Woodlands. The survey also recorded limited and scattered findings within the riparian corridors of Eastern Creek, and a tributary with the Alluvial Woodland habitat.

Approximately 95% of the Cumberland land snails found within Bungarribee were recorded in the Shale Plains Woodland to the north and west of the north-western portion of the Doonside Residential footprint. Approximately 88% of snails within this stand are located outside the development footprint, with approximately 10% of snails occurring within the development footprint.

The snails that will be impacted by the proposed development are part of a larger stable and viable population of Cumberland land snails, within the stand of Shale Plains Woodland. The area within this patch of Shale Plains Woodland that is proposed to be cleared as a result of development is approximately 1.79 ha. Of this area, only 0.66 ha (or 37%) contains snail records at this time. However it is noted that if the recent fire history was to positively change, this area would most likely become suitable snail habitat and predictably would have been in the past.

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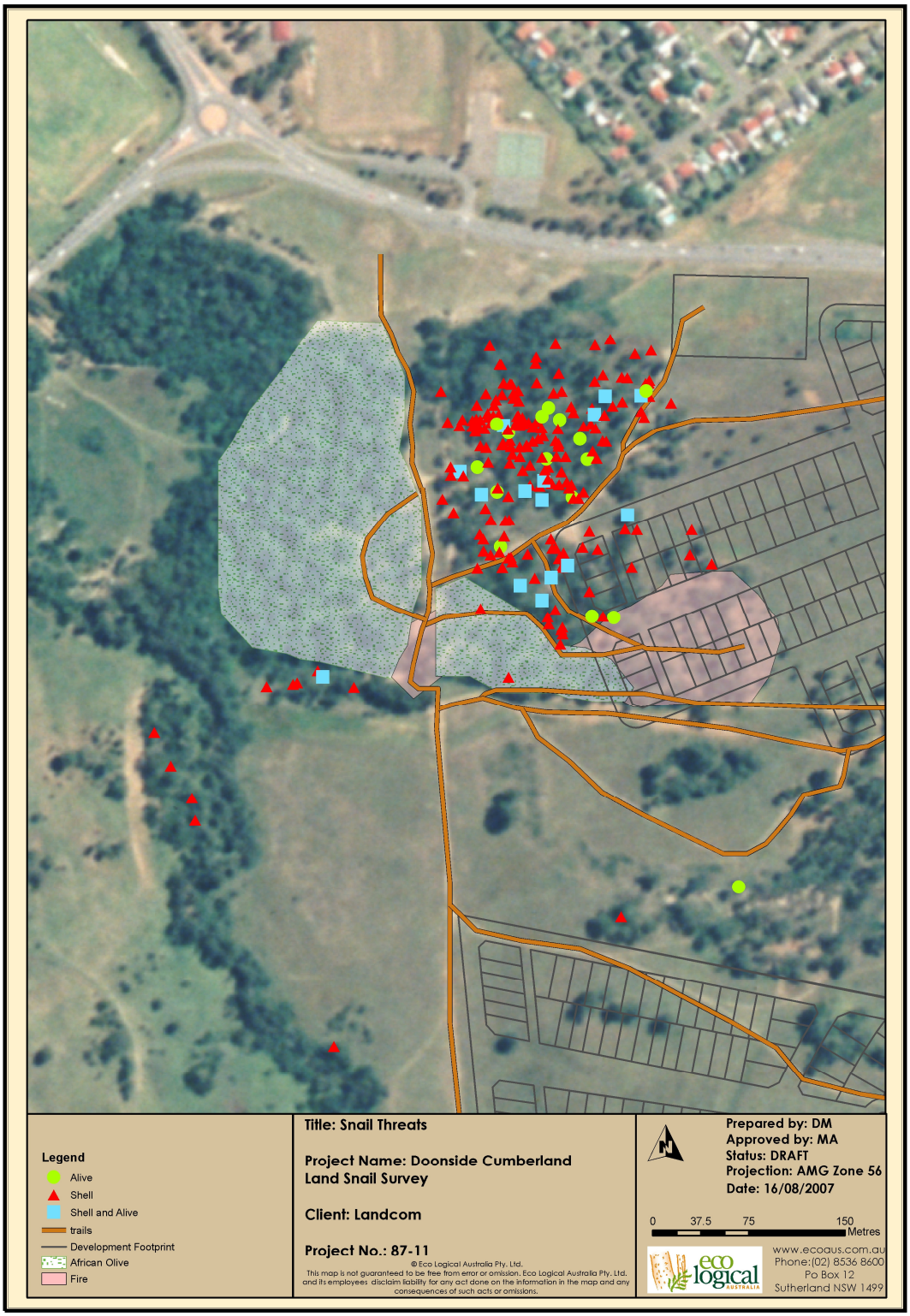
Figure 5: Snail Threats.



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5. Mitigation Measures

There are a number of measures that can be taken to address impacts on site. In order to co-ordinate and manage these measures, spatially and temporally, it is recommended that a Cumberland Land Snail Plan of Management (CLSPoM) be developed as a requirement of project approval under Part 3A.

The CLSPoM would include a detailed set of actions to improve habitat in areas adjacent to the proposed development. Issues to be addressed in the CLSPoM include:

- weed management (ie the removal of Africa Olive);
- fire management prescriptions and hazard reduction guidelines;
- predation management;
- reduction of human interference through interpretation and signage;
- ecological restoration to provide habitat linkages within the Bungarribee Precinct;
- potential translocation of affected individuals;
- a staged plan of works that will need to be carried out before, during and post development; and
- monitoring.

The mitigation measures that are outline below will require some level of coordination between the developer and the future trust. Specific mitigation measures suggested for the CLSPoM are outlined below.

5.1 Weed Management

The removal and control of Africa Olive in the western and southern areas of the Shale Plains Woodland patch will increase the available area of habitat to the existing Cumberland land snail population.

In order to reduce further the toxic nature of leaf drop from the olives, it is suggested that surrounding leaf litter also be collected and replaced with debris from area's proposed to be cleared.

