

# **Fauna surveys at Haunted Point, Bundanon**



Gaia Research Pty Ltd

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Front Cover: Alpha male Wallaroo on the Haunted Point ridge Bundanon. Photograph G. Daly.

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## EXECUTIVE SUMMARY

Fauna surveys were conducted at Haunted Point, Bundanon from 28 April to 1 May 2013 to provide systematic data and build on information gathered in 1995 (Daly and Leonard 1996). The surveys were part of the Living Landscape Project. The surveys included trapping for small and medium sized mammals, spotlight surveys for arboreal mammals, harp trapping for microbats, bird surveys and diurnal reptile searches. The methods adhered to those developed by the National Parks and Wildlife Service for the comprehensive assessment of forests in New South Wales.

The Bush Rat *Rattus fuscipes* and Brown Antechinus *A. stewartii* were trapped in Elliott and medium sized cage traps. The trap success was relatively low with no animals caught on the ridge above the amphitheatre. The majority of ground dwelling mammals were in the Wattle forest at Haunted Point. This result was not expected as this area had been recently disturbed as part of the lantana control program and generally lacked refuge sites such as hollow trees and large fallen logs.

Harp trapping captured the Little Forest Bat *Vespadelus vulturnus*, Gould's Large-eared Bat *Nyctophilus gouldii*, Lesser Large-eared Bat *N. geoffroyi* and Chocolate Wattle Bat *Chalinolobus morio*. All of these species roost in tree hollows.

Spotlight searches revealed the presence of Wombat *Vombatus ursinus*, Common Brushtail Possum *Trichosurus vulpecula*, Sugar Glider *Petaurus breviceps*, Grey-headed Flying Fox *Pteropus poliocephalus* and Black Rat *R. rattus*. No large forest owls responded to the call playback. Diurnal bird searches revealed the presence of 24 species. Indirect evidence (chewed casuarina cones) indicated that the Glossy Black Cockatoo *Calyptorhynchus lathami* forage on the ridgeline. The Glossy Black Cockatoo and the Grey-headed Flying Fox are significant as they are listed under the *Threatened Species Conservation Act 1995*.

No arboreal mammals were detected in the Wattle regrowth, again an unexpected result as Sugar Gliders use this species of Acacia for sap feeding. I concur that the area should be revegetated to augment natural regeneration to provide a species diverse landscape to better cater for native fauna. The rehabilitation of this area offers an opportunity to provide resources for sedentary and migratory species of fauna.

A review of both published and unpublished data indicates that the ridgeline above Haunted Point supports populations of Heath Monitor *Varanus rosenbergi*, Broad-headed Snake *Hoplocephalus bungaroides* and at times the Brush-tailed Rock Wallaby *Petrogale penicillata*. The latter two species are listed as endangered under the *TSC Act (1995)*.

The study also reviewed the draft Land Rehabilitation Works Plan to ensure proposed revegetation works are consistent with existing vegetation communities, to protect and enhance endangered ecological communities, and include appropriate species for the nesting or food requirements of fauna. The study identified that remnant stands of Illawarra Rainforest, an endangered ecological community under the *TSC Act (1995)* are present at Haunted Point. The work also found Snowwood *Pararchidendron pruinosum* within the Illawarra Rainforest

community, which is a significant find being within about one kilometre of the most southerly location currently known for this species.

The following recommendations are given for proposed management:

- Weed control work at Haunted Point has been effective and needs to be continued for the short (five years) and long-term (15 years) to ensure success of canopy species. There is also a need for continual maintenance for weed control. This is considered the highest priority recommendation to ensure success;
- A series of photo-monitoring point should be established to measure the success of the program as a visual diary;
- The number of each species of trees and shrubs used in revegetation, each year should be recorded. The time that the plants were put in the ground should also be recorded so that people in the future know what was planted at various times;
- Rehabilitation of select areas on Haunted Point must augment the existing depauperate subtropical (dry) rainforest to facilitate the recovery of this endangered ecological community. This will encourage a greater suite of fauna to use the site;
- Managers should look at the rehabilitation works conducted in a similar landscape at Bangalee Reserve over the past decade to provide guidance from a previous project;
- Tree guards should be used to protect all trees and shrubs used in revegetation. Experience with other revegetation work in the area indicate this is essential for success. I recommend tree guards be fashioned from 25 x 25 mm diameter 1.3 mm gauge x 1200 mm high wire (to exclude wallabies from reaching in between the wire). Tree guards are best staked with 25 x 50 x 1200 mm hardwood or steel pickets. Guards should be removed when plants have attained a height of 2.5 metres such that animals cannot eat the apical (growing) tips (Daly 2012);
- There is no justification for the planting of ground cover plants, except Matt Rush *Lomandra longifolia* to stabilise slopes. Most of the ground cover species will recolonise the area naturally;
- Vines should not be planted in any revegetation works as they can strangle shrubs and canopy species, hindering the rehabilitation of the site;
- Revegetation of the wetland should use endemic species such as Snow-in Summer *M. linariifolia*. Although *Melaleuca ericifolia* is not endemic to Haunted Point it is a wetland edge shrub in the region and its suggested use (Waugh 2012) is acceptable;
- Revegetation may use species such as Swamp Mahogany *E. robusta* for the wetland and Forest Red Gum *E. tereticornis* elsewhere on the sandy flats. These species flower in winter and late autumn respectively and hence provide a nectar food source for birds and mammals and
- A reassessment of the existing OEH vegetation mapping should be undertaken and where appropriate incorrect shape files recoded or realigned and new files created for the endangered ecological communities.

## Definition of terms

Within this report the following terms are defined.

- **Direct impacts** are those that directly affect habitat and individuals, usually within the footprint of disturbance. They include, but are not limited to, clearing and habitat removal.
- **Exotic Species** means species introduced from outside the area, that are from overseas or interstate.
- **EEC** Endangered Ecological Community as defined by the Threatened Species Conservation Act, 1995
- **EP&A Act** Environmental Planning and Assessment Act 1979
- **Grazing animals or stock** means all livestock (including cattle, horses, sheep, goats and alpacas).
- **Haunted Point** means the previously grazed area to the north-east of Bundanon homestead (**Figure 1**). It includes the Wattle forest, portions of dry rainforest and the Spotted Gum forest on the upper slopes.
- **Landholder** means Bundanon Trust or any subsequent managers if the title is sold or transferred.
- **Locality** is the area within a 5km radius of the site.
- **Native Vegetation** means indigenous vegetation as per the *Native Vegetation Act 2003*. This includes indigenous trees, shrubs, groundcover plants and aquatic plants.
- **Noxious Weeds** means any plant declared under the *Noxious Weeds Act 1993* within the local government area of *Palerang*.
- **OEH** Office of Environment and Heritage
- **Proposal** is the development, activity or action proposed
- **Regeneration** means reproduction from self-sown seeds or by vegetative recovery (sprouting from stumps, lignotubers, rhizomes or roots), which occurs naturally after disturbance.
- **Rehabilitation** The treatment or management of land previously disturbed for the purpose of establishing a biodiverse landscape that supports a diverse range of native fauna.
- **Short term** is within five years of the initiation of rehabilitation.
- **Subject area** means Haunted Point and any additional area, which may be affected by the Project.
- **Site** means the area directly affected by the removal of lantana on Haunted Point.

# 1 INTRODUCTION

## 1.1 Background

This report was commissioned by Landcare Australia Limited on behalf of Bundanon Trust under the Living Landscape Project (<http://www.bundanon.com.au/content/biodiveristy-fund-project-2012-2015>) to assess and document the species of fauna in the Haunted Point area (**Figure 1**) of Bundanon. The purpose of the report is to provide data gained from systematic, targeted and opportunistic surveys to provide a list of the species in the area especially those that may recolonise the degraded Wattle forest subject to rehabilitation works (Waugh 2012, Total Earth Care 2011). The report also discusses the importance of creating and maintaining connectivity between ecologically functional bushland in the Haunted Point rehabilitation areas, including the riparian zone, and the more undisturbed areas in the hinterland including the slopes, escarpment and ridge.