The initial removal of weed species should be incorporated into planned bush regeneration activities for the site, but made a first priority. Ongoing monitoring of olive seedlings and saplings will also be required. Weed removal should commence prior to construction. Follow up weed removal will be needed during construction and post construction, as would be recommended within a CLSPoM.

5.2 Fire Management

Detailed research has been undertaken by Watson (2006) investigating the appropriate fire regimes required for threatened flora species and Cumberland Plain Woodland in Western Sydney. These recommendations along with estimates of leaf litter accumulation and bushfire hazard should be used to determine an appropriate fire regime to support Cumberland land snail at this location. The CLSPoM should outline the recommended fire:

- Frequency;

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- Intensity;
- Season; and
- Exclusions (ie bases of *E.tereticornis*).

5.3 Reduction of Human Interference

At a minimum, access through the Shale Plains Woodland from the development should be minimised, consolidated and controlled. Raised boardwalks and tracks within the habitat area should be considered to reduce habitat impact and facilitate snail movement.

Interpretation and signage should be considered to educate future Doonside residents of the presence and habitat requirements of the Cumberland land snail. Prohibitions on fire (arson), firewood collection and garden waste disposal are considered mandatory.

5.4 Ecological Restoration

The current ecological restoration plan for the Bungarribee Precinct does not identify Shale Plains Woodland recreation or restoration within 350m of the snail population. The ecological restoration plan should be amended to provide additional habitat particularly on the eastern side of Eastern Creek where introduced (predatory) snails were not recorded.

Further landscaping adjoining the residential area should exhibit a strong preference to the placement of *E.tereticornis* where possible.

5.5 Translocation

All translocation of threatened fauna is regulated by the Department of Environment and Climate Change (DECC). Translocation of threatened fauna typically requires a licence issues under s91 of the *TSC Act*. Part 3A of the EP&A Act, under which this development is being assessed, does not extinguish the s91 licence requirements under the TSC Act.

In administering these licences, DECC has established a policy to guide the planning and implementation of translocation programs for threatened fauna in NSW. Each translocation program must be undertaken in accordance with a translocation proposal (TP) which has been prepared following the guidelines in the policy and is licensed by DECC. The DECC translocation policy is provided in **Appendix C**.

The translocation program and monitoring will need to be performed for snails located within the development footprint. These snails will need to be translocated as close to their original site as possible. The translocation program should include:

- a schedule of works;
- implementation of shelter devices within the areas where the snails will be translocated to;
- translocation events at two weeks, one week and one day prior to civil works; and
- monitoring by a qualified ecologist during works.

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5.6 Staged Implementation

A staged plan of works will need to be established for the Cumberland land snail management before, during, and after the development process. This may be expressed in table form, with categories to be addressed including:

- Action type eg. *investigation, design / planning, capital works, -maintenance;*
- Preferred Priority: *to be based on the agreed prioritisation process;*
- Preliminary Cost Estimate;
- Evaluation criteria; and
- Targets (2 and *5 years*).

5.7 Monitoring

Monitoring (ie recording snail populations) will potentially be a source of additional and ongoing impact on the snail population and its habitat. As such it is recommended that the monitoring actions that will be outlined within the CLSPoM have minimal impact on the snail population and its habitat. Achievement and fulfilment of the commitments in the CLSPoM can be readily achieved.

A comparative census should be undertaken 2 years after the implementation of the initial actions in the CLSPoM, and recommendations made as to the necessity and/or desirability of a further census at 5 years.

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6. Recommendations

The mitigation measures have the potential to significantly reduce impacts on resident Cumberland land snails within the development footprint. The mitigation measures outlined will need to be implemented to maintain a viable population of Cumberland Land Snail within the site, given the populations location and current condition.

The improvements to adjacent habitat condition that is currently degraded, through the presence of African Olive and inappropriate fire regimes in particular, is expected to increase the availability and suitability of snail habitat. With the increase in available habitat, it is not expected that the proposed translocation of a small number of snails into this larger population will result in negative impacts - such as inbreeding which would disadvantage the long term survival of the species at this location. The translocation of snails from the development footprint will need to be done in accordance with the DECC guidelines and following the implementation of the CLSPoM.

Impacts on the Cumberland land snail and its habitat within the development footprint will occur as a direct consequence of the proposed residential development. These impacts are not considered likely to pose a significant impact on the population provided an appropriate CLSPoM (as outlined above) is implemented prior to development.

The establishment of a CLSPoM will need to be the first action undertaken. The CLSPoM will outline a detailed schedule of works pre-construction, during construction, and post construction that are needed to implement all mitigation measures outlined within this report.

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Appendix A – Final Scientific Determination

Cumberland Plain land snail - endangered species listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list *Meridolum corneovirens* (Pfeiffer, 1851), a large land snail, as an ENDANGERED SPECIES on Part 1 of Schedule 1 of the Threatened Species Conservation Act.

The Scientific Committee has found that:

1. *Meridolum corneovirens* is a large land snail, found on the Cumberland Plain in remnant pockets of urban bushland, in areas associated with Wianamatta Shale and old Nepean river gravels.

2. *Meridolum corneovirens* occurs in eucalypt woodland under logs and debris and around bases of trees or clumps of grass, burrowing into loose soil.

3. Collections in the Australian and Queensland Museum indicate that the species was formerly common throughout the Cumberland Plain, but recent records indicate that only small remnant disjunct populations remain.

4. Within the present remnant disjunct populations, several morphotypes exist suggesting that there might be considerable genetic differences between extant populations.

5. The habitat of *Meridolum corneovirens* has been drastically reduced with clearing of bush and is subjected to major current development pressures, which further threaten the remaining populations.

6. In view of 3, 4 and 5 above, the Scientific Committee is of the opinion that the numbers of i have been reduced to such a critical level and its habitats have been so drastically reduced that it is in immediate danger of extinction and that M. corneovirens is likely to become extinct in nature in New South Wales unless the circumstances and factors threatening its survival cease to operate.

Associate Professor Paul Adam
Deputy Chairperson
Scientific Committee

Gazetted: 8/8/97

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Appendix B – Paper Abstract

Spatial analysis of genetic variation as a rapid assessment tool in the conservation management of narrow-range endemics

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Abstract. The number of narrow-range taxa of conservation concern is steadily increasing. As a consequence, there is an urgent need to obtain data on their spatial distributions and to determine how genetic diversity and population structure are affected by fragmentation. This paper outlines the way in which spatial analysis of genetic variation can be used to guide conservation management decisions using allozyme data for the endangered endemic terrestrial mollusc *Meridolum corneovirens* (Pfeiffer, 1851) (Pulmonata : Camaenidae). Spatial autocorrelation analysis indicates that *M. corneovirens* populations are highly structured at very short distances (2 m) and that the radius of a genetic neighbourhood is approximately 350 m. An estimate of genetic neighbourhood size is a particularly useful parameter to have available for a species, especially from a conservation management perspective. It gives an indication of the distances moved by individuals between birth and breeding and hence the size of gaps in distribution that can be filled within a generation. Furthermore, replicate samples need to be separated by more than 350 m to be considered independent. Allozymes and spatial autocorrelation analysis can be used to obtain relevant management information for some species of conservation concern in a rapid, cost effective way.

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Appendix C – Policy and Procedure Statement No.9

NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

Threatened Species Management

POLICY AND PROCEDURE STATEMENT No 9

POLICY FOR THE TRANSLOCATION
OF THREATENED FAUNA IN NSW

October 2001

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1 Introduction

Translocation has been an effective strategy for the management of threatened animals in various parts of the World. Some translocation programs have been undertaken and others are planned for a range of threatened fauna in NSW and other parts of Australia. The NSW National Parks and Wildlife Service (NPWS), through various licensing provisions, is the primary regulator of this activity in NSW.

The *Threatened Species Conservation Act 1995* (TSC Act) has an objective to prevent the extinction and promote the recovery of threatened species, populations and ecological communities in NSW. However, translocation should not be used as a substitute for protection of high quality natural areas and conservation of wild populations *in situ* and the methods, risks and consequences associated with a proposal need to be thoroughly assessed before any translocation is undertaken. Consequently, the NPWS has prepared this policy to guide planning and implementation of translocation programs for threatened fauna in NSW.

The Australian and New Zealand Environment Conservation Council (ANZECC) has prepared the (Draft) ANZECC Policy for Translocation of Threatened Animals in Australia (Appendix 1). The NSW policy follows and extends the draft ANZECC policy specifically for use in NSW, except that the NSW policy currently excludes invertebrates.

The implementation of the policy in NSW is dependent on adequately prepared Translocation Proposals (TP) for which guidelines are provided in Appendix 2. All translocations covered by the policy must be licensed by the NPWS and all applications for licences to translocate threatened fauna in NSW must be accompanied by a completed TP.

2 Definitions

For the purposes of this policy:

- *Approved recovery plan* is a recovery plan approved under Part 4 of the TSC Act.
- *Biodiversity reconstruction programs* are translocation programs which are justified by the primary objective of re-introducing locally extinct taxa to selected areas for the purposes of increasing biodiversity.
- *Captive population* means a population restrained by physical means, usually for the purposes of captive breeding, education or display.
- *Captive breeding programs* are programs that involve the restraint of individuals by physical means and the provision of conditions suitable for breeding.
- *Draft recovery plan* is a recovery plan prepared under the TSC Act that has been approved by the Director-General of National Parks and Wildlife for public exhibition.

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- *Emergency transfer programs* are programs which are justified by the objective of removing individuals from a demonstrably unavoidable life-threatening situation in the wild.
- *Endangered population* is a population specified in Part 2 of Schedule 1 of the TSC Act.
- *Endangered ecological community* is an ecological community specified in Part 3 of Schedule 1 of the TSC Act.
- *Fauna* are mammal, bird, reptile and amphibian species as defined in the *National Parks and Wildlife Act 1974.*
- *Habitat fencing* is the construction of physical barriers around areas of suitable habitat for native animals in order to meet a variety of objectives, including the exclusion of exotic pest species.
- *Host environment* is the environment where translocated individuals are to be released.
- *Introduction* is the release of an organism outside its historically known range.
- *Managed populations* means populations which require ongoing habitat management, such as feral pest control or the provision of food or shelter, in order to survive.
- *Recovery team* is a team which assists with the co-ordination of the recovery of a threatened species, population or ecological community.
- *Receiving area* is the area in which a population of a threatened species exists within the host environment prior to receiving translocated (supplementary) individuals.
- *Re-introduction* is the release of an organism into part of its historically known range from which it has become extinct.
- *Re-stocking* means the same as supplementation.
- *Source environment* is the environment from which individuals are collected for the purposes of translocation.
- *Source population* is the population from which individuals are to be taken for translocation.
- *Species* of animal includes any sub-species and taxon below sub-species as defined in the TSC Act.
- *Species recovery programs* are programs which are part of the recovery planning process under the TSC Act and may include actions to translocate animals which are justified by the objective of assisting the recovery of the threatened species.

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- *Supplementation* is the addition of individuals to an existing population of the same species.
- *Threatened animals* are those mammal, bird, reptile, amphibian and invertebrate species that are listed in Schedule 1, Parts 1 and 4, and Schedule 2 of the TSC Act.
- *Threatening processes* are processes that threaten or may have the capacity to threaten the survival or evolutionary development of species, populations or ecological communities as defined under the TSC Act.
- *Translocation* is the movement of living organisms from one area with free release in another. There are three types of translocation: introduction, re-introduction and supplementation.
- *Translocation proposal* (TP) is a document prepared in accordance with the policy, prior to the commencement of the translocation program.
- *TSC Act* is the NSW Threatened Species Conservation Act 1995.

3 Scope

The policy applies to all translocations of threatened fauna within, into or from NSW. The policy also applies to endangered populations of fauna. It will be useful to apply the policy to threatened invertebrates and to protected fauna, for example species recognised as part of an endangered ecological community and individual animals which have been rehabilitated. This policy should be read in conjunction with the NSW *Wildlife Rehabilitation Policy 1999*.