A review of the draft Land Rehabilitation Works Plan is provided so that revegetation works are placed in context to existing vegetation communities, protecting and enhancing endangered ecological communities and selecting species of plant to cater for the nesting or food requirements of fauna and implications for connectivity of improved habitat in the surrounding landscape. The description of the vegetation of the study area is given to put context of habitat to where animals were detected. The descriptions vary from that used by previous studies as the formation of standard naming for various communities has evolved over decades. I use the most contemporary OEH (2013) nomenclature, albeit the descriptions do not neatly match the associations seen during field inspections.

One of the threats to biodiversity is the invasion of bushland by weeds. *Lantana camara* is listed as a weed of national significance (WONS) and a major aim of this project is the removal of this weed and re-establish native vegetation at Haunted Point. Hence, by removing lantana and revegetating the landscape with local species (and facilitating natural regeneration) Landcare Australia and Bundanon Trust aim to reduce the risk of local extinctions and promote biodiversity.

This report was prepared by Mr Garry Daly and work was carried out under NPWS Scientific Licence S10470 and Animal Ethics Committee approval 05/2371. Mr B. Virtue conducted the bird surveys and assisted in the reptile searches.

## 1.2 Project objectives

The objectives were to:

- assess the site for species of ground dwelling mammal, arboreal mammals, microbats, diurnal birds, reptiles and large forest owls by using systematic and targeted surveys;
- assess the significance and relationship of the sandy river flats and sandstone escarpment of Haunted Point to species of fauna;
- review of the draft Land Rehabilitation Works Plan (Waugh 2012) to provided advice on revegetation works in context to existing vegetation communities, protecting and enhancing endangered ecological communities and selecting species of plant to cater for the nesting or food requirements of fauna, with particular emphasis on improving habitat for threatened species in, or moving through, the area and



- provide data from these surveys in an excel spreadsheet as per requirement of the scientific licence issued by the Office of Environment and Heritage (OEH).

### **1.3 Description of Project site**

The survey was conducted on a portion of the Bundanon property (Lot 11B DP 7511273). The total size of this portion is approximately 348 ha, which is managed by Bundanon Trust (**Figure 1**). The Site is located approximately 9 kilometres west of Nowra on the south coast of New South Wales. Bundanon is located on the northern edge of the Shoalhaven River. Elevations within the site range from approximately sea level to 100m AHD. Haunted Point was cleared and used for grazing up until the 2000 (H. Goodall pers. obs.). Black Wattle *Acacia decurrens* and Lantana have recolonised the majority of the site but there are a number of Illawarra Blue Gum *Eucalyptus saligna x botryoides* (more *botryoides* in appearance), River Oak *Casuarina cunninghamiana* and rainforest trees in the area.

The Fuel Management Plan (BES 1999) refers to a fire or series of fires that occurred in 1982. The author of that plan does not indicate whether the fire was a bush fire or a prescribed burn. Details on the exact location and intensity of the fire are not provided. It is presumed that only a relatively small area of the Bundanon ridgeline was burnt as indicated by the blackened bases of some trees and the presence of stands of Black Oak *Allocasuarina littoralis*.

#### **Geology and soil**

The sandstone escarpment of Bundanon along the Shoalhaven River is Nowra sandstone (Hazelton 1993). This geologic unit outcrops in a band from Bomaderry Creek bushland (Nowra bridge) west to the Hampton bridge in Kangaroo Valley and encompasses most of Bangalee Reserve, Tapitallee Nature Reserve (NR) Riversdale, Bundanon and Bugong National Park. On the edge of the Shoalhaven River are flats consisting of a fluvial landscape consisting of sandy alluvial soils (Hazelton 1993).

### **1.4 Previous surveys**

Previous flora and fauna surveys were conducted by Daly and Leonard (1996) and additional surveys have been undertaken by TEC (2011). Ms M. Norton conducted targeted searches for scats of Brush-tailed Rock Wallaby on 15th April 2013. Ms Norton located one recent (c. 2-3 months old) Brush-tailed Rock-wallaby scat as well as a number of very old BTRW scats. The recent scat was at the top of an escarpment edge and probably belonged to a BTRW that was moving through the area, rather than residing on that particular part of the escarpment (M. Norton pers. comm.).



**Figure 1**  
**Location of Bundanon and Haunted Point**

## 1.5 Native Vegetation

The descriptions of the vegetation communities are taken from the most up to date summary based on catchments (OEH 2013). In several instances the vegetation at Bundanon was difficult to fit into these forest ecosystems. In particular several OEH Biometric descriptions list Blackbutt *Eucalyptus pilularis* as a co-dominant canopy species. Blackbutt was not located in the Bundanon area but several of the primary and secondary canopy species, midcanopy and groundcover species listed for these communities were observed during field work. Since the OEH Biometric descriptions are based on associations of all three strata (canopy, shrublayer and groundcover species) the absence of one canopy species is not critical for the association to fall within a particular community.

Given these limitations I have used the best-fit classifications. Due to the above-mentioned errors and difficulties associated with presenting fine scale details on a map no figure is provided for the vegetation communities in the study area. On the basis of my finding no decisions regarding classification or associated offsets (BioBanking) should be based on the current OEH Biometric descriptions or polygons. Recent ground truthing of a nearby area at Tapitallee (L. Mitchell and the author) indicated a recoding of 92 polygons.

### **Lilly Pilly – Sassafras – Stinging Tree subtropical rainforest (SR568 or PM5A 112)**

Lilly Pilly – Sassafras – Stinging Tree Subtropical rainforest is not common on Bundanon and the remnant forest is small in extent and is species deficient. This forest type is located on the sandy alluvial soils on the south facing flats near Haunted Point. The name of this community is inappropriate as the largest canopy species are Stinging Tree *Dendrocnide excelsa*, Port Jackson Fig *Ficus rubiginosa*, Red Ash *Alphitonia excelsa* and Red Cedar *Toona australis*. Subtropical rainforest occurs in gullies and on protected slopes and has a large number and variety of species. The most common and characteristic are Stinging Tree *Dendrocnide excelsa*, Small-leaved Fig, *Ficus obliqua*, Morton Bay Fig *F. macrophylla* and or Superb Fig *F. superba*, sassafras *Doryphora sassafras*, Stinging Tree *Dendrocnide excelsa*, *Pennantia cunninghamii*, Cabbage Tree Palm *Livistona australis* Lilly Pilly *Syzygium smithii*, coachwood *Ceratopetalum apetalum*, and Jackwood *Cryptocarya glaucescens*. Other species include Crabapple *Schizomeria ovata*, Sweet Pittosporum *Pittosporum undulatum*, Whalebone tree *Streblus brunonianus*, Native Tamarind *Diploglottis australis*, *Pennantia cunninghamii*, *Baloghia inophylla*, *Brachychiton acerifolius*, *Toona ciliata*, *Alectryon cinereus* and *Ficus coronata*. This community constitutes the endangered ecological community - Illawarra Rainforest as described under the TSC Act (1995).

A minority of these species are present at Haunted Point as the area of this forest type is relatively small and has been disturbed. Snowwood *Pararchidendron pruinosum* was located in this community during these surveys. This is a significant record as this is a regionally uncommon species having it's southern limit immediately south of Haunted Point on the other side of the Shoalhaven River (Harden 2007, G. Daly pers. obs.).