The translocation of threatened fauna amounts to "harm" under the *National Parks and Wildlife Act 1974* (NP&W Act) which defines harm as being to: *hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure or kill, but does not include harm by changing the habitat of an animal.*

There are restrictions placed on the actions typically required for translocation.

- All actions likely to "harm" a threatened species which is living free in the wild require licensing where the action does not have approval under the *Environmental Planning and Assessment Act 1979*. Licences to "harm" may be issued under Section 120 of the NP&W Act.
- It is an offence to "liberate" a fauna species in NSW without a licence issued under Section 127 of the NP&W Act.
- In order to import fauna into NSW a licence under Section 126 of the NP&W Act is required.

An authorised officer of the NPWS can issue a single licence covering the provisions of "harm", "liberate" and "import" under the NP&W Act. When the proponent is from within the NPWS, the licence authorising the translocation should be issued from a different functional unit or Directorate of the NPWS.

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All free living native fauna in NSW including threatened species are the property of the Crown as specified in Section 97 of the NP&W Act.

NSW Agriculture has a legislative role in relation to animal welfare issues and the policy does not obviate the need for Animal Ethics Committee approval under the *Animal Research Act 1985*. The policy should be read in conjunction with:

- *Prevention of Cruelty to Animals Act 1979*
- *Prevention of Cruelty to Animals Regulation 1981*
- *Animal Research Act 1985*
- *Animal Research Regulation 1995*
- *Exhibited Animals Protection Act 1986*
- *Exhibited Animals Protection Regulation 1995*

Summary of licensing process for the translocation of threatened fauna

1 Read the policy and relevant legislation.
2 Contact the relevant NPWS Field Directorate Threatened Species Unit to discuss the relevance of translocation to any draft or approved recovery plan for the species, threat abatement plan or other management plan.
3 Complete a translocation proposal (TP) in accordance with the guidelines in the policy.
4A Apply to the relevant NPWS Regional Directorate Office for a licence under the NP&W Act and include a completed TP.
4B Concurrently with NPWS application, apply for and obtain any other necessary approvals/licences from other government agencies.
5 NPWS licence is issued, with or without conditions, or it is rejected.
6 If issued, translocation proceeds in accordance with the TP and the conditions of the licence.

NB The proponent must allow at least three months between submitting the licence application and the commencement of the translocation program.

4 Background information

4.1 Biodiversity conservation

Many factors have contributed to the extinction and decline of animal species in Australia since European settlement. These include the removal and modification of native vegetation and the introduction of competitive species (eg rabbits and goats) and predator species (eg cats, foxes and mosquito fish). The protection of habitat and control of pest species are integral to biodiversity conservation. The distribution of native vegetation and animals in NSW is fragmented and subject to a wide range of impacts including clearing, weed infestation and frequent fire.

Threatened animal conservation in NSW will typically require one or more management strategies such as:

- Protection of native vegetation

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- Restoration and rehabilitation of degraded habitat
- Pest control
- Avoid introducing exotic diseases
- Reservation of protected areas
- Off-reserve conservation
- Recovery planning
- Threat abatement planning
- Translocation programs
- Captive breeding programs
- Habitat supplementation
- Habitat fencing

4.2 Justification for translocation of threatened fauna

The policy addresses four justifications for the translocation of threatened fauna: species recovery, biodiversity reconstruction, emergency transfer and research.

4.2.1 Species recovery programs

Species recovery translocation programs are a justifiable part of the recovery planning process currently being undertaken in NSW under the TSC Act. They are undertaken as part of a broader co-ordinated recovery strategy directed toward the recovery of the threatened species in the wild.

4.2.2 Biodiversity reconstruction programs

Biodiversity reconstruction programs are area-based translocation programs that have been developed as part of a land management program. A biodiversity reconstruction program is likely to be a justifiable outcome of successful threat abatement and habitat management. Biodiversity reconstruction programs may involve several species and are aimed at re-establishing the species that historically occupied an area, thereby extending their current range. Biodiversity reconstruction programs are not necessarily a part of and should not compromise any species-specific recovery planning effort.

4.2.3 Emergency transfer programs

The purpose of emergency transfer programs is to remove threatened fauna from a demonstrably life-threatening situation in the wild. These programs are generally concerned with the welfare of individuals but may also address the conservation of the species as a whole. The care and release of fauna in these programs will be subject to the same animal welfare considerations as captive breeding strategies outlined in this policy and be guided by the NSW Wildlife Rehabilitation Policy.

Situations where a case for emergency transfer may arise include where a remnant population is in serious decline and the threat cannot be adequately ameliorated. Emergency transfers, by their nature, require an immediate response that may not allow for a detailed translocation program to be developed. The NPWS will advise applicants

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regarding the preparation of translocation proposals and will expedite licence applications in such cases.

The policy allows for the removal of individuals in an emergency situation and the holding of these individuals while a translocation proposal is prepared. Release of captive individuals to a new host environment will only be allowed when a TP is prepared and the necessary licences have been issued. This precautionary approach is necessary because the release of fauna may result in their death or injury or damage to the host environment. At the time of release, translocated individuals may be particularly vulnerable to predation, injury or stress in their new environment. Examples of damage to the host environment are overgrazing and consequent degradation of native vegetation by released herbivores and loss of native fauna to released predators. In some cases, an option may be to re-release fauna into the source environment following threat abatement or habitat rehabilitation.

4.2.4 Research programs

The NPWS will encourage proponents of TPs to include scientific research as part of translocation programs which are justified under the above programs. In addition, there may be species for which the factors causing local extinction are unknown but there is a case for re-introduction as part of a research program that aims to investigate these factors. These programs must demonstrate that they have a conservation benefit.

4.3 Types of translocation

4.3.1 Introduction

Introduction for the purpose of conservation is the release of an organism outside its historically known range but within an appropriate habitat and bio-climatic region. The introduction of a species may be potentially harmful to other species currently existing within the host environment. Introductions may also alter the evolutionary development of natural ecosystems. Introduction may be appropriate where the translocated species is to fill a niche role where such a role is crucial to the proper functioning or sustainability of the host environment or the introduction is the last resort to save a species from extinction and the potential benefits to the species outweigh any potential adverse impacts on the host environment. Introductions will be licensed only in cases where the conservation reasons are exceptionally strong.

4.3.2 Re-introduction

Re-introduction is the release of an organism into part of its historically known range from which it has become extinct. Re-introduction to establish new populations may be a very important precaution against the possible extinction of a species which is confined to a small number of isolated populations subject to continuing decline, ongoing threats or a restricted area of suitable habitat. Re-introduction may also be used for restoring a species to its historical range where it is unable or unlikely to disperse naturally and for biodiversity reconstruction programs.

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4.3.3 Supplementation (re-stocking)

Supplementation is the addition of individuals to an existing population of the same species. Supplementation may be useful where the natural recovery of a small population is so slow as to leave the population vulnerable, to counter the adverse effects of inbreeding or to maintain genetic exchange between small isolated populations.

4.4 Strategies to complement translocation programs

4.4.1. Captive breeding

Captive breeding programs are generally resource intensive. They involve the restraint of individuals by physical means and the provision of conditions suitable for breeding. The aim of captive breeding as a component of a translocation program should be to establish a secure sample of the species with a view to the maintenance or re-establishment of viable populations in the wild. Captive breeding programs may also be used to improve understanding of the biology, behaviour and ecology of a species and to develop skills to assist with translocation.

Captive breeding programs must address the risks associated with the health and welfare of individual animals. Usually, individuals are taken from the wild, bred in captivity to increase or maintain numbers, then released as part of a species recovery program. Captive breeding may require varying methods of intervention to produce suitable conditions for breeding. These may include: regular feeding of animals with artificial or natural foods, artificial breeding techniques, partitioning of the population, control of diseases and vaccinations.

In some circumstances, direct translocation without captive breeding may provide the best chance of a species becoming established in the host environment. It avoids problems associated with long-term handling and confinement of animals and is generally more cost-efficient. Hence, the decision to captive breed rather than transfer individuals directly from source to host environments should be considered carefully.

Translocations that must be endorsed include releases of captive-bred stock to the wild, including releases to areas that are fenced to exclude predators. Captive breeding programs that do not involve release into the wild as part of the program are not considered in this policy.

4.4.2 Threat abatement

In many previous translocation programs, the maintenance of translocated populations in the wild has required a comprehensive threat abatement component to address current and potential threats. The threat abatement component of a translocation program should aim to manage the threatening process(es) so as to abate, ameliorate or eliminate its adverse impacts on translocated individuals or populations. Threat abatement must be planned, resourced and undertaken for the duration of the threat. This may be a considerable component of the cost of a translocation program.

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Threat abatement may include control of vertebrate pests; retention and restoration of native vegetation, including removal of weeds; fire management, including re-establishment of a suitable fire regime; removal of sources of pollution; and exclusion of pedestrians, vehicles or stock.

4.4.3 Habitat fencing

Habitat fencing involves the construction of physical barriers around areas of habitat suitable for native animals. Habitat fencing may be a critical component of a translocation program. Various methods of habitat fencing (eg. wire netting, electrified fences) may be used to achieve a variety of objectives including: selective exclusion of pest species, especially terrestrial predators; exclusion of large grazers and browsers; limiting colonisation or re-colonisation by pest species; prevention of access by stock, pedestrians or vehicles; and creation of enclosures where native vegetation can regenerate. TPs will need to consider the potential impacts of fencing, including the risk of injury or death to fauna in the host environment.

4.4.4 Habitat supplementation

Species cannot be translocated into areas of their historically known range if the habitat is now unsuitable. A habitat supplementation component of a translocation program involves identifying the limitations of potential host environments and then providing the necessary resources to make the habitat suitable for the translocated species. Habitat supplementation may include: provision of artificial nest sites, creation of watering points, creation of refuge sites and provision of food sources including planting of food trees. Habitat supplementation should only be considered as a temporary component of a translocation program. The goal should be to provide habitat alternatives while suitable natural habitat in the wild is restored or developed.

4.4.5 Community awareness, education and involvement

Community awareness, education and involvement is encouraged where it does not compromise the objectives of the translocation program. Translocation programs are usually linked to species recovery planning, threat abatement planning or other planning mechanisms which already include strategies for community awareness, education and involvement. These and other appropriate strategies should be incorporated into the TP. Community groups, including Aboriginal community groups, local to the source and host environments will need to be identified and the appropriate levels of consultation with those groups will need to be part of the community strategy component.

5 The policy

5.1 The aim of the policy is to guide the planning and implementation of translocation programs for threatened fauna in NSW.

5.2 The policy follows the (Draft) ANZECC Policy for Translocation of Threatened Animals in Australia and extends it specifically for use in NSW.

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5.3 Translocation should not be used as a substitute for protection of high quality natural areas and conservation of wild populations *in situ*.

5.4 Translocation programs are generally long-term (years) and will require a commitment of long-term financial support.

5.5 Translocation programs should be consistent with the principles of ecologically sustainable development.

5.6 Programs should use and contribute to the development of best practices for translocation of threatened fauna.

5.7 Each translocation program must be undertaken in accordance with a Translocation Proposal (TP) which has been prepared following the guidelines in the policy and is licensed by the NPWS.

5.8 The NPWS will arrange for each TP to be refereed by two experienced scientists; one of these will be from outside the proponent's organisation and the organisations issuing the approvals and licences for the proposed translocation.

5.9 All threatened fauna translocation programs covered by this policy must be licensed by the NPWS under the *National Parks and Wildlife Act 1974*. Licence applications must be accompanied by a TP.

5.10 Prior to granting a licence, the NPWS will give consideration to the adequacy of the TP, the referees' reports on the TP, the conservation benefits and the environmental, social and economic consequences of the TP.

5.11 Introductions will be licensed only in cases where the conservation reasons are exceptionally strong.

5.12 A TP will normally be proposing an action within a species recovery plan. TPs proposing a translocation not specified in a recovery plan must show that the translocation is part of an overall plan that will benefit the conservation of the threatened species concerned.