The shrub layer is a sparse cover of Rough Treefern *Cyathea australis*, Bastard Rosewood *Synoum glandulosum*, *Eupomatia laurina*, *Coprosma quadrifida*, *Citriobatus pauciflorus*, *Pittosporum revolutum* and *Breynia oblongifolia* up to 4 metres high. Lianas include *Pandorea pandorana*, *Marsdenia rostrata*, *Smilax australis*, *Malaisia scandens*, *Cissus antarctica*, *Lagenophora moorei*, *Marsdenia flavescens*, *Maclura cochinchinensis* and *Piper novae-*

*hollandiae*. Ground cover is a sparse to mid-dense cover of ferns including Gristle Fern *Blechnum cartilagineum*, *Microsorium scandens*, *Pyrrosia rupestris*, *Lastreopsis microsora* and *Pellaea falcata ssp falcata*, *Arthropteris tenella* and *Doodia aspera* the herb *Pseuderanthereum variabile* and Settlers Flax *Gymnostachys anceps*.

OEH (2013) states that there are 2,288ha of Sub-tropical Rainforest in the Shoalhaven LGA, the majority occurs around the Cambewarra escarpment but there is a patch near Milton on the Monzonite derived soils.

**Sydney Peppermint - Spotted Gum - Lilly Pilly wet forest in gullies of the coastal foothills, northern South East Corner and southern Sydney Basin (SR654)**

Sydney Peppermint - Spotted Gum - Lilly Pilly wet forest in gullies is widespread along the south facing slopes of Haunted Point ridge. The community occurs on sheltered slopes in gullies and on escarpments with sandy loam soils below 400m south from the Illawarra. The main canopy species are Illawarra Blue Gum *Eucalyptus saligna*X*botryoides* and Spotted Gum *Corymbia maculata*. Other canopy species include Sydney Peppermint *Eucalyptus piperita* and Blue-leaved Stringybark *Eucalyptus agglomerata*. There are small occurrences of Lilly Pilly *Syzygium smithii* and Cabbage-tree Palm *Livistona australis*.

OEH states that one of the main secondary species is Blackbutt *Eucalyptus pilularis*. However, in the study area this species was not recorded. Illawarra Blue Gum *Eucalyptus saligna*X*botryoides* is the most abundant species around the amphitheatre, followed by Spotted Gum. The community has affiliations with Sydney Blue Gum x Bangalay - Lilly Pilly moist forest in gullies and on sheltered slopes, southern Sydney Basin (SR652).

Other common species are Scentsless Rosewood *Synoum glandulosum*, Sweet Pittosporum *Pittosporum undulatum* and Jackwood *Cryptocarya glaucescens*. Characteristic mid-canopy species are *Notelaea venosa*, *Clerodendrum tomentosum*, *Eupomatia laurina*, Wait-a-while *Smilax australis*. Water Vines, *Cissus* spp. are abundant in this area and cover much of the shrublayer and rock outcrops. The extent of Water Vines has increased since the 1995 survey and now weights down most of the shrublayer. OEH (2013) states that there is 2769ha of the forest type in the Shoalhaven.



**Figure 2**  
**Sydney Peppermint - Spotted Gum - Lilly Pilly wet forest**

**Red Bloodwood - Blackbutt - Spotted Gum shrubby open forest (SR592)**

Red Bloodwood – Blackbutt - Spotted Gum shrubby open forest occurs along the ridge that runs in a roughly east-west direction and peters out at Haunted Point. This forest is dominated by Red Bloodwood and Spotted Gum but Blackbutt is absent. Other characteristic co-dominant species are Grey Ironbark *Eucalyptus paniculata subsp. paniculata* and Blue-leaved Stringybark *Eucalyptus agglomerata*.

Red Bloodwood – Blackbutt - Spotted Gum has a diverse dry shrub understorey including Black She-oak *Allocasuarina littoralis*, Hairpin Banksia *Banksia spinulosa*, *Persoonia linearis* and *Lomatia ilicifolia*. The ground cover species include Wiry Panic, Spiny-headed Matt-rush, *Dianella caerulea*, *Lepidosperma laterale*, Bracken, Blady Grass *Imperata cylindrica var. major*, Kangaroo Grass *Themeda australis*, *Lomandra multiflora*, *Lomandra obliqua*, *Billardiera scandens* and *Hardenbergia violacea*. It is significant that on the Haunted Point ridge that Grey Gum *E. punctata* is absent. This is a significant secondary species as it is used by the Yellow-bellied Glider for sap feeding. During the current survey a single seedling of the Superb Fig *F. superba* was located on the southern side of the sandstone escarpment in a mesic form of this forest type. This was significant as the species had not been recorded as occurring on the site (Daly and Leonard 1996) and implies an absence of fire. The size of the seedling suggests that fire has not been through the area for at least five years.



**Figure 3**  
**Red Bloodwood – Spotted Gum shrubby open forest**

**Spotted Gum - Blackbutt shrubby open forest on the coastal foothills (SR641)**

Spotted Gum - Blackbutt shrubby open forest occurs on the upper slopes of Haunted Point. At this site the forest is dominated by Spotted Gum, which forms near monospecific stands. Blackbutt is absent but there are minor occurrences of Red Bloodwood. The forest consists primarily of Spotted Gum, is very open and has extensive stands of Burrawang *Macrozamia communis*.

The characteristic mid-storey species are Blueberry Ash *Elaeocarpus reticulatus*, *Persoonia linearis*, *Leucopogon lanceolatus*, Burrawang *Macrozamia communis*, Coffee Bush *Breynia oblongifolia*, *Notelaea longifolia*, *Hibbertia aspera*, Scentless Rosewood *Synoum glandulosum*, *Cissus hypoglauca*, Wombat Berry *Eustrephus latifolius*, *Tylophora barbata*, *Pandorea pandorana*. The characteristic groundcover species include *Dianella caerulea*, Wiry Panic *Entolasia stricta*, Spiny-headed Matt-rush *Lomandra longifolia*, Bracken *Pteridium esculentum*, *Schelhammera undulata* and *Lepidosperma urophorum*. These species are either absent or uncommon at this site.



**Figure 4**  
**Spotted Gum forest**

### **Regenerating Wattles**

Many acres of Black Wattle *Acacia mearnsii* occur at Haunted Point on the sandy river flats. This community is an indication of previous disturbance from agriculture. Vegetation within the Regenerating Wattles community is up to 5m high and often supports lantana in the shrublayer. In many areas, the wattle population is very dense with significant competition between individual trees. Much of the lantana had recently been removed by mechanical and chemical means. There are isolated remnant trees of Blue Gum, Sandpaper Fig, White Cedar, River Oak and Snow-in-summer *Melaleuca linariifolia*. The groundcover often consists of exotic grasses and species of weed such as Farmers Friends *Bidens pilosa*.



**Figure 5**  
**Wattle Forest**

### **Largely Disturbed Land**

Past farming activities have resulted in areas of disturbed land, generally associated with creeks and gullies. These areas are either devoid of native vegetation or support a dense cover of weeds. In the Haunted Point area there is an area of weeds that does not support shrubs or trees. This area formally was an ephemeral wetland and hence wattles can not colonise the periodically flooded area. Prior to European settlement this area was probably edged by Snow-in-summer. Currently the area is fringed by Wattles and one large River Oak (**Figure 6**).





**Figure 6**  
**Disturbed ephemeral wetland**

**River Oak Open Forest (SR606 or PM5A)**

A small remnant of River Oak Open Forest occurs on banks of the Shoalhaven River. The main species present is River Oak *Casuarina cunninghamiana*. Other species present include Blue Gum and Black Wattle. OEH (2013) states that there is 654ha of the forest type in the Shoalhaven.