5.13 A draft or approved recovery plan may contain an action proposing a translocation program but a TP and all appropriate licences will be required prior to the commencement of the program.

5.14 The principles of conservation genetics relevant to effective population size, compatibility and hybridisation will be considered in the TP.

5.15 Translocations of threatened fauna should only be undertaken where: the removal of individuals is unlikely to pose an unjustifiable risk to the source population (except in the case of emergency transfers); the species being translocated is likely to have no unjustifiable adverse impact, including the spread of disease or parasites, upon the host environment; where the factors which caused the species extinction in the host environment have been identified and reversed and are unlikely to occur in the future (except in the case of research programs); other potential threats are unlikely to compromise the success of the translocation; and the host environment has suitable and sufficient habitat for the survival of the species.

5.16 To save a species from imminent extinction or for the welfare of individual animals, an emergency transfer and the holding of individuals may be permitted while a translocation proposal is prepared. Release of captive individuals to a new host environment will only be allowed when a TP is prepared and the necessary licences have been issued.

5.17 Translocations covered by this policy include releases of captive-bred stock to the wild, including releases to areas that are fenced to exclude predators.

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5.18 Translocation of threatened fauna should not be used as an ameliorative measure for developments where such action is proposed in lieu of *in situ* conservation.

5.19 The policy will be reviewed as required, in particular when the ANZECC policy is finalised.

6 The Translocation Proposal (TP)

The implementation of the policy is dependent on an adequately prepared translocation proposal (TP) for each proposed translocation program. Translocations of threatened fauna have the potential to affect both the source and host environments including the translocated animals and the fauna in the host environment. Programs need to be carefully planned, implemented, monitored and documented to ensure that they have the highest chance of success and to maximise their contribution to threatened species conservation and to the development of best practices for translocation. Knowledge of the biology, behaviour and ecology of the species and host environment will be integral to the success of a translocation program. However, few threatened fauna are well understood and many are rare, little studied and poorly understood. Hence, each TP will need to weigh the potential benefits to the species against the potential risks to the individual animals which are translocated and to the host environment.

The TP must provide sufficient information about the species and the proposed translocation for an informed decision to be made whether to license or reject the proposal. It should review relevant knowledge about the biology, behaviour and ecology of the species, its past and present distribution and conservation status, and the urgency of conservation action. Information presented should be supported by references or data. Opinions expressed about aspects of the conservation biology of the species should be clearly identified as such. The TP must identify the commitment to and parties responsible for monitoring, research and reporting during the program. The TP should be forwarded to the NPWS with a licence application at least three months before the planned date of the translocation.

BRIAN GILLIGAN
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APPENDIX 1

(DRAFT) ANZECC POLICY FOR TRANSLOCATIONS OF THREATENED ANIMALS IN AUSTRALIA

SCOPE

This policy applies to translocations within Australia of threatened animals for the purpose of nature conservation; usually for the purpose of decreasing the probability of a species becoming extinct. This policy applies to any animal species listed as threatened pursuant to Commonwealth or State legislation.

The Policy should be read in conjunction with *The IUCN position statement on translocation of living organisms* (IUCN 1987) and the *IUCN guidelines for re-introductions* (1998). [Note that the 1998 guidelines use terminology that differs from the definitions in the 1987 position statement. The terminology in this policy is based on IUCN (1987).]

DEFINITIONS

The following definitions apply:

"Introduction" means releasing or establishing an organism outside its historically known native range.

"Re-introduction" means the movement of an organism into part of its native range from which it has disappeared or become extirpated in historic times as a result of human activities or natural catastrophe.

"Re-stocking" means the movement of numbers of animals with the intention of building up the number of individuals of that species in an original habitat or of introducing greater genetic diversity.

"Translocation" means the movement of living organisms from one area with free release in another. Translocation includes introductions, re-introductions and re-stocking.

"Translocation Proposal" means a written statement of intent to carry out a translocation in Australia covering all matters provided in the Appendix.

NEED FOR A POLICY

The IUCN Position Statement recommends, *inter alia*, that Governments should formulate national policies on translocation of wild species.

Translocation is becoming an effective and popular method of research into and management of threatened species. Translocations have already been carried out, or are being contemplated, for mammals, birds, reptiles, frogs, freshwater fish and insects. For some species, translocations are likely to be the best or the only way of preventing extinction. In much of Australia, translocation is the only method available for reconstructing former communities where elements have been lost because of disturbances. Translocation can also be used for preserving or enhancing genetic diversity at infra-specific levels.

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A national policy relating to translocations of threatened animals is needed because:

1. Recovery Plans are increasingly specifying actions throughout a species' former range, not in one State or Territory. A national policy will assist scientists and managers prepare background information in support of applications and help decision-makers in different jurisdictions consider applications.

2. Translocations have the potential to affect existing environments. As is the case for any proposed action that may have a significant effect on the environment, a clear benefit and impact statement should be available.

POLICY

1. All translocations within Australia, except as provided below, shall follow the principles laid down by IUCN (1987) and take note of the re-introduction guidelines provided by IUCN (1998). Translocations that must be approved include releases from captive-bred stock to the wild, including releases to areas that are fenced to exclude predators.

2. Proposed translocations will be approved only after review of a "Translocation Proposal" (TP - see Appendix 1) prepared by the proponent and covering all relevant matters, including the effects of the proposed translocation on the conservation values of the target area. (This process should complement, not duplicate, any existing impact assessment procedure required by legislation.) States and Territories will refer TPs to at least two experienced scientists for refereeing; one of these shall be from outside the organisations issuing the permits or licences authorising the proposed activity. The relevant wildlife authority(ies) will then consider the TP, the referees' comments and any other submissions before deciding whether to issue a permit.

3. A TP will normally be proposing an action within a species Recovery Plan. TPs proposing a translocation not specified in a Recovery Plan must show that the translocation is part of an overall plan that will benefit the conservation of the threatened species concerned.

4. The introduction of species to habitats or locations from which they have not been recorded in historical times will not be approved unless there are exceptionally strong conservation reasons for so doing. Proposed introductions to islands must also demonstrate that the proposed introduction is more important than, or will have no effect on, possible translocations of other threatened taxa to that island.

5. Where there is more than one possible source for the animals to be translocated, TPs will provide reasons why a particular population was chosen above others. Where there is more than one potential target site, the TP must evaluate the alternatives and provide reasons for choosing the recommended site.

6. Translocations from islands to the mainland will not normally be approved if the species still exists on the mainland. TPs for translocations from islands to the mainland

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must review evidence for the extinction of that taxon on the mainland or provide over-riding reasons for the introduction of an island population.

7. TPs will consider the principles of conservation genetics when proposing translocations. In particular, TPs will discuss the number of individuals to be translocated in relation to effective population size.

8. TPs will review the causes of the original local extinction of the taxon at the target site and provide evidence that the cause(s) has been removed or ameliorated.

9. Where an animal (or eggs) is being taken into captivity for release within one year, a TP should be approved before the animal is taken from the wild. Where several years breeding are proposed, the TP should be approved before the release.

10. Detailed records of all translocations and the fate of the translocated animals shall be kept and lodged with the wildlife authority(ies) issuing the permits.

REFERENCES

IUCN (1987). The IUCN position statement on translocation of living organisms. Introductions, re-introductions and re-stocking. IUCN, Gland, Switzerland.

IUCN (1998). IUCN Guidelines for re-introductions. Prepared by the IUCN/SSC Re-introduction Specialist Group. IUCN, Gland, Switzerland.

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ANZECC DRAFT
Matters to be covered by a Translocation Proposal (TP)

The TP must provide sufficient information about the species and the proposed translocation for an informed decision to be made whether to approve or reject the proposal. It should review relevant knowledge about the species' biology and ecology, its past and present distribution and conservation status, and the urgency of conservation action. Information presented should be supported by references or data. Opinions expressed about aspects of the species' conservation biology should be clearly identified as such. The TP should be forwarded the relevant State/Territory agency at least three months before the planned date of the translocation.

The TP should contain the following information.

1. **Summary** (maximum of one page).

2. **Name and affiliation of proponent**.

3. **Background**. Define the taxon to be translocated, provide information on the species' former and present distribution, its conservation status, population trends, its biology and ecology. Provide a brief outline of the recovery plan/program showing how the proposed translocation is integral to overall recovery. If there is no recovery plan, explain how proposed translocation will benefit the taxon

4. **The Translocation**. Discuss why the translocation is being proposed and provide a detailed description of the proposal, including post-release monitoring. Define the goal/objective of the translocation, eg, re-establishing populations, supplementation, increasing genetic variability, etc, how many animals to be translocated and over what time frame. List all organisations/expertise involved in proposed translocation. Include the following information:

   (a) Provide details of the status of the land at the translocation site and provide evidence of the agreement of the controlling body or owner.

   (b) Where there is more than one possible source for the organisms to be translocated, TPs will provide reasons why a particular population was chosen above others. Where there is more than one potential target site, the TP must evaluate the alternatives and provide reasons for choosing the recommended site.

   (c) TPs proposing introductions must demonstrate that opportunities for re-introductions of the species do not exist, that the impact of the introduced species on the natural environment is unlikely to be significant, that there are exceptionally strong conservation reasons for the introduction, and/or that available distributional data (including sub-fossil records) or bioclimatic modelling suggest that the species probably occurred in the area. TPs proposing introductions to islands must also demonstrate that the proposed introduction is more important than, or will have no effect on, possible translocations of other threatened taxa to that island.

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(d) TPs for translocations from islands to the mainland must provide strong evidence that the taxon, or one with which it might hybridise, does not now exist on the mainland, or provide over-riding nature conservation reasons for the introduction of an island population.

(e) TPs will consider the principles of conservation genetics when proposing translocations. In particular, TPs will discuss the number of individuals to be translocated in relation to maintaining genetic variability. TPs will state whether it is proposed to mix individuals from more than one population and, if so, provide evidence that this will benefit conservation of biodiversity.

(f) When re-introductions are being proposed, TPs will review the causes of the original local extinction of the taxon at the target site and provide evidence that the cause(s) has been removed or ameliorated and will continue to be controlled.

(g) For translocations of arthropods, a life-table framework (immature mortality, adult longevity etc.) should be prepared and an assessment should be made whether colonies of any generalist predators occur near the release site.

(h) Details of post-release monitoring must include a commitment to closely monitor the fate of a significant proportion of the translocated animals in the short term and the resulting population in the medium to long term. Define what criteria will be used to measure success and when the proposed translocation, if successful, is likely to be concluded.

5. **Funding**. Identify the source of funds for the translocation and demonstrate that long-term management resources (in terms of the proposed time-frame of the translocation) for the translocated population are available and committed. Normally, this will be a commitment from the land manager.

6. **Animal Ethics Committee approval**. Provide evidence that the proposal has been submitted to and approved by an Animal Ethics Committee operating according to the "Code of practice for the care and use of animals in research in Australia" (National Health and Medical Research Council and Commonwealth Scientific and Industrial Research Organisation).

7. **Endorsement by proponent and proponent's organisation**. Endorsement by partner organisations and other stakeholders should be provided where appropriate.

8. **References**.

9. **Attachments**. Include the Interim Recovery Plan or Recovery Plan, Animal Ethics Committee approval, copies of supporting documents, funding approvals, etc.

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APPENDIX 2

GUIDELINES FOR THE CONTENTS OF A TRANSLOCATION PROPOSAL

(Interim)
THREATENED FAUNA - NSW

Table of Contents

Allow at least 3 months between licence application and proposed starting date of the program

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Title

The Translocation Proposal (TP) will generally be titled "Translocation Proposal for [species] from [source location] to [host location]".

Summary

The TP will include a summary (maximum of one page).

1. Proponent

The TP will give the name, qualifications, experience and affiliation of the proponent/s.