## **2 METHODS**

### **2.1 Fauna surveys**

Fauna surveys attempt to detect animals by a range of methods including trapping, direct observations, call playback, identification of calls and indirect evidence (scats, incisions or scratches on trees or cracked casuarina cones). During the early 1990's the then State Forests of New South Wales developed a set of systematic methods to assess the impacts of logging (York *et al.* 1991). In the late 1990's a set of different methods were developed for the comprehensive assessment of forests as part of the Regional Forestry Agreement. These methods also used systematic methods to assess fauna and flora over a broader landscape including State Forests, National Parks and crown land.

The author headed a team of biologists and sampled from Narooma to Nowra and west to Kuscusuzko NP. Over 100 sites were surveyed each year between 1997-1999. The sites were stratified according to vegetation and soil type and sites were separated by a distance of one kilometre. The current survey adheres to these methods to build on this existing dataset (the largest in the region). The sites at Haunted Point were separated by a mere 200m but placed in different vegetation communities (Spotted Gum forest and Wattle regrowth) in an attempt to measure differences on abundance.

#### **2.1.1 Elliott and cage trapping**

Ten size A Elliott traps (0.1 x 0.1 x 0.3m) were set along three, two hundred metre lines (herein termed transects) at regular intervals for three consecutive days initially from 29 April to 1 May 2013 (**Figure 7**). Traps were set, on the ground and baited with a mixture of peanut butter and rolled oats. The traps were placed under bushes or other vegetation to protect captured animals from the elements. Leaves were placed in the traps to provide insulation for captured animals. Traps were checked in the early morning and captured animals were released after identification.

Two medium sized (0.2 x 0.2 x 0.55 m) cage traps were set along each transect at point one and five for the same period as the Elliott traps. The cage traps were baited with a mixture of sardines, peanut butter and rolled oats. Cage traps were rebaited on day two or when animals had been caught. The location of transects are given in **Table 1** and shown in **Figure 7**. One transect was positioned on the ridge above the amphitheatre and the other two on Haunted Point.

#### **2.1.2 Harp Trapping**

Three harp traps (Harp 1 and Harp 2 sites – see **Figure 7**) were erected within 100m of the Elliott and cage trapping transects from 29 April to 1 May 2013. In addition one trap was erected near the amphitheatre during that period.

#### **2.1.3 Foot-based Spotlighting**

Spotlighting was conducted for arboreal mammals for 40 minutes at two sites, one in the Blue Gum - Red Bloodwood - Blackbutt - Spotted Gum Forest from the amphitheatre uphill to the ridge and the other at Haunted Point from the distal point of the Elliott trapping transect within the Spotted Gum forest to the Wattle forest Elliott trapping transect. These transect covered an area of approximate 2ha each and were done along trails. Spotlighting was conducted with the

aid of a lens lezer light and involved the identification of animals by direct observation and the recognition of species-specific calls.

#### **2.1.4 Nocturnal Call Playback**

Nocturnal birds and mammals are often detected when they vocalise to proclaim their territory or during social interaction. This behaviour is exploited when surveying by broadcasting pre-recorded species-specific calls to elicit a response if that particular species is within the immediate area. The standard suite of calls used for the Southern Comprehensive Regional Assessment was broadcast. Although some of the species assessed by call playback are not listed, as occurring in the area by the various databases the use of these calls is consistent with previous work conducted by the author.

The calls were broadcast from the amphitheatre (start of Spotlight Transect 1 = Call Playback Site 1) through a car stereo system from 19.43h to 20.00hrs on 29 April 2013 and on 30 April 2013 from the Spotted Gum forest - Wattle forest interface at Haunted Point (**Figure 7**). These locations were selected as they allowed the sound to cover a large area of forest. No spotlights were operated during the playback but the immediate area was spotlighted after the cessation of the playback. Call playback was undertaken prior to spotlighting as owls may call some time (more than 10min after the cessation of the broadcast).

Call playback was given in the following order.

- Powerful Owl *Ninox strenua*.
- Barking Owl *N. connivens*.
- Masked Owl *Tyto novaehollandiae*.
- Sooty Owl *Tyto taeniolatus*.
- Squirrel Glider *Petaurus norfolcensis*.
- Yellow-Bellied Glider *Petaurus australis*.
- Koala *Phascolarctos cinereus*.
- Bush Stone Curlew *Burhinus grallarius*.

#### **2.1.5 Diurnal Herpetofauna Census**

The herpetofauna census involved two 60-minute searches near Elliot trapping line 1 and near Elliott trap line 2. The searches were conducted on 29 April 2013 and 1 May 2013. Two people conducted the surveys. During herpetofauna searches, active animals were observed as they basked or foraged. Searches also involved lifting fallen logs, loose rocks and searching leaf litter. The searches focused on locating and lifting exposed flat sandstone on north-west facing aspects as this habitat is used as a refuge site by Broad-headed Snakes.

#### **2.1.6 Incidental Observations**

Further incidental observations of animals were made based on visual identification of animal, remains, or other features or call recognition. These are included in **Appendix 1**.

**Table 1**  
**Summary of survey site locations**

**Note:** Grid References in GDA 94.

Location	Survey/Name	Location	
		Easting	Northing
Haunted Point - ridge	Elliott & cage trapping site 1	271998 <sup>1</sup>	6136891 <sup>1</sup>
		271886 <sup>2</sup>	6136905 <sup>2</sup>
Haunted Point – spotted gum forest	Elliott & cage trapping site 2	272961 <sup>1</sup>	6136687 <sup>1</sup>
		273048 <sup>2</sup>	6136764 <sup>2</sup>
Haunted Point – Black Wattle forest	Elliott & cage trapping site 3	273172 <sup>1</sup>	6136925 <sup>1</sup>
		273059 <sup>2</sup>	6136964 <sup>2</sup>
Haunted Point - ridge	Harp trap site 1	271954	6136895
Haunted Point – Black Wattle forest_a	Harp trap site 2	273172	6136925
Haunted Point – Black Wattle forest_b	Harp trap site 3	273083	6136902
Amphitheatre	Harp trap site 4	271797	6136724
Amphitheatre to Haunted Point - ridge	Spotlight site 1	271797 <sup>1</sup>	6136724 <sup>1</sup>
		271886 <sup>2</sup>	6136905 <sup>2</sup>
Haunted Point Spotted Gum forest to wattle forest	Spotlight site 2	272961 <sup>1</sup>	6136687 <sup>1</sup>
		273048 <sup>2</sup>	6136764 <sup>2</sup>
Amphitheatre	Diurnal Birds site 1	271797	6136724
Haunted Point - ridge	Diurnal Birds site 2	271954	6136895
Haunted Point – spotted gum forest	Diurnal bird site 3	272961	6136687
Amphitheatre	Call Playback site 1	271797	6136724
Haunted Point – spotted gum forest	Call Playback site 2	748885	6063069
Spotted Gum forest to ridge	Diurnal reptile survey 1	272961 <sup>1</sup>	6136687 <sup>1</sup>
		273048 <sup>2</sup>	6136764 <sup>2</sup>
Haunted Point - ridge	Diurnal reptile survey 2	272093 <sup>1</sup>	6136889 <sup>1</sup>
		272449 <sup>2</sup>	6136698 <sup>2</sup>

Note 1: Start point of transect.

Note 2: Finish point of transect.

Note 3: Indicative commencement point.



**Figure 7**  
**Approximate Location of trap sites**

Key dotted lines represent small mammal trapping transects, the blue squares represent harp trap sites and the green squares represents the location where call-playback broadcast.

### 3 RESULTS

#### 3.1 Fauna surveys

The surveys detected thirteen species of mammal, 43 species of bird, four species of reptile and three species of frog. Two species of animal currently listed as threatened under the *Threatened Species Conservation Act 1995* were detected they were the Glossy Black Cockatoo and the Grey-headed Flying Fox.

##### 3.1.1 Elliott and cage trapping

###### Species diversity

Elliott and cage trapping caught the Bush Rat *Rattus fuscipes* and Brown Antechinus *A. stewartii* (Tables 2 and 3). The site supports a low species density and diversity of small ground dwelling mammal.

###### Species density

The trapping rate for Elliott traps was c. 3%, which is considered very low for this area. No exotic species of small mammal were trapped on the site, but one Black Rat *R. rattus* was observed during spotlight survey.

One Bush Rat was caught in the cage traps. The capture of the Bush Rat was anticipated as this species is common in the area.

**Table 2**  
Comparison of total number of each species caught in Elliott traps

Species	Site 1	Site 2	Site 3
Bush Rat	0	0	1
Brown Antechinus	1	0	1
<b>Percent Success</b>	<b>3</b>	<b>0</b>	<b>6</b>

Note: Site 1 is haunted ridge, site 2 was in the Spotted Gum forest and site 3 was in the wattle regrowth

**Table 3**  
Comparison of total number of each species caught in Cage traps

Species	Site 1	Site 2	Site 3
Bush Rat	0	0	1
<b>Percent Success</b>	<b>0</b>	<b>0</b>	<b>17</b>

##### 3.1.2 Microbats

Four species were caught during the survey. They were:

- Chocolate Wattled Bat *Chalinolobus morio*,
- Little Forest Bat *Vespadelus vulturnus*,
- Gould's Long-eared Bat *Nyctophilus gouldii*
- Lesser Long-eared Bat *Nyctophilus geoffroyi*.

**Table 4** presents an overview of species caught at various locations. The species caught are common in the Shoalhaven region of NSW.

**Table 4**  
**Summary of bats trapped**

Site	Cm	Ng	Ne	Vv
Harp Trap Site 1 – Amphitheatre		2		7
Harp Trap Site 2 - Ridgeline		2	2	3
Harp Trap Site 3 – Haunted Point_a	2			2
Harp Trap Site 4 - Haunted Point_b				

Note : Cm = Chalinolobus morio, Ng = Nyctophilus gouldii, Ne = Nyctophilus geoffroyi, Vv = Vespadelus vulturnus. Clear cells indicates no captures

### 3.1.3 Diurnal Birds

Twenty-four species of bird were detected during the systematic diurnal surveys (**Table 5**). Incidental observations revealed the presence of an additional 19 species. This information is included in **Appendix 1**. Haunted Point has a relatively high species diversity of bird.

A large number of seasonal migratory birds, such as the Yellow-faced Honeyeater, Noisy Friarbird, White-naped Honeyeater and Rainbow Lorikeet were detected during the surveys. The Yellow-faced Honeyeater and White-naped Honeyeater makes regular movements along the Illawarra escarpment and then along the ridges of Riversdale and Bundanon in response to annual eucalyptus flowering events. The Rainbow Lorikeet was observed feeding on flowering Spotted Gum and the population migrates in response to food resources. A number of seasonal breeding migratory birds were not detected during the systematic surveys as these species had left the area. These included the Rufous Whistler, Rufous Fantail, Sacred Kingfisher and Dollarbird.

**Table 5**  
**Number of individual Birds Detected During the Systematic Surveys**

Species	Sites		
	1	2	3
Sulphur Crested Cockatoo	2o		
Yellow-faced Honeyeater	3o	4o	30W
Eastern Spinebill	1w		
Rainbow Lorikeet	15W	10o	15W
Australian Magpie	1W		
Superb Lyrebird	1w		
Lewins Honeyeater	3w		3w
White-throated Treecreeper	1o		
Silvereye	3w		
Spotted Pardalote	1w		
Satin Bowerbird	1o		
White-browed Scrubwren	1w		

Species	Sites		
	1	2	3
Australian Raven	1W		1W
Brown Thornbill	2o		
White-naped Honeyeater	2w		
Red Wattlebird		4W	1W
Common Bronzewing		1o	
Noisy Friarbird		4o	1W
Crimson Rosella		1o	
Noisy Miner			1W
Grey Butcherbird			1W
Laughing Kookaburra			1W
Pied Currawong			1W
Golden Whistler			2o
Total species	15	6	11

Note : o = observed within Subject Site, w = heard call within Subject Site, O = observed adjacent to Subject Site, W = heard call adjacent to Subject Site.

### 3.1.4 Foot-Based Spotlighting

Spotlighting revealed the presence of the following species.

- Common Brushtail Possum *Trichosurus vulpes*.
- Sugar Glider *Petaurus breviceps*.
- Common Wombat *Vombatus ursinus*.
- Grey-Headed Flying Fox *Pteropus poliocephalus*.

**Table 6**  
Comparison of total number of each species detected during spotlight searches

Species	Transect 1	Transect 2
Common Brushtail Possum	2	2
Sugar Glider	3	3
Common Wombat	1	0
Grey-headed Flying Fox	2	0
Black Rat	0	1

Note 1: Transect 1 includes Elliott trapping site 1

Note 2: Transect 2 includes Elliott trapping sites 2 and 3

### 3.1.5 Nocturnal Call Playback

No large owls were heard calling during the call playback or during spotlight surveys. A Boobook Owl called during the broadcast of the pre-recorded calls at the amphitheatre.

### 3.1.6 Diurnal Herpetofauna Census

Along the Haunted Point ridge, south of Elliott trap site 1 one Wall Skink *Cryptoblepharus pulcher*, two Grass Skinks *Lampropholis delicata*, one Red-throated Skink *Acritoscincus*



*platynotum* and one Yellow-faced Whip Snake *Demansia psammophis* were observed. Along the Haunted Point ridge uphill from the Spotted Gum forest (Elliott trap site 2) the Grass Skink *Lampropholis delicata* was observed. These species had previously been observed on the site.

### **3.1.7 Incidental Observations**

Species observed or heard opportunistically were recorded. The species observed and type of observation is detailed in **Appendix 1**. Bundanon supports a mob of about 30 Wallaroos as well as Eastern Grey Kangaroo. Both species camp during the day under Black Oaks on the ridge above the amphitheatre. They move down to the pasture around the Bundanon homestead to graze. Many people would not distinguish female Wallaroo from Eastern Grey Kangaroo as the animals have similar coloured pelage.

The Glossy Black Cockatoo was detected on the ridge above the amphitheatre by the presence of chewed casuarina cones. This species has also been sighted in the area by Bundanon Trust staff (H. Goodall pers. comm.). The Large-billed Scrubwren was observed in the rainforest near Haunted Point. This species is uncommon in the area and highly associated with tall open and closed forests. Bibron's Toadlet was found in the ephemeral wetland at Haunted Point, about 10 males called and one was examined and was on a clutch of eggs.

## **4 DISCUSSION**

The number and type of species of fauna detected was typical for this region, habitat type and time of the year.

### **4.1 Ground dwelling mammals**

The native vegetation supports a relatively low population of Bush Rat and Brown Antechinus. The species trapped are common in the region but the low density was unexpected. The trapping was conducted over a variety of vegetation communities, two of which had refuge habitat for small mammals (fallen large logs, rock outcrops, hollow-bearing trees). However, the greatest diversity and density was in the Wattle forest, a landscape that was highly disturbed from the recent lantana control work and generally lacked large fallen logs. In a recent survey approximately one kilometre south of Haunted Point (Wogamia NR) the author trapped three Brown Antechinus and nine Bush Rats over three days. The sites at Wogamia were in a similar vegetation community (Spotted Gum – Blackbutt forest with water vines beside a creek) but at Bundanon there was a reduced ground cover (especially in the Spotted Gum forest), which may be an explanation for the different results.