2. Outline for the project

2.1 The legal status of the species throughout its range should be explained.
2.2 The overall objective and all specific objectives of the program should be stated.
2.3 The TP should give criteria for success of the program, including targets and timeframes to achieve key specific objectives.
2.4 The TP must specify whether the translocation is justified as a part of a species recovery program, biodiversity reconstruction program or an emergency transfer program. The relevant plan/s or parts of plan/s should be cited and appended.
2.5 The TP must specify whether the type of translocation is to be an introduction, re-introduction or supplementation.
2.6 The TP must state the consequences of not proceeding with the proposed translocation program.
2.7 The potential risks and strategies for dealing with them should be outlined.
2.8 If the translocation is staged, discuss the strategy for dealing with failure at any one of the stages.

3. Background biology and ecology

The following factors must be considered:
3.1 Taxonomy of the species.
3.2 Distribution of the species in NSW and across its range, including current and historical range.
3.3 The relevant ecological requirements of the species, such as life-cycle stages (for invertebrates) reproductive biology, population dynamics, social behaviour, group composition, home range size, shelter and food requirements, foraging behaviour, predators and diseases.
3.4 Known and potential threats.
3.5 The success of previous translocation programs of the same or analogous species.

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4. Source environment and population

The following information, if relevant, should be provided:
4.1 Site tenure.
4.2 Consideration of alternative source populations.
4.3 The proposed schedule and rationale for the translocation/s, including timing, numbers, age, sex ratio, genetic information.
4.4 An assessment of the impact of the removal of individuals upon the source population and environment and possible ameliorative measures.
4.5 The methods of capture and transfer to the host environment.

5. Host environment

The following information, if relevant, should be provided:
5.1 Site tenure and level of conservation protection.
5.2 Consideration of alternative host environments.
5.3 Whether the site is part of the historically known range of the species.
5.4 For introductions, the conservation reasons why the species cannot be conserved satisfactorily within its historically known range.
5.5 How the habitat requirements of the species will be met and what rehabilitation is required prior to release.
5.6 How known and potential threats to the species will be managed, including the likely causes of the historical decline and/or local extinction of the species from the host environment.
5.7 For supplementation, the likely consequences of the translocation on the genetic composition and viability of the host population.
5.8 An estimation of the dispersal of individuals and the carrying capacity of the habitat and whether it is considered likely to sustain a viable population of the species.
5.9 Potential environmental impacts of the species upon the host environment and surrounding ecosystems, including hybridisation and the spread of disease or parasites, and possible ameliorative measures.
5.10 The proposed management strategy if the translocation results in the establishment of a population that exceeds the carrying capacity of the habitat or the species spreads to areas substantially beyond the host environment.

6. Monitoring and research

The TP should provide summaries of the following:
6.1 Methods and rationale for monitoring in the first year post-release and reporting the fate of a significant proportion of the individuals translocated.
6.2 Methods and rationale for medium-term monitoring (1-3 years) and subsequent longer-term monitoring.
6.3 Methods and rationale for undertaking particular research.
6.4 How the monitoring data will be used to assess the success of the program, including impacts upon the source and host environments.
6.5 How the program will inform the management of the species throughout its range.
6.6 How the program will contribute to the knowledge of best practice threatened species management.

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7. Component strategies

The details of all component strategies should be given, including:
7.1 A strategy in the event that the species fails to establish in the host environment.
7.2 For captive breeding components, discuss the need for captive breeding.
7.3 For captive breeding components not covered by Department of Agriculture approval under the *Exhibited Animals Protection Act*, discuss:
- 7.3.1 the proposed record keeping and genetic management techniques
- 7.3.2 the design and standards of housing facilities, including use of display versus off-display facilities
- 7.3.3 special requirements likely to be needed by the species (for example diet, prevention of habituation to humans, maintenance of natural behaviours)
- 7.3.4 release strategies to optimise the chances of survival in the wild
- 7.3.5 disease risk strategies

7.4 For habitat fencing components, discuss:
- 7.4.1 the need for a fence
- 7.4.2 the proposed size of the area to be fenced and fence type in relation to the ecology of the translocated species
- 7.4.3 non-target impacts, particularly barrier effects
- 7.4.4 the number of years that the fence will be maintained

7.5 The consequences of not utilising component strategies, particularly a threat abatement component.

8. Community awareness, education and involvement

Outline the strategy for community awareness, education and involvement in the translocation program, including:
8.1 Links to community components of species recovery planning, threat abatement planning and other planning mechanism.
8.2 Issues related to restricting community access so that the objectives of the translocation program are not compromised.
8.3 Identification of community groups, including indigenous groups, local to the source and host environments and the appropriate levels of consultation with those groups.

9. Social and economic considerations

Summarise the social and economic factors which have been considered in relevant species recovery planning, threat abatement planning and other planning documents. Discuss all issues related to adverse social and economic effects.

10. Resource commitments

The budget requirements of the program must be itemised, including component strategies, and the source/s of funds and in-kind support identified. The TP must demonstrate that adequate resources are committed for the period of the program. Discuss the projected resources required to manage the population after the completion of the translocation program and identify those responsible and their level of commitment.

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11. References

Literature cited in the TP will be referenced in an appropriate scientific style.

12. Endorsements

The proponent must attach letters of endorsement from all stakeholders and partner organisations, including the landholders and land managers of the source and host environments and the recovery team (if no draft or endorsed recovery plan).

13. Licences

The proponent must complete the first three columns of the table. Licensing of the translocation will be conditional upon the granting of all necessary licences/approvals for the period of the program.

Licence/approval	*Authority*	*Date of application*	*Licence/approval number and period of currency*
NP&W Act licence/s	NPWS		
Animal Care and Ethics Committee approval	As appropriate: NPWS or University, etc		
Other: (eg ABBBS banding licence; EAP Act licence)	As appropriate: Environment Australia; NSW Agriculture, etc		

Appendices

A. Associated plans

The proponent will attach all appropriate recovery plans, draft recovery plans, threat abatement plans or other management plans or relevant parts of these plans.

B. Letters of endorsement

Attach letters of endorsement as per Section 12.

C. Referees reports

The NPWS will attach two referees' reports.

NPWS report on the TP will be attached

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