The absence of the Long-nosed Bandicoot was disappointing but populations of this species fluctuate considerably over time and have previously been detected on the property (H. Goodall pers. comm.). Several other ground dwelling mammals have been trapped – detected in the broader Bundanon area these include the Dusky Antechinus *A. swainsonii*, White-footed Dunnart *Sminthopsis leucopus*, New Holland Mouse *Pseudomys novaehollandiae* and Eastern Pygmy Possum *Cercartetus nana* (Daly and Murphy 1996, unpub. data). The latter four species are usually found in dense heathlands a habitat not sampled in the current survey. The Dusky Antechinus is a rare in the Shoalhaven with few animals found.

## **4.2 Arboreal mammals**

The remnant native vegetation continues to support species of arboreal mammal typical of this landscape. The site has a relatively high population of Common Brushtail Possum as several animals were seen, trapped and heard during the surveys. No Yellow-bellied Gliders were detected and the absence of Grey Gum *E. punctata*, the key sap feed tree for this species in the area may account for the absence of the glider. It is recommended to include Grey Gum as part of the revegetation program to provide food resources for this species

## **4.3 Bats**

All of the species of bat trapped den in hollow bearing trees. Previous surveys (Hoye 1995 in Gaia 1996) trapped the Large-eared Pied Bat and Eastern Horseshoe bat at Bundanon. These cave dwelling species are expected to forage and possibly roost along Haunted Point ridge. The survey was conducted at a time of the year when the activity of micro-bats may have been compromised. Surveys in summer may have captured more animals and species.

The Grey-headed Flying Fox was observed feeding on flowering Spotted Gum. The Red Bloodwood - Blackbutt - Spotted Gum and Spotted Gum forests provide food resources for this threatened species.

## **4.4 Birds**

The site supports a relatively high species diversity of bird as there are a range of vegetation communities and habitat types. There was a high concentration of honeyeaters and parrots foraging on the blossom of two flowering Spotted Gum at the ridge site. These factors contributed to the high species diversity for the site. If surveys were conducted during late spring or summer it is likely that additional species (summer breeding migrants) would have been detected.

No large forest owls responded to the broadcast of call playback. This does not mean that these species do not forage on Bundanon. The habitat is suitable for all three large forest owls (Sooty, Masked and Powerful) and all species have been detected within a few kilometres of the site at Bangalee Reserve. Large forest owls have home ranges that cover hundreds to over a thousand hectares (DEC 2005) and animals may not have been within earshot the nights of the broadcast of the calls or may not have responded to the calls.

## **4.5 Fauna linkages and the significance of Haunted Point**

Haunted Point and the associated ridge are important for fauna for providing a linkage of habitat for sedentary and migratory species. For sedentary species such as the Bush Rat and Brown Antechinus, which have already colonised the Wattle forest the habitat supports animals within the population which covers the broader area. For species such as the Sugar Glider, Common Brushtail Possum, microbats and some birds the wattle forest may be used on occasion but can be augmented to better cater for these species. Their habitat can be improved by planting additional canopy species to provide resources such as nectar, seed and eventually den and roost sites.

Haunted Point is important as a stepping stone for animals that can fly, especially birds. As previously mentioned there are a number of species that use the ridgeline as a corridor for north-south migrations. These include the Yellow-faced Honeyeater, Red Wattlebird, Noisy Friarbird, White-naped Honeyeater, Silvereye, Brown-headed Honeyeater and Scarlet Honeyeater. These species follow a seasonal supply of nectar and hence move along the

ridgeline to the Spotted Gum forest. It is recommended to plant additional canopy species to provide resources such as nectar during the winter.

Haunted Point is important for summer breeding migratory species of bird. These include the Rufous Fantail, Rufous Whistler, Black-faced Monarch, Sacred Kingfisher and White-throated Gerygone. The Rufous Fantail and the Black-faced Monarch migrate to and from the area along the escarpment forests (G. Daly pers. obs.).

Haunted Point is important for habitat specialist species of bird. These include the species that forage and nest in rainforests including the Rufous Fantail, Black-faced Monarch, Brown Gerygone, Catbird, Top-knot Pigeon and Large-billed Scrubwren. Augmentation of habitat can be achieved by the planting of additional canopy species to provide resources such as nesting sites, fruit and seed.

There is a need and desire to remove noxious weeds such as Lantana, restore the degraded landscape and use a number of endemic species to provide additional habitat resources for animals. For example the rehabilitation works plan for Bundanon state the use of Forest Red Gum for several areas for revegetation. Although there may be small occurrences of Forest Red Gum adjacent to the pasture near the homestead the majority of trees are Cabbage Gum *E. amplifolia*. In this instance the use of Forest Red Gum is endorsed as it flowers in late autumn-winter and hence provides nectar for animals such as Sugar Gliders, Feathertail Gliders, Grey-headed Flying Fox and a host of bird species. Forest Red Gum is also listed on SEPP 44 as a food source for Koala. Currently no Koala have been detected at Bundanon but the species historically occurred in the area (Daly 2012a) and most records are centred around the Tolwong plateau (Allen 2002). There is scope to re-introduce the Koala at Bundanon and it is recommended to plant feed trees such as Forest Red Gum and Swamp Mahogany as part of this revegetation works so that re-introduction may be possible in the future.

## **5 REVIEW OF ENVIRONMENTAL REFORESTATION WORKS AT HAUNTED POINT**

The rehabilitation works plan for Bundanon lists the species to be planted as part of the work program (Appendix 2 and 7 in Waugh 2012). This plan is reviewed in the context of native fauna, the attributes of the particular species and the authors experience with rehabilitating degraded landscapes in this area over 20 years (Daly 2012b). The use of endemic native plants by fauna is described by the author in the booklet *Rehabilitating Shoalhaven Landscapes*.

Rehabilitating landscapes must take into account the following criteria: what remnants are present that give an idea of the original floristic composition, the soil type and moisture content of the site and what species can be used to bolster biodiversity in a landscape experiencing climate change.

In the Haunted Point river flats subject to rehabilitation the remnant flora includes rainforest species, Illawarra Blue Gum (with features akin to *E. botryoides*), river oaks and Black wattle. These regrowth species indicate that on the southern section of the point the forest consisted mainly of dry rainforest consisting of canopy species such as Red Cedar, White Cedar, Red

Ash, and Sandpaper Fig. These species also occur as isolated remnants over the broader rehabilitation area at Haunted Point. Illawarra Blue Gum is a common species that occurs over the broader area of the Haunted Point Flat and trees were probably retained or allowed to regenerate along the bank for soil conservation. There are also small occurrences of River Oak that have colonised the edge of the Shoalhaven River. There are few remnants edging the wetland area but one large (c. 450mm DBH) River Oak does exist (**Figure 6**).

Below is Appendix 2 and 7 from the rehabilitation works plan for Bundanon.

**Appendix 2: Native plant species inventory for CFI 3 – Environmental Reforestation works – Haunted Point, Bundanon.**

**Canopy species:** *Acacia implexa*, *Acacia falcata*, *Acacia mearnsii*, *Allocasuarina littoralis*, *Allocasuarina torulosa*, *Brachychiton populneus*, *Corymbia maculata*, *Eucalyptus agglomerata*, *Eucalyptus botyoides*, *Eucalyptus globoidea*, *Eucalyptus pilularis*, *Eucalyptus tereticornis*, *Ficus rubiginosa*.

**Understorey species:** *Acacia floribunda*, *Acacia myrtifolia*, *Cassinia aculeata*, *Dodonaea triquetra*, *Dodonaea viscosa*, *Davesia ulicifolia*, *Indigofera australis*, *Hakea sericea*, *Hymenanthera dentata*, *Jacksonia scoparia*, *Ozothamnus diosmifolius*.

**Groundcover species:** *Aristida vagans*, *Cymbopogon refractus*, *Dianella caerulea*, *Dichondra repens*, *Hardenbergia violacea*, *Imperata cylindrical*, *Kennedia prostrata*, *Lomandra longifolia*, *Microlaena stipoides*, *Poa labillardierii*, *Saga leiocladum*, *Themeda triandra*.

**Appendix 7: Native plant species inventory for Landscape Revegetation works - Landscape 3, 4 & 5 – Wetland Reconstruction – Bundanon Homestead/Lagoon Paddock; Bundanon Swamp/Haunted Point Paddock; and Riversdale Homestead/Northern Riparian Paddock.**

**Canopy species:** *Melaleuca ericifolia*

**Understorey species:** *Callistemon citrinus*, *Leptospermum continentale*, *Leptospermum juniperium*, *Leptospermum lanigerum*.

**Groundcover species:** *Baumea articulata*, *Baumea rubiginosa*, *Bolboschoenus fluvialitis*, *Carex appressa*, *Carex fascicularis*, *Carex gaudichaudiana*, *Cladium procerum*, *Crinum pendunculatum*, *Cyperus exaltatus*, *Eleocharis sphacelata*, *Gahnia clarkei*, *Isolepsis nodosa*, *Juncus usitatus*, *Lomandra longifolia*, *Paspalum distichum*, *Persicaria decipiens*, *Phragmites australis*, *Schoenoplectus mucronatus*, *Schoenoplectus validus*, *Triglochin procerum*, *Typha orientalis*.

The plan does not mention rainforest species (*Brachychiton populneus* is the exception), even though this community is small and degraded it is listed on the TSC Act (1995) as endangered and should be given appropriate consideration. The rehabilitation at Haunted Point must use a mixture of rainforest species to protect and enhance this small community. Rainforest supports a range of specialist birds (Green Catbird, Rufous fantail, Black-faced Monarch etc) that occur at Bundanon and judicious planting can bolster the sites diversity. Several of these specialist rainforest species of bird (Top-not Pigeon, Emerald-wing Pigeon, Rose-crowned fruit Dove) use the various patches of forest as 'stepping stones' as they forage over the broader landscape for food. Planting should focus on species to cater for these birds, as suggested in Tables 7 and 8.

Many of the species recommended for revegetation at Haunted Point are inappropriate. For example Blue-leaved Stringybark *Eucalyptus agglomerata* and White Stringybark *Eucalyptus globoidea* naturally occurs on the drier ridges and are inappropriate for the sandy river flats. There is some scope for replanting Spotted Gum on the better-drained area adjacent to the

existing Spotted Gum forest, along with species such as *Allocasuarina littoralis*, *Jacksonia scoparia*, *Dodonaea triquetra*, *Hymenanthera dentata* and *Ficus rubiginosa*. There is no need to plant species of *Acacia* as the existing forest is adequate for the food requirements of Sugar Gliders. There is no need to plant species of vine such as *Kennedia prostrata* as these will recolonise the drier slopes and may hinder regrowth.

In the wetland area there is no need to revegetate the basin of the ephemeral swamp as this dynamic ecosystem which periodically fills with water and shrubs and trees may drown. The basin also experiences prolonged periods of dry and it may be that wetland plants dehydrate during these periods. Currently the site is used by Bibron's Toadlet *Pseudophryne bibronii* for breeding and hence the basin should be left to regenerate naturally.

On the slightly elevated areas of the wetland the species recommended in the rehabilitation works plan, *Melaleuca ericifolia* can be planted. Other species recommended include Swamp Mahogany *E. robusta* and Snow-in Summer *M. linariifolia*. The use of Swamp Mahogany is justified as it occurs adjacent to wetlands in the region and flowers in late winter providing a nectar source for many species of bird. Snow-in Summer occurs on site and would have originally occurred at this site. Australia has warmed since 1950 over 0.7 degrees celcius and is locked in to warm further until 2030. The use of species that can cope with higher temperatures such as Swamp Mahogany and Forest Red Gum is considered appropriate to cater for the measured and predicted change.

## **6 CONCLUSIONS**

The rehabilitation of Bundanon is an ambitious, large project. It is one of the largest lantana control/revegetation projects that has been conducted in the Shoalhaven. The Land Rehabilitation Works Plan lists some of the priorities for the works are to remove weeds and re-establish biodiversity corridors and manage habitat. This report puts in context the importance of Haunted Point to the fauna of the subject area with recommendations for revegetation works to repair the damaged landscape and better cater the food and nesting resources of native fauna.

## **7 RECOMMENDATIONS**

The following recommendations are given for proposed management:

- Weed control work at Haunted Point has been effective and needs to be continued for the short (five years) and long-term (15 years) to ensure success of canopy species. There is also a need for continual maintenance for weed control. This is considered the highest priority recommendation to ensure success;
- A series of photo-monitoring point should be established to measure the success of the program as a visual diary;
- The number of each species of trees and shrubs used in revegetation, each year should be recorded. The time that the plants were put in the ground should also be recorded so that people in the future know what was planted at various times;
- Rehabilitation of select areas on Haunted Point must augment the existing depauperate subtropical (dry) rainforest to facilitate the recovery of this endangered ecological community. This will encourage a greater suite of fauna to use the site;
- Managers should look at the rehabilitation works conducted in a similar landscape at Bangalee Reserve over the past decade to provide guidance from a previous project;

- Tree guards should be used to protect all trees and shrubs used in revegetation. Experience with other revegetation work in the area indicate this is essential for success. I recommend tree guards be fashioned from 25 x 25 mm diameter 1.3 mm gauge x 1200 mm high wire (to exclude wallabies from reaching in between the wire). Tree guards are best staked with 25 x 50 x 1200 mm hardwood or steel pickets. Guards should be removed when plants have attained a height of 2.5 metres such that animals cannot eat the apical (growing) tips (Daly 2012);
- There is no justification for the planting of ground cover plants, except Matt Rush *Lomandra longifolia* to stabilise slopes. Most of the ground cover species will recolonise the area naturally;
- Vines should not be planted in any revegetation works as they can strangle shrubs and canopy species, hindering the rehabilitation of the site;
- Revegetation of the wetland should use endemic species such as Snow-in Summer *M. linariifolia*. Although *Melaleuca ericifolia* is not endemic to Haunted Point it is a wetland edge shrub in the region and its suggested use (Waugh 2012) is acceptable;
- Revegetation may use species such as Swamp Mahogany *E. robusta* for the wetland and Forest Red Gum *E. tereticornis* elsewhere on the sandy flats. These species flower in winter and late autumn respectively and hence provide a nectar food source for birds and mammals and
- A reassessment of the existing OEH vegetation mapping should be undertaken and where appropriate incorrect shape files recoded or realigned and new files created for the endangered ecological communities.

**Table 7**  
**Recommended endemic rainforest species for revegetation at Haunted Point**

Common Name	Scientific Name	Fauna	Use
Red Ash	<i>Alphitonia excelsa</i>	Lewins Honeyeater	Seed
Grey Myrtle	<i>Backhousia myrtifolia</i>	Various birds	Nesting
Flame Tree	<i>Brachychiton acerifolius</i>	Seed eaten by Pied Currawong, leaves eaten by Tailed Emperor, White-banded Plane & Common Pencilled-blue butterflies	<i>Brachychiton acerifolius</i>
Jackwood	<i>Cryptocarya glaucescens</i>	Various pigeons, Satin Bowerbird, Green Catbird	Fruit
Murrogun	<i>Cryptocarya microneura</i>	As above	Fruit
Black Plum	<i>Diospyros australis</i>	Fruit-Lewins Honeyeater	Fruit
Koda	<i>Ehretia acuminata</i>	Fruit-Lewins Honeyeater, Leaves – Hairy Lineblue Butterfly	Fruit
Pigeonberry Ash	<i>Elaeocarpus kirtonii</i>	Fruit- various birds	Fruit
Blue-berry Ash	<i>Elaeocarpus reticulatus</i>	Fruit- various birds	Fruit
Red-fruited Olive Plum	<i>Elaeodendron australe</i>	Fruit- various birds	Fruit
Corkwood	<i>Endiandra sieberi</i>	Fruit- Top-knot Pigeon, Leaves – Eastern Flat butterfly	Fruit
Pigeonberry Ash	<i>Elaeocarpus kirtonii</i>	Various birds	Fruit
Morton Bay Fig	<i>Ficus macrophylla</i>	Top-knot Pigeon	Fruit
Small-leaved Fig	<i>Ficus obliqua</i>	Top-knot Pigeon	Fruit
Port Jackson Fig	<i>Ficus rubiginosa</i>	Various birds	Fruit
Superb Fig	<i>Ficus superba</i>	Top-knot Pigeon	Fruit
Cheese Tree	<i>Glochidion ferdinandi</i>	Lewin's Honeyeater	Seed
Bleeding Heart	<i>Homalanthus populifolius</i>	Brown Cuckoo Dove	Fruit

Common Name	Scientific Name	Fauna	Use
Cabbage Tree Palm	<i>Livistona australis</i>	Top-knot Pigeon	Fruit
<i>Melicope micrococca</i>	White Euodia	Leaves - Orchard Butterfly	Leaves
Snowwood	<i>Pararchidendron pruinosum</i>	Wonga Pigeon?	Fruit
Brush Cherry	<i>Syzygium australe</i>	Various pigeons	Fruit
Lillypilly	<i>Syzygium smithii</i>	Various pigeons, Bowerbird, Green Catbird	Satin Fruit
Native Peach	<i>Trema tomentosa var. aspera</i>	Lewin's Honeyeater and Cuckoo Dove	Brown Fruit

**Table 8**  
**Priority Eucalypt species for revegetation and their use by fauna**

Common Name	Scientific Name	Fauna	Use
Spotted Gum	<i>Corymbia maculata</i>	Sugar Glider and birds	Nectar
Forest Red Gum	<i>Eucalyptus tereticornis</i>	Koala, Sugar Glider and birds	Leaves & Nectar.
Blackbutt	<i>Eucalyptus pilularis</i>	Sugar Glider, Greater Glider	Invertebrates Leaves.
Grey Gum	<i>Eucalyptus punctata</i>	Koala, Sugar Glider, Yellow-bellied Glider, Yellow-tufted Honeyeater	Invertebrates Leaves, Sap and Nectar.
Swamp Mahogany	<i>Eucalyptus robusta</i>	Honeyeater, Parrots, Yellow-bellied Glider and Sugar Glider	Invertebrates Nectar and sap

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## Appendix Fauna detected on site

### Fauna Detected on the Site

Nomenclature is based on Van Dyke and Strahan, R. (2008), Christides and Boles (1994). and Wilson and Swan (2010).

#### Key

##### Record

W	heard call
O	observed during survey
S	scats
T	trapped
M	data from TEC (2010)
*	introduced species

All records were made by either G. Daly or B. Virtue (Gaia Research).

### Mammals

Family	Species	Common Name	Records
Dasyuridae	<i>Antechinus stuartii</i>	Brown Antechinus	T
Vombatidae	<i>Vombatus ursinus</i>	Common Wombat	O
Phalangeridae	<i>Trichosurus vulpes</i>	Common Brushtail Possum	O
Petauridae	<i>Petaurus breviceps</i>	Sugar Glider	O
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	O
	<i>Macropus robustus</i>	Wallaroo	O
	<i>Wallabia bicolor</i>	Swamp Wallaby	O
Pteropodidae	<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	O
Molossidae	<i>Tararida australis</i>	White-striped Mastiff Bat	W
Vespertilionidae	<i>Chalinolobus morio</i>	Chocolate Wattle Bat	T
	<i>Vespadelus vulturnus</i>	Little Forest Bat	T
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	T
	<i>Nyctophilus gouldii</i>	Gould's Long-eared Bat	T
Muridae	<i>Rattus fuscipes</i>	Bush Rat	T
	<i>Rattus rattus</i>	Black Rat*	O

### Birds

Family	Species	Common Name	Gaia
Ardeidae	<i>Egretta novaehollandiae</i>	White Faced Heron	O
	<i>Accipiter fasciatus</i>	Brown Goshawk	O
	<i>Haliaeetus leucogaster</i>	Sea Eagle	O
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	W
Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo	M
	<i>Cacatua galerita</i>	Sulfur-crested Cockatoo	W
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	O
	<i>Alisterus scapularis</i>	Australian King Parrot	W
	<i>Platycercus elegans</i>	Crimson Rosella	O
	<i>Platycercus eximius</i>	Eastern Rosella	O

Family	Species	Common Name	Gaia
	<i>Cacatua galerita</i>	Sulfur-crested Cockatoo	W
Strigidae	<i>Ninox novaeseelandiae</i>	Southern Boobook	W
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	O
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	W
Menuridae	<i>Menura novaehollandiae</i>	Superb Lyrebird	W
Climacteridae	<i>Climacteris leucophaea</i>	White-throated Treecreeper	W
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote	W
	<i>Sericornis frontalis</i>	White-browed Scrubwren	O
	<i>Acanthiza pusilla</i>	Brown Thornbill	O
Meliphagidae	<i>Anthochaera carunculata</i>	Red Wattlebird	W
	<i>Philemon corniculatus</i>	Noisy Friarbird	O
	<i>Manorina melanophrys</i>	Bell Miner	W
	<i>Manorina melanocephala</i>	Noisy Miner	W
	<i>Meliphaga lewinii</i>	Lewin's Honeyeater	O
	<i>Melithreptus lunatus</i>	White-naped Honeyeater	W
	<i>Lichenostomus chrysops</i>	Yellow-faced Honeyeater	O
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater	W
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater	O
	<i>Acanthorhynchus tenuirostris</i>	Eastern Spinebill	O
Petroicidae	<i>Eopsaltria australis</i>	Eastern Yellow Robin	O
Cinclosomatidae	<i>Psophodes olivaceus</i>	Eastern Whipbird	W
Pachycephalidae	<i>Pachycephala pectoralis</i>	Golden Whistler	O
Dicruridae	<i>Rhipidura fuliginosa</i>	Grey Fantail	O
	<i>Rhipidura leucophrys</i>	Willie Wagtail	O
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole	W
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird	W
	<i>Gymnorhina tibicen</i>	Australian Magpie	W
	<i>Strepera graculina</i>	Pied Currawong	W
Corvidae	<i>Corvus coronoides</i>	Australian Raven	W
Ptilonorhynchidae	<i>Ptilonorhynchus violaceus</i>	Satin Bowerbird	O
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	W
Zosteropidae	<i>Zosterops lateralis</i>	Silvereye	W
Muscicapidae	<i>Turdus merula</i>	Common Blackbird*	O

### Reptiles

Family	Species	Common Name	Observation
Scincidae	<i>Acritoscincus platynotum</i>	Red-throated Skink	O
	<i>Cryptoblepharus pulcher</i>	Elegant Snake-eyed Skink	O
	<i>Lampropholis delicata</i>	Grass Skink	O
	<i>Lampropholis guichenoti</i>	Garden Skink	O
Elapidae	<i>Demansia psammophis</i>	Yellow-faced Whip Snake	O
	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake	O
	<i>Rhinoplocephalus nigrescens</i>	Small-eyed Snake	O

### Amphibians

Family	Species	Common Name	Observation
Myobatrachidae	<i>Crinia signifera</i>	Common Eastern Froglet	W
	<i>Limnodynastes peroni</i>	Striped Marsh Frog	O
	<i>Pseudophryne bibronii</i>	Bibron's Toadlet	O